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JOINT REPORT ON
 EXPLORATION LICENCES 102/87
 QUEENSTOWN AND 55/89,
 MT DARWIN, N.W. TASMANIA
 FOR THE YEAR
 ENDING 21ST MARCH 1991
 VOLUME ONE

91 - 3252

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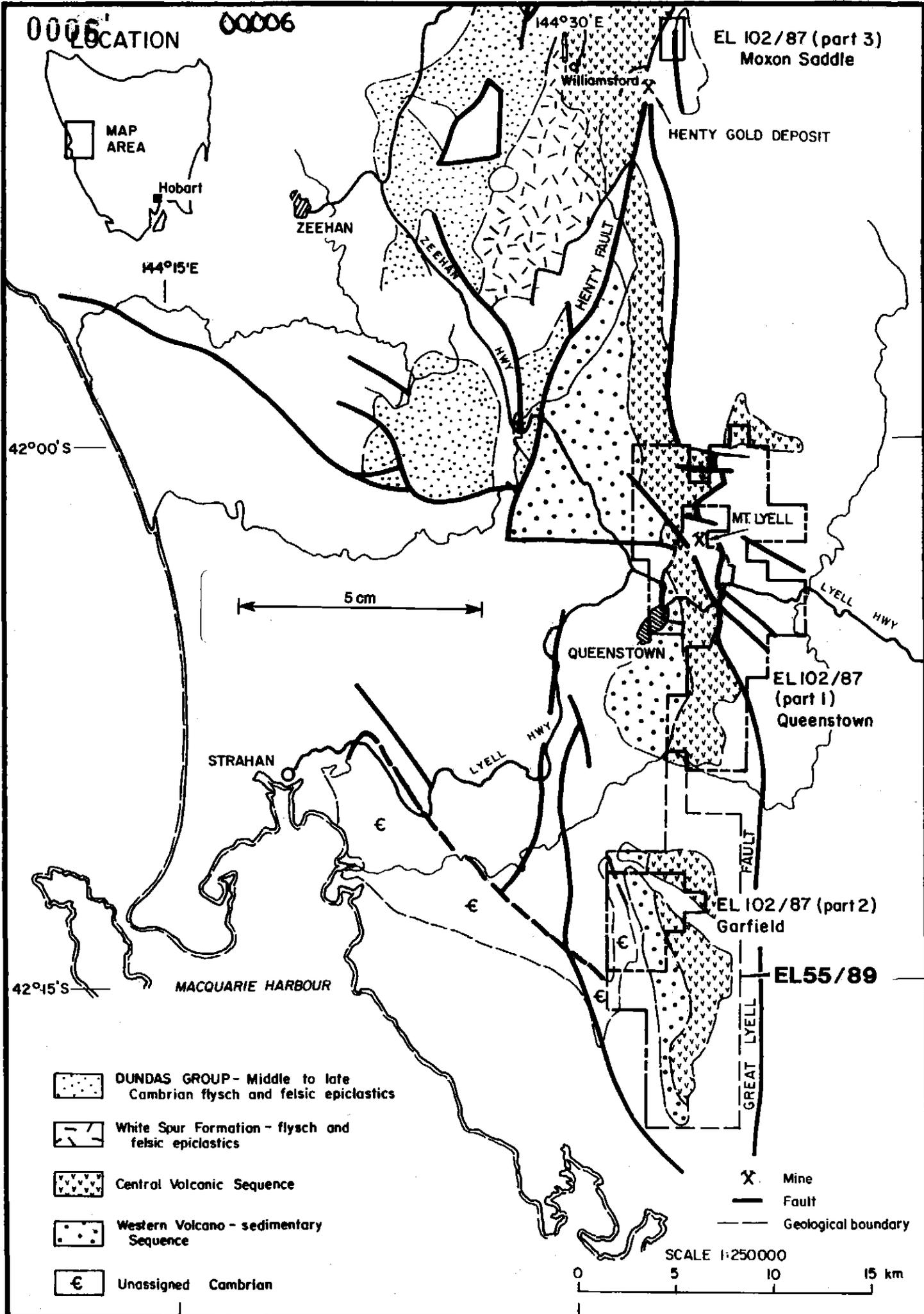
SUMMARY

The Queenstown (EL 102/87) and Mt Darwin (EL 55/89) licences form a contiguous block covering the Mt Read Volcanic Belt from north of Queenstown south to its boundary with the World Heritage Area north of Macquarie Harbour. Exploration within the licences is targeted on base metal mineralisation within the Cambrian Volcanic sequences, with gold a secondary target.

Work during the 1990-1991, year centred on evaluating the potential of the volcanic sequences exposed in Part 2, Garfield (EL 102/87) and the Clark Valley (EL 55/89), using blanket UTEM coverage of prospective units in conjunction with geological mapping and rock chip sampling. A total of 190 line kilometers of UTEM and mapping was completed. One hundred and sixty four rock chip samples were collected and analysed for Cu, Pb, Zn, Au, Ag, Ba, As. Results of these samples proved disappointing and no base metals mineralisation was detected.

A single weak-moderate UTEM conductive source was recognised within the Garfield Area, east of the Thomas Currie Rivulet. The area in which the conductors lies is covered by scree and/or moraine and outcrop is poor. The anomaly remains unresolved and warrants diamond drill testing.

Follow-up BLEG stream sampling and rock chip sampling of old workings at Mt Ellen confirmed that a gold source is present within the boundaries of the Mt Ellen drainage area. Best stream results were 962 ppb Au from a drainage known to include alluvial gold workings, though a number of samples returned >10 ppb from drainages believed to be reflecting bedrock gold sources. Of the samples collected from the Mt Ellen workings, all samples take from the walls of the adits returned gold greater than 0.2 ppm, with the best result of 5 m at 2.18 g/t. It is thought the Mt Ellen workings may not represent the focus of the mineralisation which has yet to be discovered.



Centre
Melbourne

Date
20.11.89

THE BROKEN HILL PROPRIETARY CO. LTD.
QUEENSTOWN REGION, TAS.
FIG 1 EXPLORATION TENEMENTS & REGIONAL GEOLOGY

Project No
B57

Drawing No
A4 3001

1. INTRODUCTION

This report details exploration activity undertaken by BHP Minerals Ltd (BHP) in EL 102/87 and EL 55/89 for the period April 1990 to March 1991.

Approval was granted on 15 March 1991 for joint reporting on the above licences on the basis that the tenements form a contiguous block (Figure 1) applied for on similar geological grounds, and that joint reporting allows for a coherent and readily understandable presentation of BHP's coordinated exploration programmes and results.

EL 102/87 was granted on 22nd April 1988 and is currently made up of three parts which occupy 99 km² east of Queenstown and surrounding the Mt Lyell Cu-Au mine and extending north to include Area 3 (2 km²) at Moxon Saddle, and south to Area 2 in the vicinity of the Garfield Valley (19 km²) which in turn is surrounded by EL 55/89 (Figure 1). EL 55/89 was granted to BHP on the 5th May 1990 and covers 78 km² of ground extending south from Mt Jukes to South Darwin Peak and including the headwaters of the Thomas Currie Rivulet and Garfield River and the Clark Valley.

Exploration within these licences is primarily directed towards the discovery of massive Pb-Zn sulphide mineralisation within the Cambrian Mt Read Volcanics. Previous work by BHP within EL102/87 has centred on saturation TEM coverage of prospective lithologies within Parts 1 and 3 of EL 102/87. In line with this exploration philosophy emphasis has shifted towards a similar approach in Area 2 of EL 102/87 and the extensions of the prospective lithologies into EL 55/89.

Further work has continued on assessing the gold potential of EL 102/87 with rock chip sampling of several old gold prospects and follow-up BLEG sampling of stream anomalies in Area 1.

2. PREVIOUS EXPLORATION

2.1 Garfield Area

The Garfield Area has been explored and prospected since alluvial gold was discovered in the Garfield River and then Flannigans Flat in the late 19th and early 20th Centuries (Nye, 1931). During the 1930's, workings at nearby Flannigans Flat exposed slate hosted gold bearing quartz veins, close to a porphyry intrusive, with quartz vein material overlying this claimed to contain in excess of 3000 g/t Au and "telluride". A sample of the veining collected by Nye (1931) returned 13 g/t Au, though he concluded that the veins exposed beneath the alluvials did not represent the source of the alluvial gold.

Two hardrock prospects are also known to have been worked during this period. Sailor Jacks, located east of the Thomas Currie Rivulet towards Mt Jukes, consisted of a series of workings across the faulted contact between Owen Conglomerate and felsic units of the Mt. Read Volcanic Belt. Mineralisation is described as sandstone hosted pyritic quartz veins containing free gold. Minor alluvial activity was also present downstream within Owen Conglomerate derived gravels. The Snake Spur workings are located within the faulted contact of Owen Conglomerate and Cambrian Volcanics south west of Sailor Jacks. Several trenches are reported to have been dug by prospectors to test localised weak pyrite-chalcopyrite mineralisation within altered volcanics on the western flank of Snake Spur. Channel samples collected by Mt. Lyell Mining in 1977-78, from the main excavation of Snake Spur costean returned 8m at 0.96% Cu. Later sampling by Goldfields (1984) for multi-element analysis gave low Au (<0.08 ppm), Pb and Zn, but up to 1.4% Cu.

Recent exploration of the area commenced in the 1970's with the Mt. Lyell Co. and E.Z. Co. undertaking limited stream sediment, soil and rock chip sampling within the Garfield Valley area. This work was largely incomplete and failed to detect any areas of significant anomalism.

Between 1984-1985 Goldfields Exploration embarked upon an integrated exploration programme to fully evaluate the potential of the area using geological mapping, rock chip sampling and pan concentrate/-80 # stream sediment sampling at a sample density of one per 2 km² drainage. Samples were analysed for Cu, Pb, Zn, Ag, Sn, Wo₃ and Au. A maximum value of 4.5 ppm Au with associated high Ag, Cu and Wo₃ (up to 42 ppm) was found in the headwaters of the Garfield River but was thought to originate from outside the licence boundary. Many other drainages within the area contained low levels of Au (0.1 - 1 ppm) though with the exception of one area, Cu, Pb, Zn results were poor. The base metal anomalous drainage was located within a stream draining massive volcanic units outside the EL boundary and was characterised by a 330 ppm Pb anomaly which decreased upstream through fluvio-glacial deposited Owen Conglomerate into outcropping volcanics containing minor galena-pyrite veinlets and limonitic stockwork veins which assayed up to 0.22% Pb and 1400 ppm Zn. The zone of mineralisation proved discontinuous along strike to the south.

The encouraging gold in stream sediment results led Goldfield to focus their exploration on gold mineralisation as the major target. Two grids were constructed to follow-up stream anomalies at Snake Spur and Flannigans (Figure 2). Both grids were mapped, rockchip sampled, soil sampled and bedrock 'Wacker' sampled. No significant gold anomalous zones were clearly outlined on the Flannigans Grid although irregular elevated gold values (max. 0.44 g/t Au) were present but these failed to define any consistent geologically controlled pattern. The only significant area of gold in bedrock mineralisation identified was on Snake Spur grid where a broad belt of anomalous (>0.1 g/t Au) samples were collected over the north western flank of Snake Spur and the Thomas Currie Rivulet. Within this anomaly two linear zones with values up to 0.46 g/t Au were defined. The zone was tested by two diamond drillholes (SS1/SS2) in 1986 with no significant mineralisation intersected in either hole. Downhole EM in SS2 failed to identify any offhole conductors.

Creek mapping by Goldfields did define a zone of schistose sericite - pyrite alteration on the western side of the divide between the Garfield and Thomas Currie Valleys. Limited assay data did not indicate any significant base metal anomalism.

Prior to BHP's interest in the Garfield Area of EL 102/87 only one TEM survey had been conducted. This survey was a two loop UTEM survey conducted by Goldfields in 1985 at the Snake Spur Grid (Kerr, 1990). Although this UTEM program was part of a gold exploration program, the primary target was a North Lyell type copper deposit. A secondary target was a volcanic-hosted gold deposit.

The loop and line positions used by Goldfields are shown in Figure 2. Fifty metre single vertical component UTEM data were collected on 200m and 400m spaced lines. Anomalies were detailed at 25m spacing. The survey concentrated on an area of >0.1 ppm gold anomalism, adjacent to loops TX3 and TX4. An area of base metal anomalism at the southern end of loop TX3 was not covered with UTEM data.

Several early-time, short strike length, UTEM anomalies were identified by Bishop (1985). These anomalies have been interpreted by BHP to be low conductivity lithological units or weathering features. They do not represent base metal targets.

In summary, the Garfield Area has undergone a number of phases of geological and geochemical exploration with only limited coverage using TEM to search for base metal mineralisation. The most comprehensive work was that of Goldfields in the early-mid 1980's which identified and tested two main zones of gold anomalism at Flannigans Flat and Snake Spur. A number of alteration zones and outcrops with weak base metal mineralisation remain to be tested as does the potential for unexposed base metal mineralisation.

2.2 Clark Valley Area

By far the majority of exploration within EL 55/89 has been centred on the Lake Jukes-Darwin Ridge and its associated copper mineralisation.

Intensive prospecting of the area commenced in 1897 following the discovery of copper at Lake Jukes and later in 1898 at East Darwin. By 1900 a number of small prospecting companies were operating but activity waned in 1903 due to the closure of the Crotty Smelters. Only minimal work was undertaken until 1956 when Mount Lyell Mining and Railway Co. Ltd. and Electrolytic Zinc Co. included the area as part of a regional SW Tasmania exploration programme for Mt. Lyell style copper-gold mineralisation. During a 6 year period, 1956-1962, a programme of regional mapping followed up by detailed adit mapping and sampling at Findons and Prince Darwin workings, aeromagnetic coverage followed by helicopter EM over Prince Darwin and ground magnetic coverage over Jukes Proprietary culminated in the drilling of two holes in the Lake Jukes mine area (L1, L7). Neither hole intersected mineralisation of significant interest.

In 1964 United States Metal Refining Co. under EL 2/64 mapped, sampled adits and completed SP surveys over Prince Darwin, Findons and Jukes Proprietary workings with little encouragement.

Between 1965-1972 BHP tested the extent of the known mineralisation at the Prince Darwin workings by diamond drilling two holes south of the Prince Darwin Adit. DDH1 tested a coincident airborne EM and rockchip copper anomaly and DDH2 tested a rock chip copper anomaly within a zone of pyrite mineralisation. No significant copper mineralisation was intersected. Subsequently, in 1972 BHP and International Nickel Australia Ltd. entered a joint venture to explore the Jukes-Darwin area. This work included geological mapping, adit sampling and a helicopter Turair and aeromagnetic survey (Ruddock, 1974). On the basis of this work five priority areas were selected for follow-up. I.P. surveys were carried out over all five areas with only two, East Darwin and Jukes Proprietary, locating moderate to strong anomalies beneath the old workings which warranted testing by diamond drilling. Results of the four holes drilled indicated that the encouraging grades and widths of copper mineralisation in the old adits did not extend with depth and may have been enhanced by secondary enrichment.

E.Z. Co. Ltd. entered into the BHP/INAL joint venture in late 1974 after acquiring an area, including the Clark Valley, under S.P.L. 140. Target mineralisation was Rosebery-Que River style Pb-Zn mineralisation within lavas and pyroclastic units located west of Jukes-Darwin. A programme of stream sediment geochemical sampling, and mapping in Clark Valley and the headwaters of the Garfield Valley produced little encouragement and led them to conclude that the geology of the areas mapped was not permissive to the target style of mineralisation due to the lack of pyroclastic rocks and a predominance of lavas.

Goldfields exploration of the Clark Valley between 1976-1979 was also focussed on Rosebery style Pb-Zn mineralisation with extensive mapping, stream, soil and rock chip sampling and IP surveys. Goldfields concluded that despite the

favourable periods of volcanic quiescence that allowed deposition of a number of black shale and chert units there is an apparent lack of base metal geochemistry from surface sampling of the volcanic sequence and this downgraded the prospectivity of the area. Over 1000 soil and rock samples produced soil results <500 ppm for Cu, Pb and Zn and a highest value of 2250 Pb from a pyritic black shale rock chip sample. No base metal sulphides were observed. In 1983-1984 further work was carried out by Goldfields in the search for gold in the Mt. Darwin and Inter-colonial Spur areas. No significant results were produced during this work.

Following on from Goldfields, Norgold/EZ Ltd reassessed the Jukes-Mt. Darwin Ridge area, for epithermal gold mineralisation on the basis that previous explorers hadn't been looking specifically for gold and failed to systematically sample the area. A large part of this work appears to have been centred over old prospects which had been identified at the turn of the century. A programme of mapping and geochemical sampling was carried out and this succeeded in the rediscovery of 'Norms Prospect', a gold in quartz-sulphide vein occurrence. Samples of the 200m long outcrop/suboutcropping 1.5m wide quartz pyrite-chalcopyrite vein returned results up to 6.7 g/t Au while a number of smaller veins in the vicinity were of considerably lower grade (<0.2 g/t Au). A recommendation that two holes test the zone of veining was not undertaken and Norgold unsuccessfully sought a JV partner.

In summary, the major part of previous exploration within EL 55/89 has focussed on the search for Mt. Lyell style copper-gold mineralisation within the Cambrian felsic volcanics that form the Jukes-Darwin Ridge. Results of this work have indicated that while minor zones of copper mineralisation are present within the complex, no major discoveries were made. Within the Clark Valley previous exploration has identified a sequence of felsic volcanoclastics, black shales, cherts and lavas which on geological grounds appear favourable hosts for Rosebery style Pb-Zn mineralisation. Work to date has concentrated on geological and geochemical exploration of the outcropping lithologies with no TEM coverage to test for occurrences of shallow unexposed base metal mineralisation.

2.2.1 Geophysical Surveys (after Bishop, 1990)

The past geophysical exploration conducted within EL 55/89 is summarised in Figures 3-5. The first surveys of the area were conducted in 1957 by Lyell-EZ Exploration who flew an aeromagnetic survey and Ronka helicopter-borne EM survey. The latter survey followed an irregular flight path and consequently covered only sections of EL 55/89.

Several aeromagnetic anomalies from the Lyell-EZ survey were followed up by the U.S. Metals Refining Co. The magnetic anomalies were due to magnetite bodies occurring at the Prince Darwin prospect.

A BHP-International Nickel joint venture conducted a Turair survey in 1973 that covered the majority of EL 55/89. This survey did not reproduce the 1957 Ronka EM responses, which have largely been discredited. International Nickel followed up 7 weak Turair responses within EL 55/89 using IP.

As part of the 1981 Western Tasmania aeromagnetic survey commissioned by the Tasmanian Mines Dept., the entire Garfield-Clark Valley area was covered with digital aeromagnetic data. This data was degraded by terrain effects.

Several small scale ground geophysical surveys have been conducted within EL 55/89. Only the most significant of these are mentioned here.

The BMR conducted a 880 Hz Turam survey at the East Darwin Prospect. Three weak responses attributed to low levels of chalcopyrite were recorded at Souter's, Dillon's and Pearce's workings.

Two generations of IP surveys have been conducted within EL 55/89. Between 1972 and 1974 International Nickel conducted 50 m pole-dipole surveys to follow-up Turair anomalies at East Darwin, Allan's Creek, Snake Peak, Findons and Inter-colonial Spur. Drilling at East Darwin intersected wide alteration zones containing enough sulfide to explain the IP responses. A joint venture between Mt Lyell and Getty oil conducted a gradient array IP survey over the Clark Valley grid in 1978. The IP responses recorded correlate closely with mapped black shale horizons.

Former ground geophysical exploration of EL 55/89 has been concentrated on prospects occurring within the Cambrian felsic volcanics along the Mt. Darwin ridge. These surveys were of limited areal extent. Prior to BHP only a gradient array IP survey had been conducted within the Clark Valley. Consequently, this area remained basically unexplored for buried massive sulfide deposits.

3. REGIONAL GEOLOGY

The regional geology of the area included in EL 102/87 and EL 55/89 is summarised in Figure 1. The Cambrian Mt Read Volcanics form a dominant north-south trending belt of acid to intermediate volcanics which has been divided into three distinct litho-stratigraphic sequences by Corbett and McNeill (1988).

Within the belt the Central Volcanic Sequence comprises a complex series of extrusive and intrusive feldspar-phyric rhyolitic-dacitic lavas, volcanoclastics and tuffs with associated andesites, minor basalts, shale and chert. Flanking this sequence to the west is the volcano-sedimentary Western Sequence including interbedded quartz-feldspar phyric rhyolite lavas and volcanoclastics, tuff, greywacke, shale and less extensive andesites and basalts. The relationship between the Western Sequence and the Central Volcanic Sequence is poorly understood but has been proposed by Corbett and Solomon (1989) to be one where the Western Sequence underlies and interfingers with the Central Sequence. Overlying the Western Sequence in the west and flanking the Central Sequence to the east are the younger Middle Cambrian Tyndall Group quartz-feldspar phyric volcanics and volcanoclastics with associated sandstone, shale and minor limestone.

Overlapping and flanking the Mt Read Volcanics in the east and to the south, are Upper Cambrian - Lower Ordovician siliciclastic conglomerate and sandstone of the Owen Conglomerate which in turn are unconformably overlain by Ordovician Gordon Limestone and younger clastic sediments further south.

4. WORK COMPLETED AND RESULTS 1990-1991

4.1 Garfield and Clark Valley Area

A review of previous exploration has shown that while a number of geochemistry and mapping programs have been undertaken within the Mt Read Volcanic Belt exposed in the Garfield and Clark Valley Area, only limited use has been made of geophysical exploration techniques to test for poorly exposed mineralisation. Mapping to date has recognised the potential of this area to host massive sulphide mineralization within a sequence of lavas, volcaniclastics and black shale horizons along the eastern margin of this area. Blanket coverage UTEM surveys and grid based mapping across this zone of interest has been completed as part of the ongoing exploration program in this region.

4.1.1 Geological Mapping

Grid based mapping on 200m spaced lines at 1:5,000 scale, was completed over the Cambrian volcanic sequences exposed within the Garfield and Clark Valley Area. Maps generated from this work are included as Figures 6-8 and summarised in Figure 9. The objective of this work was to identify and record any exposed alteration and mineralisation and to gain some further understanding of the volcanic packages present within the area and their depositional relationships, in particular the contact zone between the compositionally different Western and Central Sequence Volcanics. Mapping was hampered by poorly outcropping lithologies and often intense weathering, and dense vegetation preventing mapping along strike between lines,.

4.1.1.1 Central Sequence Volcanics

This sequence consists predominantly of massive pink grey green feldspar phyric to aphyric rhyolite-rhyodacite lavas that form Mt Darwin and its surrounding plateau. Interbedded with the lavas are sheared fine-medium grained feldspar-phyric volcaniclastics. Both units are locally chloritic with minor pyrite and are commonly crosscut by hematite-magnetite veining. Rare quartz-phyric rhyolite lavas, possibly dykes, with associated quartz-phyric volcaniclastics were observed within this sequence in the headwaters of the Clark River (Figure 8).

4.1.1.2 Central Sequence?/Western Sequence?

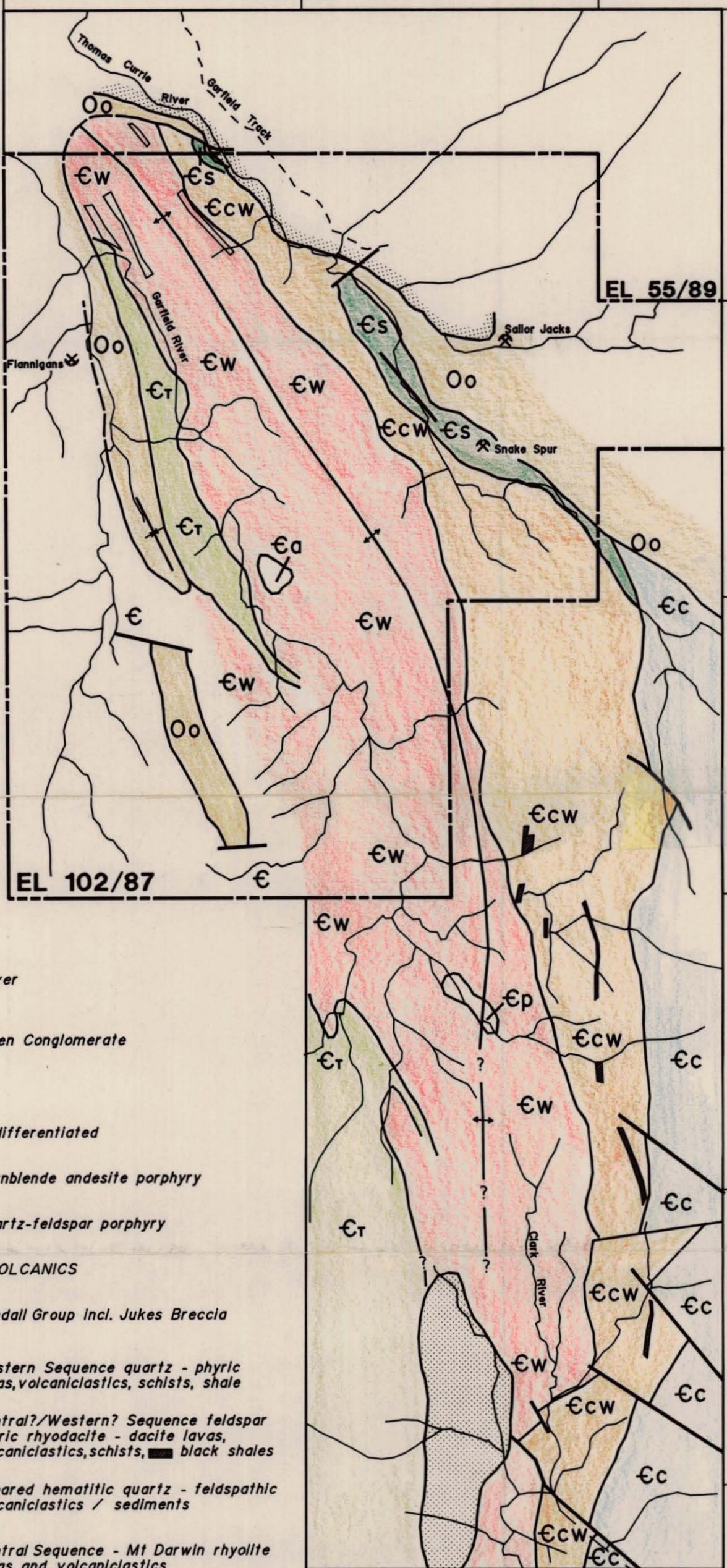
The western contact to the massive lavas of the Central Sequence is marked by a change in character of the volcanics to a sequence of fine-coarse grained crystal-lithic feldspar ± quartz phyric volcaniclastics, schists and tuffaceous units interbedded with feldspar phyric blocky rhyodacite-dacite lavas and rare quartz phyric lavas. Within this sequence a number of pyritic (1-5%) black shale units lie within siltstones and cherty sediments/volcaniclastics along the eastern side of the headwaters of the Thomas Currie and the Clark Valley (Figures 7 and 8). To the north of Slate Spur the units are dominantly lavas,

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LOCATION



78000E 80000E 82000E 28000N 26000N 24000N 22000N 20000N 18000N



LEGEND

- Fault
- ↕ / ↕? / ↕ Anticline/Syncline (actual/inferred)
- / - - - Sequence boundary (actual/inferred)
- ▬ Lithological contact
- Creek
- - - Track
- ⊗ Hardrock Prospect
- ⊗ Alluvial Prospect

RECENT - PLEISTOCENE Cover

ORDVICIAN Owen Conglomerate

CAMBRIAN Undifferentiated

Hornblende andesite porphyry

Quartz-feldspar porphyry

MT READ VOLCANICS

Tyndall Group incl. Jukes Breccia

Western Sequence quartz - phytic lavas, volcaniclastics, schists, shale

Central?/Western? Sequence feldspar phytic rhyodacite - dacite lavas, volcaniclastics, schists, black shales

Sheared hematitic quartz - feldspathic volcaniclastics / sediments

Central Sequence - Mt Darwin rhyolite lavas and volcaniclastics

BHP Minerals
Asia Pacific Division - Exploration

EL 102/87, QUEENSTOWN & EL 55/89, Mt DARWIN, TAS.
GARFIELD - CLARK VALLEY
INTERPRETATIVE GEOLOGY

Prepared: J. Cameron	Date: April 1991
Drawn: Ush/Borlow	Project No.: B57
Centre: Melbourne	Drawing No.:

A3 - 1940

FIG 9

5 cm

0 500 1000 2000 3000 m

374010

whereas south of Slate Spur the sequence consists predominantly of the volcanoclastic units. It is not clear whether these rocks are part of a normally feldspar-phyric Central Sequence or part of the Western Sequence.

Chlorite wisps, segregations and partings are present within a number of the volcanoclastic samples and resemble pumice fragments suggesting that the rock may be pyroclastic in origin, possibly ignimbrites. Alternatively the chlorite may be an alteration feature.

An isolated occurrence of vesicular pyrite-chlorite altered andesite/basalt was noted north of Slate Spur (Figure 7).

West of Snake Spur a band of sheared (mylonitised?) hematitic quartzo-feldspathic volcanoclastics, fine grained sandstone, siltstone and minor shale can be traced along the eastern margin of this sequence before disappearing under cover in the north. These rocks are weakly pyrite -chalcopyrite mineralised at Snake Spur. The true relationships between these sediments and the adjacent feldspar \pm quartz phyric units to the west is not fully known but it is thought they may be a lateral correlative to units of the Tyndall Group, or a sediment package associated with the feldspar - phyric lavas and volcanoclastics.

4.1.1.3 Western Sequence Volcanics

Units within this sequence include quartz \pm feldspar phyric massive-blocky rhyolite lava which is locally flow banded, autobrecciated and strongly cleaved. Interfingered with the lavas are fine-coarse grained crystal-lithic quartz dominated volcanoclastics containing localised concentrations of pumiceous fragments. Associated with these units are minor tuff, shale and ash horizons. Deformation and associated alteration of the volcanoclastics and lavas have developed quartz-feldspar - sericite schists.

Two porphyry bodies were mapped within this sequence. In the north a semi-circular hornblende plagioclase porphyritic andesite body (probably an intrusive) containing minor lithic fragments and with adjacent andesitic tuffs outcrops along 1800N and within the drainage immediately north (Figure 6). To the south below Slate Spur (Figure 7) a massive fine-medium grained quartz-feldspar porphyry (probably intrusive) is enclosed by quartz phyric rhyolite lavas.

4.1.1.4 Tyndall Group

Units of the Tyndall Group volcano-sedimentary sequence are best exposed within and to the west of the Garfield River; upstream from Flannigans Creek junction and within the river's headwaters below Slate Spur. Within the Garfield River the sequence is dominated by

-10-

steeply west dipping quartz-rich fine-medium grained volcanoclastics/epiclastics, sandstone, siltstone and shales unconformably overlying quartz phyric lavas of the Western Sequence. This unconformity is best exposed within the Garfield River on 2800N where steeply dipping black shale directly overlies and lenses out against the lavas. Locally these units are pyritic and quartz veined.

North of Slate Spur a medium-coarse grained quartz-mica porphyritic lava (intrusive?) is associated with siltstone and shale units of this sequence.

No evidence was seen to suggest that these units of Tyndall Group extend across Slate Spur into the upper Clark Valley. Previous workers have interpreted this to be the case as volcano-sedimentary units are mapped along the western side of the Clark Valley south of the area covered by this mapping programme.

Overlying these units west of the Garfield and forming cliffs beneath Owen Conglomerate in the Clark Valley is a lithic rich quartz-feldspar epiclastic breccia/conglomerate unit known as Jukes Breccia. Within the breccia, volcanic fragments and quartz pebbles are the dominant clast types.

4.1.1.5 Ordovician-Silurian Units

Siliceous hematite stained quartz rich boulder conglomerate and pink quartz sandstone of the Owen Conglomerate overlies the Tyndall Group west of the Garfield River and sits adjacent to Central? Western Sequence units along the eastern side of Snake Spur.

Gordon Limestone is known to overlie the Owen Conglomerate within the licence area though this relationship was not observed during mapping. Isolated outcrops of black pyritic puggy clay thought to represent weathered carbonaceous limestone were noted in the Thomas Currie Rivulet east of Snake spur and in the lower reaches of Flannigans Creek.

4.1.1.6 Structure

The dominant structural trend within the mapped area is the N-NNW strike of the volcanic belt as it follows the edge of the Precambrian Tyennan Block. Airphoto interpretation of the area has identified a number of similarly trending lineaments, some of which have been mapped as faults, within the northern part of the Garfield Area. Recognition of structures on the ground is limited by patchy outcrop and on airphotos thick vegetation north of Slate Spur prevents a comprehensive interpretation. To the south along the eastern margin of Clark Valley a number of NW trending lineaments dominate the topography and are reflected in streams draining Mt Darwin ridge and

in apparent offsets in the geology along the flanks of the ridge (Figure 8). Within the mapped units a number of silicified and brecciated outcrops correspond with the proposed trace of these lineaments and are thus inferred to represent faults.

Mapping in the northern part of the Garfield Area has confirmed the location of the previously inferred north plunging anticlinal structure (Figure 6). Owen Conglomerate units were traced around the nose of the fold, which lies north of 5000N (Figure 6), and a number of feldspar phyric lava and volcanoclastic units were mapped within quartz phyric Western Sequence lavas and volcanoclastics towards the Garfield River. Where mapped the feldspar phyric units appear discontinuous along strike due to interfingering and lensing of the units, but in hand specimen closely resemble the more massive feldspar phyric lavas mapped west of the Thomas Currie River. The trace of the fold hinge south is unclear and is thought to run adjacent to the main spine of the Thomas Currie - Garfield divide, along which the volcanics are strongly cleaved and often deformed to schists. Although cleavage remains strongly developed within the volcanic sequence across and to the south of Slate Spur, the degree of and extent of schistosity appears to weaken. Bedding measurements, on Tyndal Group sediments in the Garfield headwaters and black shale contacts along the Mt Darwin ridge edge (Figure 8), indicate N-NW strikes and 60-80° west and east dips respectively suggesting the antiform persists at least to this point.

Cleavage development within the sequences appears to be strongest along the spine of the Garfield - Thomas Currie divide, coincident with zones of most intense schistosity and the inferred trace of the antiform. Here the cleavage is steeply plunging and is predominantly N-NW trending throughout the mapped area with the exception of along 20600N on Slate Spur where rhyolite lavas have an east-west striking cleavage plunging 72° north (Figure 8) suggesting an F² fold event has taken place. Away from the major zone of schist development along the divide, towards both the Garfield and the Thomas Currie Rivers, cleavage development weakens markedly and the units take on a more massive blocky form.

A major shear/mylonite zone has been recognised within the NW trending hematite quartzo-feldspathic epiclastics exposed along the western side of Snake Spur (Figures 6 and 7). The contact between this unit and Owen Conglomerate to the east is best exposed in the vicinity of Snake Spur Costean, while the shearing is more apparent in outcrops within the Thomas Currie River and has been detailed in the drill logs from SS1 and SS2/2A which tested this zone. Interpretation of the drill holes and mapping by Goldfields (Fitzgerald and Cartwright, 1986) suggests that several prominent fault structures are present within this sequence of rocks.

4.1.1.7 Alteration

A number of zones of quartz-sericite ± pyrite ± chlorite alteration were recognised within the volcanic sequences. Carbonate occurs in some places and albitised plagioclase is common. The most extensive zone occurs in the northern portion of the Garfield - Thomas Currie divide where a 300 m x 600 m area of extensively pyrite - sericite ± quartz altered volcanoclastics and schists is exposed within a creek and along a number of traverse lines (Figure 6). Within this zone, pyrite is normally disseminated throughout the units and locally constitutes up to 25% by volume. Silicification is rare but silica is present within the altered units. An auriferous pyrite prospect claimed to be located just west of this zone was not found. Along strike from the creek outcrop, exposure along the gridlines is poor and bedrock is extensively leached of pyrite and bleached, often leading to a failure to recognise the same schistose alteration zone. While a number of other alteration zones were mapped within the different sequences, none were as extensive.

Towards the head of the Garfield - Thomas Currie drainages a number of alteration zones are apparent within both the quartz-phyric and the feldspar-phyric sequences though within both cases the width and strike extent of these zones is restricted. The first is controlled by the nature of the alteration system, the second by the difficulties in mapping along strike in this area.

4.1.1.8 Discussion

Previous workers have all recognised and detailed the lithological changes which reflect chemical variations, depositional environment and age, between the dominantly feldspar-phyric units characterised by the Mt Darwin lavas to the east, with dominantly quartz phyric volcanics, volcanoclastics and epiclastics to the west. The nature of the two volcanic sequences and their inter-relationship remains somewhat unresolved even on completion of the recent mapping programme. Contrary to the work by Corbett and McNeill (1988), suggesting that Central Sequence Volcanics extend as far north as the nose of the mapped anticline and lie adjacent to the Western Sequence at this point, it appears that in reality a transitional zone exists between the two sequences. Within this transitional zone (Central?/Western? Sequence) both quartz phyric and feldspar phyric lavas, volcanoclastics and schists are present though the feldspar phyric units predominate. Within this transitional sequence lie a number of black shale and cherty units indicative of submarine conditions prevailing during quiescent period of volcanism, providing a permissive environment for the deposition of base metal mineralisation similar to that found at Rosebery.

Comparison of both hand specimen and thin sections of the Central Sequence - Mt Darwin lavas and the feldspar phyric rhyodacite-dacite samples confirms that the two are physically different and can be mapped as such on the basis of the relative abundance of feldspar phenocrysts visible in hand specimen, their grain size and the grain size of the matrix. The unit termed Central?/Western? Sequence is dominated by lavas in the north and more commonly volcanoclastic units to the south. In the south along the western margin of Mt Darwin (Figure 8) the volcanoclastics are similar to those observed north of Slate Spur and have been previously mapped as a sequence of "Flanking Pyroclastics" (Ruddock [1974]) around the Mt Darwin dome complex.

In the vicinity of Snake Spur this transitional zone sits adjacent to a sequence of sheared quartzo-feldspathic hematitic volcanoclastics/epiclastics which bear some resemblance to Tyndall Group sediments found on the western side of the mapped area (Figures 6 and 7). This shear is interpreted to represent a major mylonite zone along a plane of dislocation with the sediments possibly eastern limbs equivalents of the west dipping Tyndall Group seen in the Garfield River.

4.1.2 Geochemistry

A total of 186 samples were collected from the Garfield and Clark Valley Area during this programme. Of these, 164 were submitted to Analabs, Burnie for Cu, Pb, Zn, Ag, Au, Ba and As analysis. Sample locations and results are shown on Figures 6-8 and sample descriptions included in Appendix 1. A further twenty-five hand specimen samples were despatched for petrographic description to Pontifex and Associates Pty Ltd. The ensuing report is presented in Appendix 2 and locations of the samples shown on Figures 6-8.

To avoid bias and to maximise the probability of sampling a prospective unit, any outcrop or exposure which showed any signs of alteration, silicification, brecciation, sulphide or iron staining was representatively sampled. Results of this work proved disappointing with values rarely above those considered to represent background concentrations within the Mt Read Volcanic Belt. Maximum values of 845 ppm Pb in black shale samples, 365 ppm Zn within chloritic rhyodacite schist and 350 ppm Cu with 0.31 ppm Au from a sample of silicified hematite sandstone were returned but these levels are uncommon within the data set.

A further 18 samples were collected during traverses of the stream draining the main pyrite - sericite - quartz alteration zone on the northern end of the Garfield - Currie divide (Figure 6). In all instances samples contained up to 25% pyrite as fine grained disseminations, microveins, and along cleavage planes within sericite-chlorite schists after volcanoclastics. Results were disappointing with a high of 210 ppm Zn from one sample, and Au concentration rarely above the detection limit. This work substantially downgraded prospectivity of this alteration zone, though the bleached nature of most of the samples may indicate that surface leaching may have led to a surficial zone of base metal depletion.

Overall sampling to date confirms the observation that it is highly unlikely that mineralisation exists within outcropping volcanic units in the mapped area. This does not preclude the existence of as yet undetected subsurface shallow mineralisation.

4.1.3 Geophysics

4.1.3.1 Initial Garfield Utem (after Kerr, 1990)

A reconnaissance UTEM (West et al., 1984) survey was conducted over the Garfield grid EL 102/87 during March/April 1990. This survey was contracted to Lamontagne Geophysics. Seventy five line kilometres of data were collected from nine energizing loops (Figure 10). The survey was conducted at an operating frequency of 26.23 Hz, measuring 10 time channels of data. The time channels used are displayed in Table 1. Data was collected at 50 m station spacings on 200m spaced lines. Each line was surveyed in-loop and out-of-loop, with the exception of lines occurring between loops 6 and 7. These lines were only surveyed out-of-loop. The UTEM data collected is presented in Appendix 3.

The survey was completed in 24 days comprising 15 two receiver production days, 1 single receiver production day and 8 standby days. For each two receiver day an average of 4.5 line/km of data was collected. The contractor cost for the survey was \$52,200 or \$698 per kilometer of data.

The interpretation of the Garfield UTEM data is presented in figure 10. Numerous broad early-time (channels 7, 8 and 9) responses, due to surficial conductors, were identified within the Garfield grid. These surficial conductors are either slightly conductive lithological units (black shales), differentially weathered volcanics or glacial overburden. These conductors are termed "lithological conductors" and are considered non-prospective.

Two conductors were interpreted as bedrock conductors which had the potential to be buried massive sulfide mineralization. The conductor occurring on lines 3600N to 4200N was termed the Currie Conductor (Figure 11). This conductor produced a small amplitude, channel 4 and 5 response whose amplitude consistently decreased in a northerly direction.

TABLE 1
UTEM Data Plotting Specifications

		Nominal Time Windows (for a base frequency of 26.23 Hz)		
Symbol	Channel Number	Start (ms)	Centre (ms)	End (ms)
◇	10	.018	.027	.036
△	9	.036	.054	.072
	8	.072	.108	.144
	7	.144	.216	.288
∠	6	.288	.432	.576
≤	5	.576	.864	1.152
□	4	1.152	1.730	2.304
\	3	2.304	3.460	4.608
/	2	4.608	6.910	9.216
	1	9.216	13.820	18.43

All channels are plotted as :

$$\frac{\text{Channel} - \text{reference}}{\text{base}} \times 100\%$$

For continuously normalised plots :

reference = primary (for channel 1)
 = channel 1 (for all other channels)

base = primary field (total) at reading station

For point normalised plots :

reference = primary (for channel 1)
 = channel 1 (for all other channels)

base = primary field (total at reference station marked with symbol***)

The second conductor, termed the Heli Conductor, was identified on lines 3200N - 3800N. This conductor was thought to plunge in a southerly direction from a depth of 130 m on line 3800N to over 190 m on line 3400N.

Although these UTEM anomalies were considered to be potentially due to massive sulfides, the possibility that they represented lithological units, could not be discounted on the basis of the 50 m data. Follow-up UTEM data was collected to determine the source of these conductors.

4.1.3.2 Follow-Up Garfield UTEM

In order to further characterize the response of the Currie and Heli conductors loops 10 and 11 of follow-up UTEM data were collected (Figure 12). Data from these loops were collected at 25m spacings at a frequency of 26.23 Hz. Vertical component data were collected on each follow-up line. Horizontal component data were collected only on lines 4200N, 4000N and 3600N from loop 10. The data are included in Appendix 3.

The Garfield follow-up UTEM survey commenced on Sunday 24th June and were abandoned on Friday 29th June due to extreme weather conditions. The follow-up survey recommenced on November 4 at the start of the main 1990 reconnaissance survey. In addition to loops 10 and 11, 25m data were collected from loop 2, the original discovery loop.

Some 14.6 line/km of 25 m spaced ^{vertical} ~~vertical~~ component and 3.2 line/km of 25 m spaced horizontal component follow-up data were collected. The contractor cost for collection of this data was \$32,235 or \$1,810.26 per line/km.

The loop two 25 m data showed three adjacent conductors exist within the region of the Currie Conductor. Conductor I extends from 2800E - 3000E, 3600N - 4400N and is interpreted to be a wide lithological unit exhibiting significant line to line variability. The second conductor is the Currie Conductor shown by the follow-up data to be a weakly conductive lithological unit. The features observable in the follow-up UTEM data that suggest this are :

- (1) Lack of a cross-over anomaly where recorded from loop 2.
- (2) Identification of sharp "edges" in the UTEM profile characteristic of surficial conductors.

The lack of a loop 10 cross-over anomaly coincident with the Currie Conductor could have been due to a lack of significant current-gathering within a surficial conductor or poor eletro-magnetic coupling

with a bedrock conductor. The latter could only have occurred if a bedrock conductor was shallowly dipping to the west, contrary to the observed geological dip such a conductor would have been efficiently energized from loop 3, which covered the Currie Conductor with in-loop readings. The in-loop data does not exhibit a response in a position as would be expected if the Currie conductor was shallowly west dipping. If the Currie Conductor occurred in bedrock then a response from loop 10 would have occurred. Consequently the Currie Conductor must be a surficial conductor preferentially excited from loop 2.

The third conductor observed from loop 2 was originally interpreted from the 50 m data as an "edge-effect" anomaly due to the termination of conductive overburden. This conductor, termed the Thomas Conductor (Figure 12) is overlain by Ordovician Owen Conglomerate scree east of the Thomas Currie Rivulet.

The Thomas Conductor has three possible sources :

- (1) Edge of conductive Ordovician cover rocks.
- (2) Black shale underneath Ordovician cover rocks.
- (3) Buried massive sulfides.

The Thomas Conductor exhibits a channel 5 to 9 UTEM response, with an inductive time constant of 0.3ms and conductivity/thickness product of 9 siemens/metre. The conductor has a strike length of >800 m and exhibits characteristics of both surficial and bedrock conductors. If the response is due to a bedrock conductor then some overprinting of the bedrock response by surficial conductors has occurred.

The possibility that the Thomas Conductor is due to termination of conductive cover is considered unlikely. The western edge of the Owen Conglomerate observed elsewhere in the area is easily recognizable as a sharp, surficial, early-time response quite unlike the Thomas Conductor.

A bedrock conductor underneath the Owen Conglomerate could be either black shales or sulfides. Computer modelling has suggested that 2-3m of very conductive black shales could produce the observed response (MacNae pers. comm.). Black shales throughout the Garfield area produced channel 8 and 9 responses of low to moderate amplitude. Some shales produced no EM response. Thus, if the Thomas conductor is a black shale it would have to be either more conductive or of greater width than any shale known in the Garfield area.

-18-

The time constant of the Thomas Conductor is exponential indicating the anomaly is produced by a confined vortex current, not gathered currents. This is further evidence to suggest the conductor is not a lithological unit as lithological conductors usually exhibit power law decay constants produced by gathered currents.

A significant possibility exists that the Thomas Conductor is a buried massive sulfide deposit. Consequently drill testing of the anomaly is recommended. The conductor should be tested 90 m below 3225E on line 3800N. Down-hole EM on the test hole will determine if the Thomas Conductor is purely surficial in nature.

The loop 11 follow-up data collected over the Heli Conductor revealed this conductor to be a weakly conductive broad lithological unit. No further work is required along this trend.

4.1.3.3 Extension UTEM Survey

The reconnaissance UTEM survey to cover the remainder of the Garfield area not read with UTEM in March/April 1990 and then extend into the Clark Valley, commenced on November 10, 1990. This survey aimed to blanket cover the Western Sequence Volcanics, effectively exploring this sequence for economic sulfide deposits occurring within a depth range of 0-300 m.

A total of 109.5 line/km (Figures 13 and 14) of 50 m spaced and 2.6 line/km of 25 m spaced UTEM data were collected. This data is included in Appendix 5. Routinely out-of-loop data were collected from loops 12 to 26, except for several large loops (loops 15, 17, 19 and 21) where in-loop data was collected to provide effective coverage for targets situated a significant distance from the loop front. The survey was completed in 29.5 production days with 3 standby days. The average two receiver production rate was 3.8 line/km. The total contractor cost for data collection was \$77,830.54 i.e. \$710 per line/km of data.

Within the Garfield extension and Clark Valley grids a minor degree of background EM response was recorded. Several localized responses were recorded indicative of wide, poor conductors, none of which could be attributed to a massive sulfide deposit. The black shale horizons occurring on the east side of the Clark Valley produced surficial UTEM responses extending until UTEM channel 7, sometimes channel 6. These responses lasted in time twice as long as the shale responses from the Garfield area. This was due to the greater thickness of the Clark Valley shale horizons. No indications of massive sulfide mineralisation associated with the shales were identified.

One loop of follow-up data, loop 26 (Figure 14), was collected in the Clark Valley. This loop investigated an early tie feature detected from loops 22 and 24. This feature was revealed by loop 26 as the eastern edge of conductive source on the slopes of Mt Sorell.

No EM responses was detected in the Clark Valley or Garfield extension UTEM data that could be attributed to massive sulfides mineralisation. Consequently this region has been effectively sterilized for conductive sulfides to a depth of 200-300m.

4.2 OTHER AREAS

4.2.1 Mt Ellen Prospect

Following encouraging results from first pass stream sediment BLEG and rock chip sampling of the old workings at Mt Ellen a further programme was undertaken to test the area for gold mineralisation.

A further 19 2 kg BLEG samples were collected from the previously identified anomalous drainages surrounding the Mt Ellen and Mountain Maid workings in an attempt to narrow down the gold source area. Results from the sampling have proven to be highly anomalous with a maximum value of 962 ppb, coming from a 2.5 km long drainage, upstream from an area of suspected alluvial workings (Figure 15). As shown on Figure 15 it appears that a number of the high results (>10 ppb) may be due to similar contamination but a number of results still appear to be reflecting a bedrock source, including two, 2.8 and 29.1 ppb, which tested drainages originating from the vicinity of Mountain Maid. A number of samples upstream from Mt Ellen remain anomalous and need further resolution.

Twenty rock chip and channel rock chip samples were taken from the walls of two adits exposed when the collapsed adit entrance was cleaved. Channel sampling in the two adits produced Au anomalism in all samples ranging from 0.195 - 2.18 g/t (Figure 16). The best results were 5m at 2.18 g/t in a cross-cut off adit 1 and 3.95 g/t in a sample taken across a gently dipping quartz vein in adit 2. Other quartz veins sampled tended to be stringer veins and produced ≤ 0.5 g/t only. Overall the Au values appear to relate to the thin quartz stringers formed along gently dipping joints in altered rhyolite. While the old workings appear to have been somewhat substantial it appears that the exposed mineralisation is weak and may be distal to its primary source.

4.2.2 Linda Valley

Follow-up BLEG sampling was undertaken within part of the Linda Valley where an initial regional BLEG sample had returned 65 ppb. Results and locations of the follow-up samples are shown on Figure 15. Results upstream of the anomaly lie in the range 0.37 - 15 ppb with the lower results lying upstream from the 15 ppb sample. This downgrades the anomaly as a stream traverse at the time of

Centre
Melbourne
Date
April '91

EL 102/87, QUEENSTOWN, TASMANIA
THE BROKEN HILL PROPRIETARY CO. LTD.
MT ELLEN MINE, WORKINGS and SAMPLE LOCATIONS - GOLD

Project No
B57
Drawing No
A4 - 3124

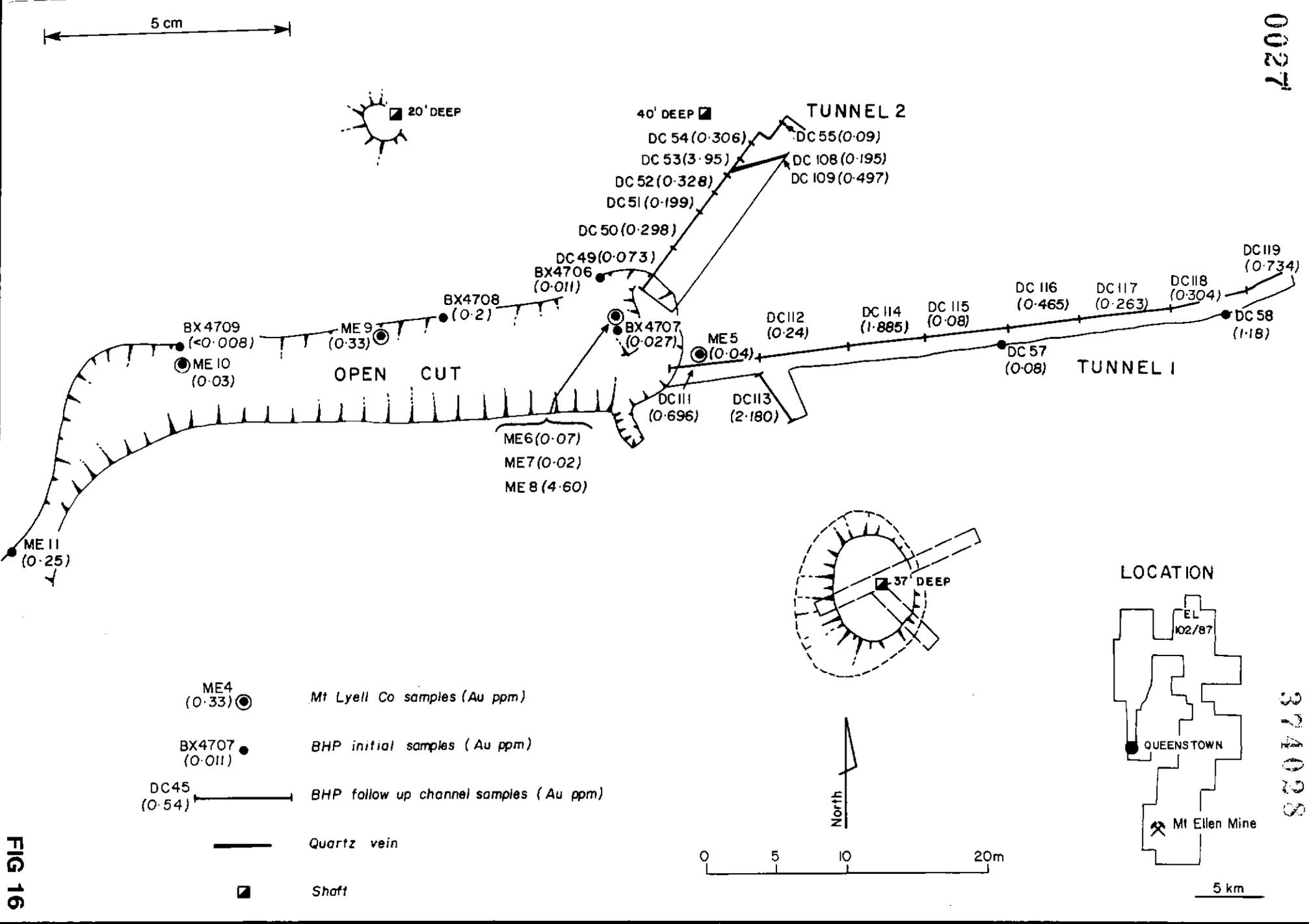


FIG 16

sampling failed to note any alteration or gold mineralisation with the exception of pyritic Gordon Limestone. It is likely that the anomalism may be due to alluvial gold shedding from basal Owen Conglomerate.

4.2.3 Moxon Saddle

The north-west corner of the Moxon Saddle EL was mapped, 23 rock-chip and 3 panned concentrate samples collected. (Sample numbers & locations are given on Figure 7). Analytical Results are given in Table 2.

The Henty Fault Zone is defined by poorly outcropping chloritic schist, with elevated Zn (100-300 ppm). In the immediate footwall is a massive, purple to pink, quartz-porphyritic (?) rhyolite lava. Alteration is minor, with pervasive silica and hematite, sparse hematised pyrite cubes and rare quartz-bornite-hematite veins. Six random grab samples returned background base precious metal values. To the west is a feldspar-porphyritic unit showing flow-layering and rarely brecciation. At the margin of the two volcanic units is an auriferous pyritic schist (discussed in Wilde & Kerr, 1990).

4.2.4 West Sedgwick/#3 Dam Zone

Following recommendations made during the last reporting period (Wilde and Kerr, 1990), 24 samples of drillcore from diamond drillhole WS-2 were assayed for Au at Analabs, Burnie. Cu, Pb, Zn, Ag, Ba and As analyses were also undertaken. Description of the samples and the sample interval are included in Appendix 1 and the assay results detailed in Appendix 6.

WS-2 was targeted to intersect a pyritic quartz-sericite schist zone (Tramway Pyrite) at depth. In outcrop the Tramway Pyrite zone is 2 metres wide with a probable strike length of <30 metres and from rock chip sampling assays 0.7 g/t Au. WS-2 intersected a number of alteration zones containing 1-2% disseminated pyrite, pyrite veins and pyrite carbonate veining within shales and interbedded sandy units and within andesitic volcanoclastics, all of which were selectively sampled for assay. In all samples both Au and base metal levels were low (maximum 0.01 ppm Au, 105 ppm Cu, 130 ppm Pb, 410 ppm Zn) severely downgrading the gold bearing potential of this alteration zone.

TABLE 2
Analyses of Trace Elements in Samples
from the Moxon Saddle

PPM		Cu	Pb	Zn	Ag	Au
Henty Fault Zone						
DC65	Quartz-sercite schist	5	15	35	0.5	<0.008
DC67	Quartz-sercite schist	5	20	25	0.5	<0.008
DC68	Chlorite schist	30	25	125	<0.5	<0.008
DC69	Chlorite schist	5	10	80	<0.5	<0.008
DC71	Quartz-sercite rock	10	5	35	<0.5	<0.008
DC73	Quartz-chlorite schist	5	5	130	<0.5	<0.008
DC74	Chlorite-sercite schist	15	10	135	<0.5	<0.008
DC75	Chlorite schist	<5	30	200	<0.5	<0.008
DC76	Chlorite-quartz schist	<5	70	270	<0.5	<0.008
DC77	Chlorite schist	5	35	180	<0.5	<0.008
AVERAGE		9	23	122	<0.05	<0.008
Quartz-Phyric Lava						
DC37	With rare pyrite	<5	10	55	<0.5	<0.008
DC38	Minor chlorite	<5	<5	85	<0.5	<0.008
DC39	Minor quartz veining	5	85	35	<0.5	<0.008
DC40	Schistose pyrite	5	20	60	<0.5	<0.008
DC41	Rare pyrite cubes	20	60	40	<0.5	<0.008
DC42	1% pyrite cubes	5	10	10	<0.5	<0.008
AVERAGE		7	32	48	<0.5	<0.008
From Old Workings						
DC36	Altered volcanic	25	20	280	<0.5	0.062
DC43	Vein fragment (?)	8.05	<5	65	18	0.220
DC44	Altered volcanic (?)	6.88	<5	55	8	0.102
DC45	Quartz hematite vein	40	250	70	<0.5	<0.008
DC46	Silicified lava	30	320	40	1	<0.008
DC47	Quartz-veined lava	25	395	30	1	<0.008
DC48	Maroon lava	20	160	60	<0.5	<0.008

5. CONCLUSIONS AND RECOMMENDATIONS

Base metal exploration within EL 102/87 (Part 2) and EL 55/89 has centred on the use of TEM coverage over prospective volcanic sequences with complimentary grid based geological mapping and rock chip geochemistry.

Geological mapping has delineated a number of alteration zones within the volcanic sequences as well as traced the strike continuation of a series of prospective black shale units along the western margin of the Clark and Thomas Currie - Garfield Valleys. A transitional sequence of feldspar phyric rhyodacite-dacite lavas with associated volcanoclastics lies between the Western Sequence quartz phyric dominated volcanics to the west and the massive Mt Darwin lava and volcanoclastics to the east. This transitional sequence is referred to as the Central? Western Sequence.

Geochemical sampling throughout the mapped area has failed to identify any economically mineralised horizons. Elevated Pb and Zn values are barely above that considered background for the Mt Read Volcanic Belt.

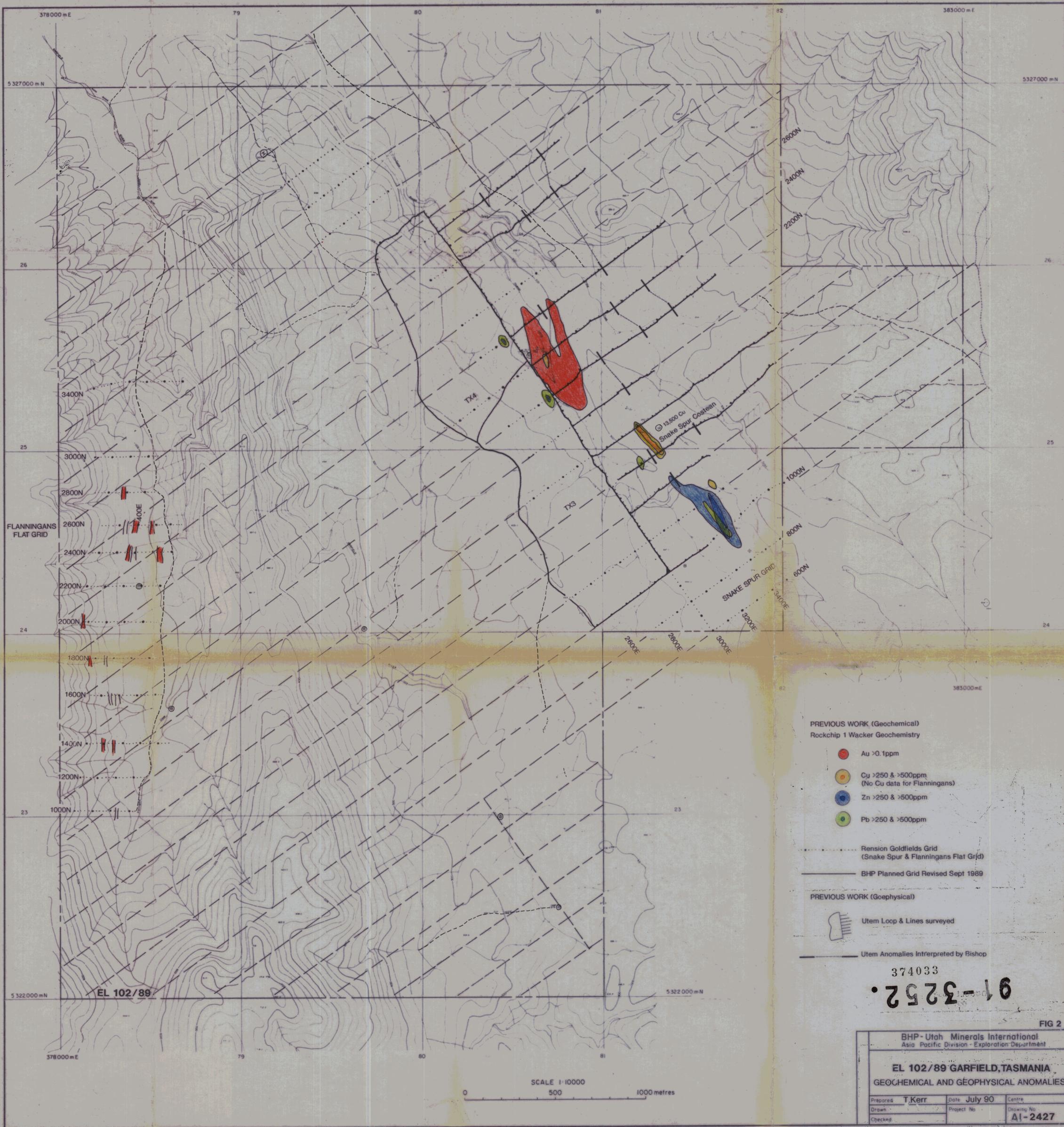
UTEM coverage of the prospective volcanic sequences has identified a weak-moderate conductor beneath Owen Conglomerate scree/moraine east of the Thomas Currie. Mapping suggests that the sequence of quartzo-felspathic hematitic volcanoclastics exposed west of Snake Spur may extend beneath this cover and could represent a suitable host for base metal mineralisation. This anomaly should be tested with diamond drilling and the hole/s logged by downhole TEM.

Ongoing gold exploration has delineated several areas of interest which warrant further exploration. The Moxon Saddle IP anomaly located in the previous reporting period remains untested. Shallow auguring should be undertaken to establish the nature of bedrock in the vicinity of the IP anomaly and to test for bedrock gold anomalism. Similarly systematic soil sampling across the Henty Fault footwall zone should be undertaken to evaluate its gold potential.

Preliminary follow-up BLEG stream sampling and adit channel sampling of the Mt Ellen workings has confirmed the presence of a weak-moderately mineralised system. Work to date suggests that Mt Ellen may not be the focus of the mineralising event and that further work is needed to resolve the source of the gold. Exploration should be aimed towards further resolution of the stream sediment anomalies using stream traverses with rock chip sampling; and wacker/auger soil sampling over the remaining anomalous drainage areas. The whole area should be mapped in conjunction with this sampling.

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PREVIOUS WORK (Geochemical)
 Rockchip 1 Wacker Geochemistry

- Au >0.1ppm
- Cu >250 & >500ppm
(No Cu data for Flanningans)
- Zn >250 & >500ppm
- Pb >250 & >500ppm

PREVIOUS WORK (Geophysical)

- Utem Loop & Lines surveyed
- Utem Anomalies Interpreted by Bishop

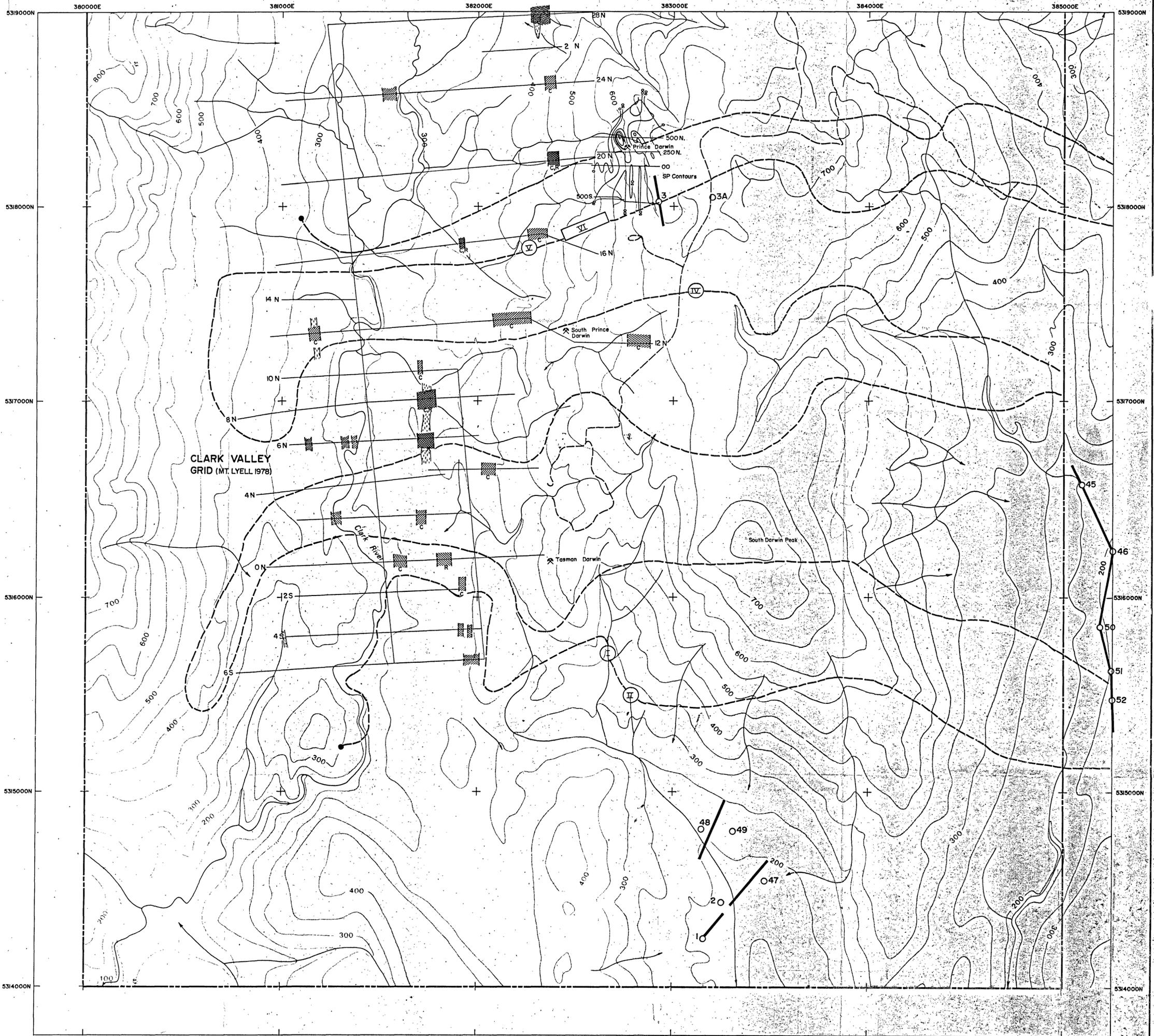
374033
 91-3252

FIG 2

BHP-Utah Minerals International Asia Pacific Division - Exploration Department		
EL 102/89 GARFIELD, TASMANIA		
GEOCHEMICAL AND GEOPHYSICAL ANOMALIES		
Prepared	T. Kerr	Date July 90
Drawn		Project No
Checked		Centre Drawing No A1-2427

SCALE 1:10000
 0 500 1000 metres

5 cm

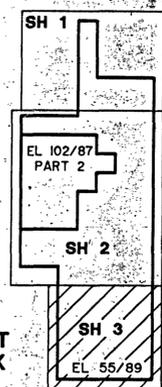


LEGEND

- Axis of Turair anomaly, at $\le 10\text{ Mhos}$
- Axis of Turair anomaly, $10 < \le 100\text{ Mhos}$ } 1974 Turair survey for INAL
- Axis of Turair anomaly, at $> 100\text{ Mhos}$
- IP Chargeability anomaly (1979 Scintrex survey)
- IP Resistivity anomaly (1979 Scintrex survey)
- Black shale unit
- Helicopter EM anomaly (Lyll E-Z survey 1957)
- Helicopter EM anomaly (Lyll E-Z survey 1957)
- Prospect
- Flight path of helicopter (Lyll E-Z EM survey 1957)



SHEET INDEX

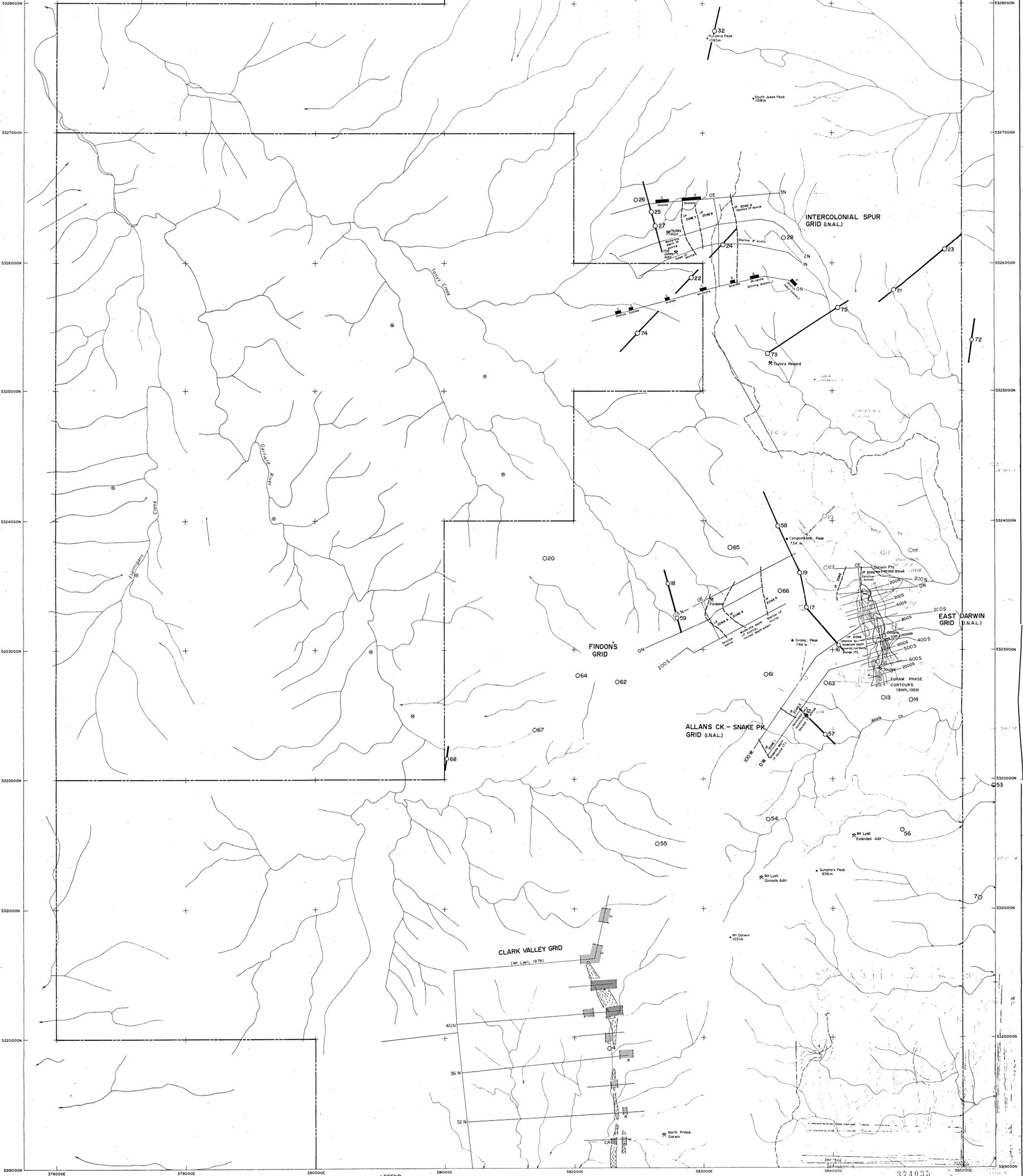


371037
91-3252.

Scale 1:10000
0 500 1000 metres

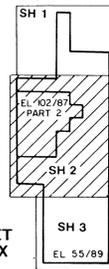
FIGURE 3

BHP-Utah Minerals International Asia Pacific Division - Exploration Department		
EL 55/89, MT DARWIN, TASMANIA		
PAST GEOPHYSICAL EXPLORATION		
Prepared: J. Read	Date: July 1990	Centre: Melbourne
Drawn: F. Barlow	Project No.: BHPMG90/18	Figure 3
Checked: J. Read	Drawing No.:	

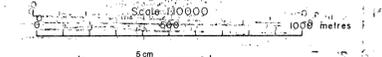


LEGEND

- Axis of Turair anomaly, <10 Mhos
- Axis of Turair anomaly, $10 < \Delta < 100$ Mhos
- Axis of Turair anomaly, >100 Mhos
- ▨ IP Chargeability anomaly (1979 Scintrex survey)
- ▨ IP Resistivity anomaly (1979 Scintrex survey)
- ▨ Blackshale unit
- Axis of IP anomaly (1974 Geotrex survey)
- IP Chargeability anomaly with qualitative indication of depth (1974 Geotrex survey)
- INAL International Nickel Australia Limited
- ⚡ Prospect

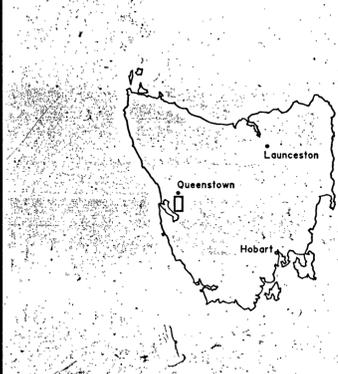
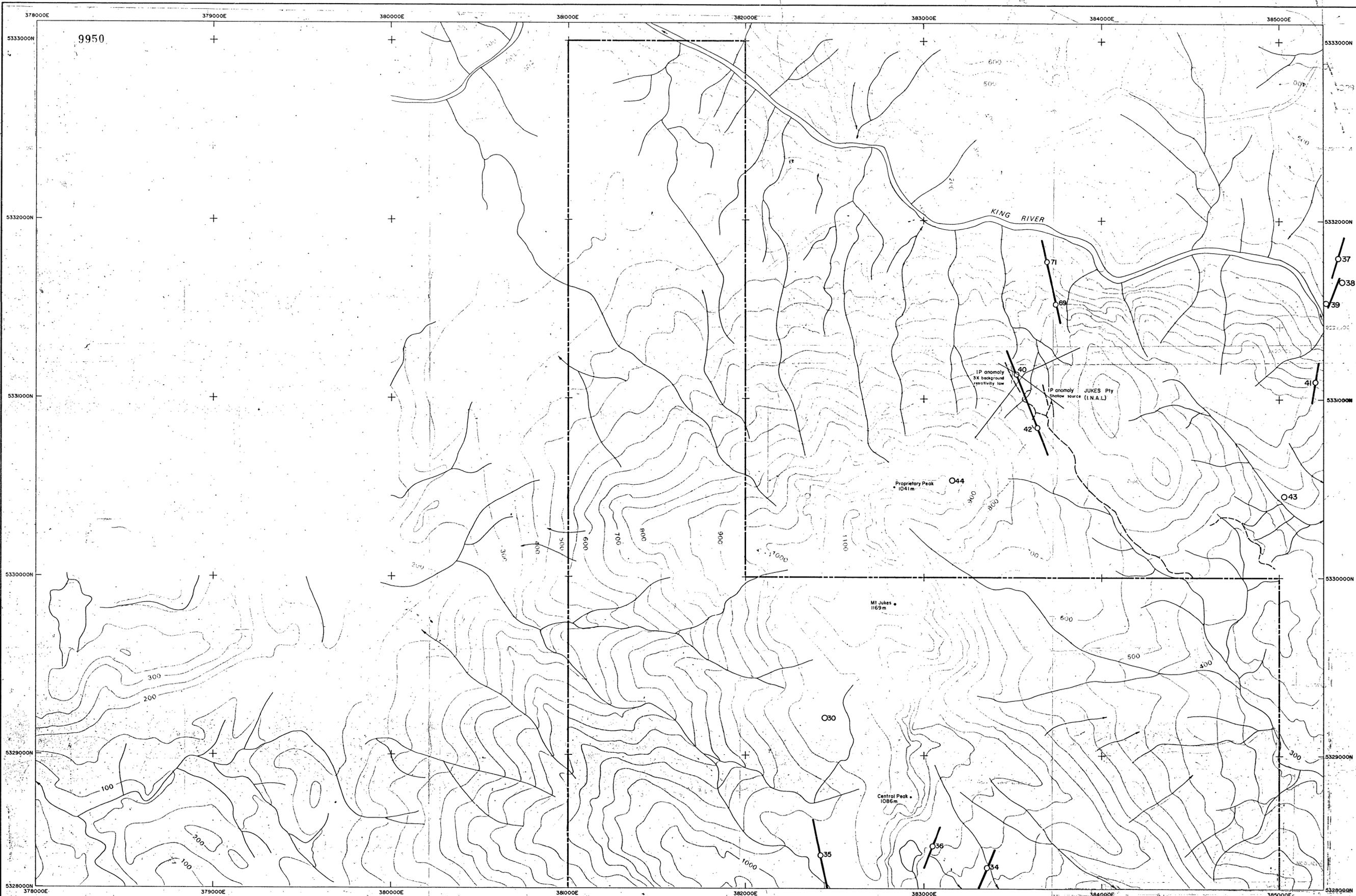


374035
91-3252.



BHP-Utah Minerals International
 Partic Division - Tasmania
EL 55/89, MT DARWIN, TASMANIA
PAST GEOPHYSICAL EXPLORATION

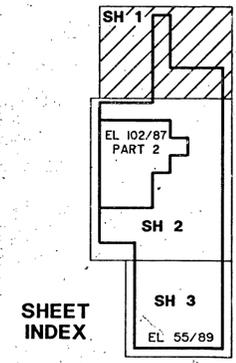
Prepared: J. Reed	Date: July 89	Centre: Melbourne
Drawn: F. Barlow	Project No: BHP/MS/89/6	Figure: 25
Checked: J. Reed	Drawing No:	



LEGEND

- Axis of Turair anomaly, at >10Mhos
- Axis of Turair anomaly, 10< at <100Mhos
- Axis of Turair anomaly, at >100Mhos
- Axis of IP anomaly (1974 Geotrex survey)
- ⋈ Prospect

] 1974 Turair survey
for I.N.A.L.



91-3252.
374036

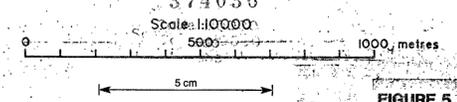
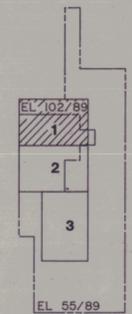


FIGURE 5

BHP-Utah Minerals International Asia-Pacific Division - Exploration Department		
EL 55/89, MT DARWIN, TASMANIA		
PAST GEOPHYSICAL EXPLORATION		
Prepared: J. Read	Date: July 90	Centre: Melbourne
Drawn: F. Barlow	Project No.: BHP/M690/18	Figure 5
Checked: J. Read	Drawing No.:	



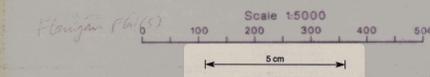
LEGEND

- GEOLOGY**
- RECENT: Undifferentiated alluvium, colluvium, talus
 - PLEISTOCENE: moraine, Glacial Moraine, outwash gravels
 - ORDOVICIAN:
 - Gordon Limestone - weathered to black puggy clays
 - Owen Conglomerate - siliceous hematite stained quartz rich boulder conglomerate and pink quartz sandstone
 - MT READ VOLCANICS Tyndall Group:
 - Lithic rich quartz - feldspar epiclastic breccia and cobble conglomerate - Jukes Breccia
 - Medium - coarse grained quartz - mica porphyry
 - Quartz phryic fine - medium grained volcanoclastic, sandstone, siltstone, black shale
 - Western Sequence:
 - Hornblende plagioclase porphyritic andesite
 - Massive fine - medium grained quartz - feldspar porphyry
 - CAMBRIAN:
 - Quartz + feldspar phryic massive - blocking rhyolite lava, variably flow banded cleaved and/or subbrecciated
 - Quartz dominated + feldspar phryic fine - coarse grained crystal - lithic volcanoclastics including pumice debris, tuff, minor shale
 - Quartz + feldspar schist ex rhyolite lavas/volcanoclastics
 - Sericite/chlorite schist ex fine grained volcanoclastics
 - Central Sequence ? / Western Sequence ? :
 - Sheared hematitic fine grained quartz - feldspathic epiclastics, sandstone, siltstone and minor shale
 - Feldspar + quartz phryic blocky - columnar jointed rhyodacite - dacite lavas, minor rhyolite
 - Feldspar dominant + quartz phryic fine - coarse grained crystal - lithic volcanoclastics including pumice debris, ash, tuff, and rare ignimbrite
 - Black shale
 - Feldspathic schist
 - Vesicular chlorite andesite/basalt (uncommon)
 - Central Sequence:
 - Pink gray green feldspar phryic - aphyric massive hematite - magnetite veined rhyolite - rhyodacite lavas and volcanoclastics

- STRUCTURE**
- Cleavage strike/dip
 - Foliation strike/dip
 - Foliation strike/dip vertical
 - Bedding strike/dip
 - Anticline / Syncline
 - Lithological contact
 - Airphoto lineament
 - Fault (actual/inferred)
 - Flow banding
 - Younging direction
 - Sequence boundary

- ABBREVIATIONS**
- q quartz vein
 - mt magnetite
 - hm hematite
 - ser sericite
 - chl chlorite
 - py pyrite
 - gn gneiss
 - lim limonite
 - Fst iron stained
 - sil silicified/silicification
 - silt siltstone
 - bx breccia/brecciated
 - sh sheared
 - fibd flow banded
 - Febxw boxwork iron staining
 - civ cleaved
 - ms massive
 - rd rhyodacite
 - dc dacite
 - ssl sandstone
 - shl shale
 - vc volcanoclastic

- GENERAL**
- Prospect
 - Alluvial Workings
 - Walking track
 - UTEM Loop edge
 - Petrographic sample location
 - Drill hole
 - Rock chip sample number. (Prefix DC)
 - Results - Cu, Pb, Zn, Ag, Au, Ba, AS ppm

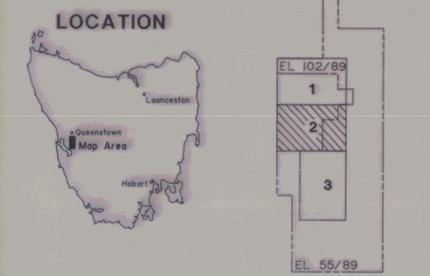
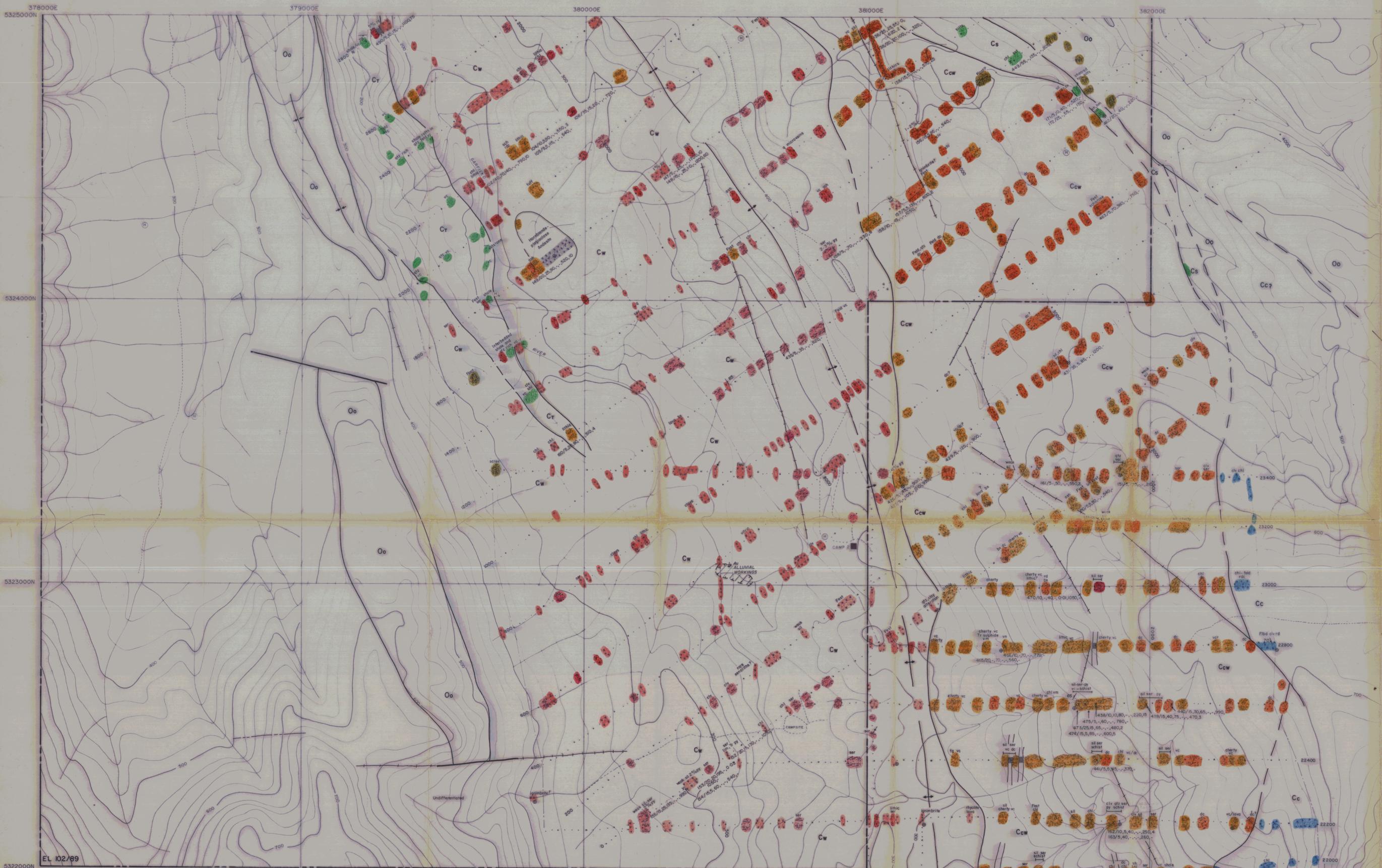


BHP Minerals
Asia Pacific Division - Exploration Department

EL 102/87 QUEENSTOWN and EL 55.89 MT DARWIN, TAS.
GARFIELD GEOCHEMISTRY, FACTUAL GEOLOGY and INTERPRETATION SHEET 1

Prepared: J. Cameron Date: March 1991
Drawn: F. Barlow Project No.: B57
Checked: J. Cameron Drawing No.: FIG 6

374037



LEGEND

GEOLOGY

RECENT: Undifferentiated alluvium, colluvium, talus

PLEISTOCENE: moraine: Glacial Moraine, outwash gravels

ORDOVICIAN: Oo: Gordon Limestone - weathered to black puggy clays; Owen Conglomerate - siliceous hematite stained quartz rich boulder conglomerate and pink quartz sandstone

MT READ VOLCANICS
Tyndall Group

Cr: Lithic rich quartz - feldspar epistatic breccia and cobble conglomerate - Jukes Breccia; Medium - coarse grained quartz - mica porphyry; Quartz phytic fine - medium grained volcanoclastic, sandstone, siltstone, black shale

Western Sequence

Cw: Hornblende plagioclase porphyritic andesite; Massive fine - medium grained quartz - feldspar porphyry

CAMBRIAN

Cc: Quartz + feldspar phytic massive - blocky rhyolite lava, variably flow banded cleaved and/or subbrecciated; Quartz dominated + feldspar phytic fine - coarse grained crystal - lithic volcanoclastics, including pumice debris, tuff, minor shale; Quartz + feldspar schist ex rhyolite lavas/volcanoclastics; Sericite/chlorite schist ex fine grained volcanoclastics

Central Sequence ? / Western Sequence ?

Ccw: Sheared hematitic fine grained quartz - feldspathic epistatic sandstone, siltstone and minor shale; Feldspar + quartz phytic blocky - columnar jointed rhyolite - dacite lavas. Minor rhyolite; Feldspar dominant + quartz phytic fine - coarse grained crystal - lithic volcanoclastics including pumice debris, ash, tuff, and rare ignimbrite; Black shale; Feldspathic schist

Central Sequence

Cc: Pink grey green feldspar phytic - aphyric massive hematite - magnetite veined rhyolite - rhyolite lavas and volcanoclastics

STRUCTURE

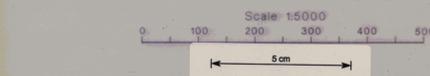
Cleavage strike/dip: 30°; Foliation strike/dip: 50°; Bedding strike/dip: 50°; Anticline / Syncline; Lithological contact (actual/inferred); Airphoto lineament; Fault (actual/inferred); Flow banding; Younging direction; Sequence boundary

ABBREVIATIONS

q quartz vein; mt magnetite; hm hematite; ser sericite; chl chlorite; py pyrite; gn garnet; lim limonite; Fest iron stained; sll silicified/silicification; sils siltstone; bx breccia/brecciated; sh sheared; fibd flow banded; Febxw boxwork iron staining; clv cleaved; ms massive; rd rhyolite; dc dacite; sst sandstone; shi shale; vc volcanoclastic

GENERAL

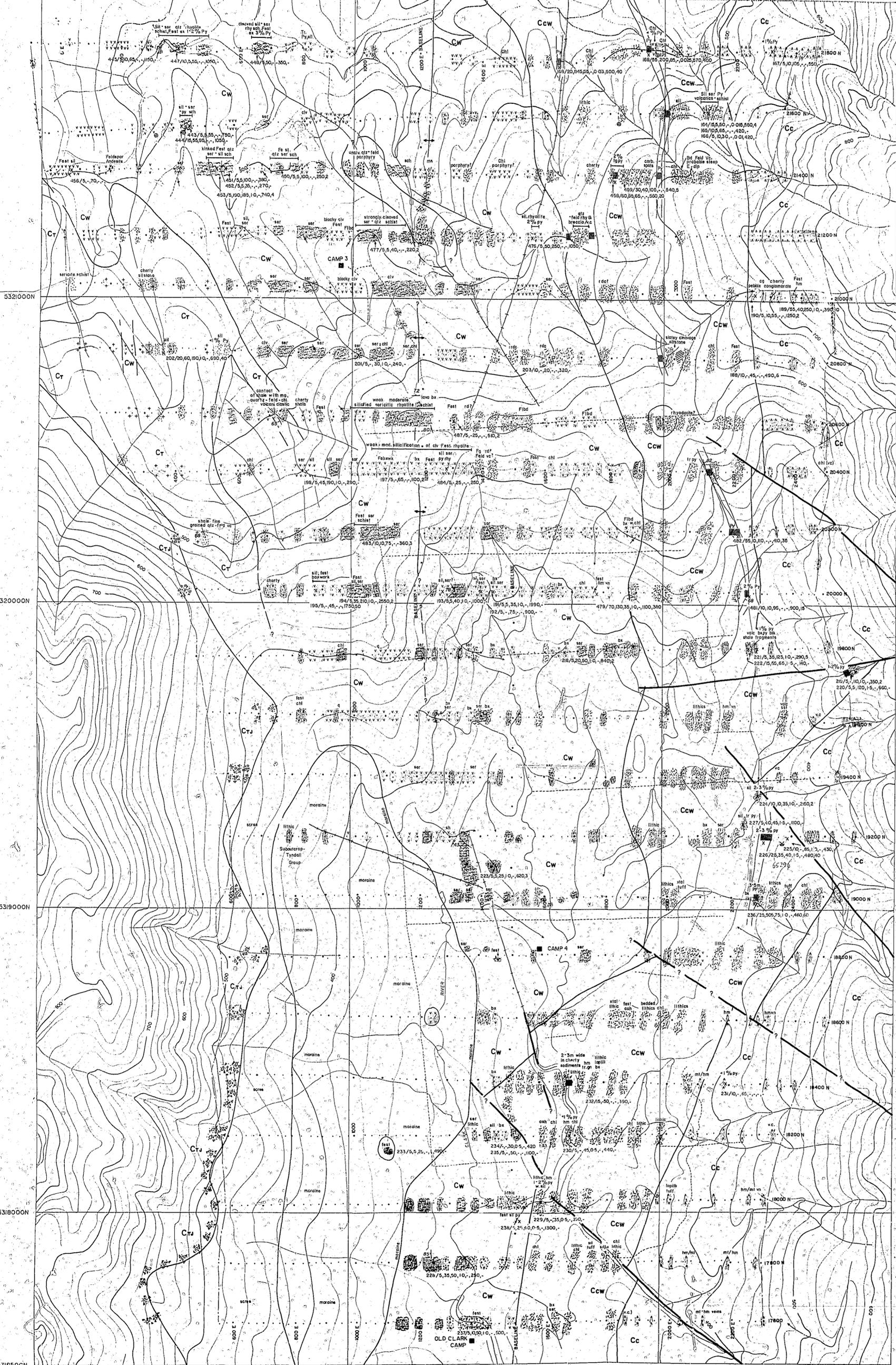
Prospect; Alluvial Workings; Walking track; UTEM Loop edge; Petrographic sample location; Drill hole; Rock chip sample number. (Prefix DC) Results - Cu, Pb, Zn, Ag, Au, Ba, AS ppm



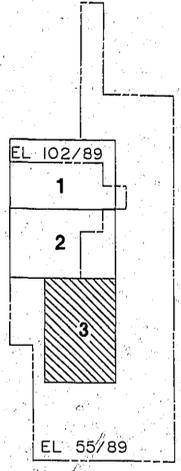
BHP Minerals
Asia Pacific Division - Exploration Department

EL 102/87, QUEENSTOWN and EL 55/89 MI DARWIN, TAS.
GEOCHEMISTRY, FACTUAL GEOLOGY and INTERPRETATION.
SHEET 2

Prepared: J. Cameron Date: March 1991 Centre: Melbourne
Drawn: F. Barlow Project No: 857
Checked: J. Cameron Drawing No: FIG 7



SHEET INDEX



LEGEND

GEOLOGY

- RECENT**
 - Undifferentiated alluvium, colluvium, talus
- PLEISTOCENE**
 - Glacial Moraine, outwash gravels
- ORDOVICIAN**
 - Gordon Limestone - weathered to black boggy clays
 - Owen Conglomerate - siliceous hematite stained quartz rich boulder conglomerate and pink quartz sandstone
- MT READ VOLCANICS**
 - Tyndall Group**
 - Lithic rich quartz - feldspar epiclastic breccia and cobble conglomerate - Jukes Breccia
 - Medium - coarse grained quartz - mica porphyry
 - Quartz phytic fine - medium grained volcanoclastic, sandstone, siltstone, black shale
 - Western Sequence**
 - Hornblende plagioclase porphyritic andesite
 - Massive fine - medium grained quartz - feldspar porphyry
 - Quartz + feldspar phytic massive - blocking rhyolite lava, variably flow banded cleaved and/or subvolcanic
 - Quartz dominated feldspar phytic fine - coarse grained crystal - lithic volcanoclastics including pumice debris, tuff, minor shale
 - Quartz - feldspar schist ex rhyolite lavas/volcanoclastics
 - CAMBRIAN**
 - Feldspathic schist
 - Vesicular chlorite andesite/basalt (uncommon)
 - Central Sequence**
 - Pink grey green feldspar phytic - ophyric massive hematite - magnetite veined rhyolite - rhyodacite lavas and volcanoclastics

STRUCTURE

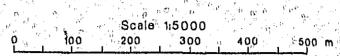
- Cleavage strike/dip
- Foliation strike/dip
- Foliation strike/dip vertical
- Bedding strike/dip
- Anticline / Syncline
- Lithological contact (actual/inferred)
- Airphoto lineament
- Fault (actual/inferred)
- Flow banding
- Younging direction
- Sequence boundary

ABBREVIATIONS

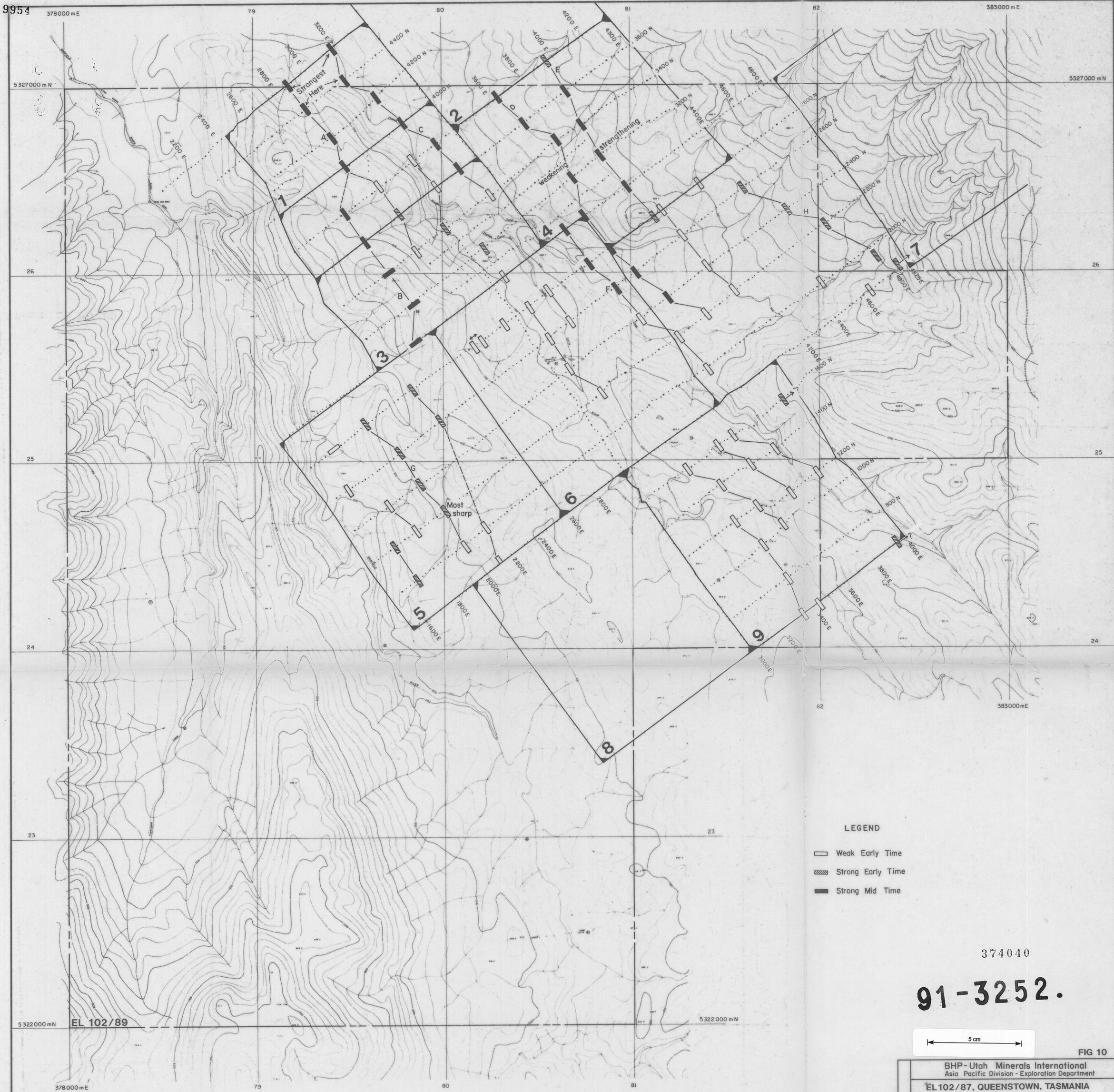
- q quartz vein
- ml magnetite
- hm hematite
- ser sericite
- chl chlorite
- py pyrite
- gn galena
- lim limonite
- Fest iron stained
- sil siltification
- silt siltstone
- bx breccia/brecciated
- sh sheared
- fibd flow banded
- Febxwk boxwork iron staining
- clv cleaved
- ms massive
- rd rhyodacite
- dc dacite
- ssd sandstone
- shl shale
- vc volcanoclastic

GENERAL

- Prospect
- Alluvial Workings
- Walking track
- UTEM Loop edge
- Petrographic sample location
- Drill hole
- Rock chip sample number. (Prefix DC) Results - Cu, Pb, Zn, Ag, Au, Bi, As ppm



BHP Minerals
Asia Pacific Division - Exploration Department
EL 55/89, Mt Darwin, TAS.
CLARK VALLEY GEOCHEMISTRY, FACTUAL GEOLOGY and INTERPRETATION
SHEET 3
Prepared: J. Cameron Date: March 1991 Central: M. Osborne
Drawn: F. Blaw Project No: 857
Checked: J. Cameron Drawing No: **FIG 8**



LEGEND

-  Weak Early Time
-  Strong Early Time
-  Strong Mid Time

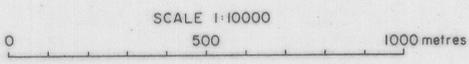
374040

91-3252.



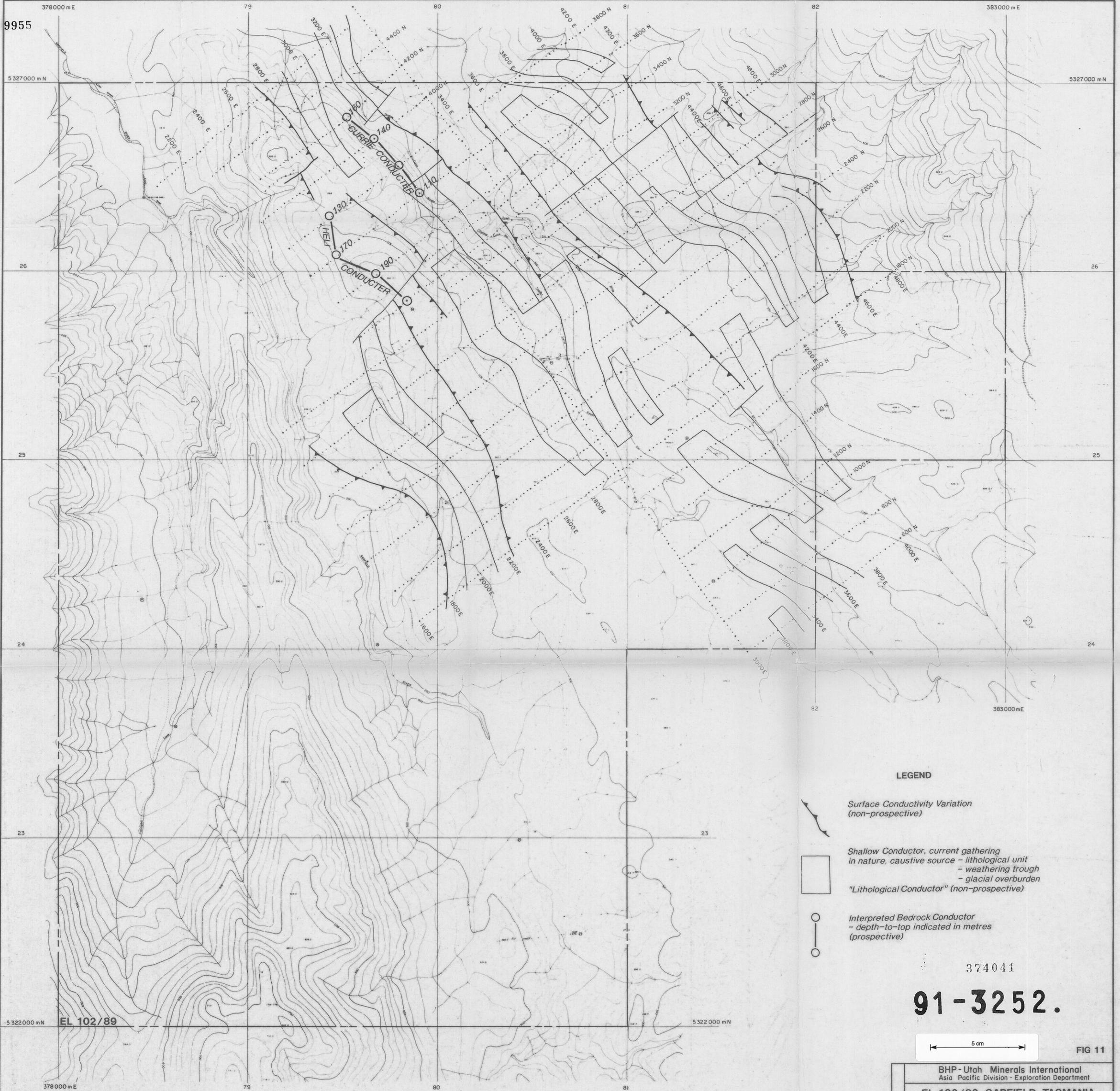
FIG 10

BHP-Utah Minerals International Asia Pacific Division - Exploration Department		
EL 102/87, QUEENSTOWN, TASMANIA 1990 GARFIELD UTEM SURVEY LOOP LOCATIONS AND INTERPRETED ANOMALIES		
Prepared : T. Kerr	Date : 1-6-90	Centre : Melbourne
Drawn : F. Barlow	Project No : B 57	Drawing No : AI- 2418
Checked : T. Kerr		



EL 102/89

9955



LEGEND

-  Surface Conductivity Variation (non-prospective)
-  Shallow Conductor, current gathering in nature, causive source - lithological unit - weathering trough - glacial overburden "Lithological Conductor" (non-prospective)
-  Interpreted Bedrock Conductor - depth-to-top indicated in metres (prospective)

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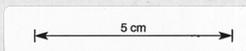
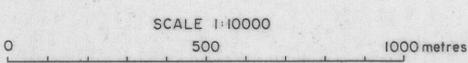


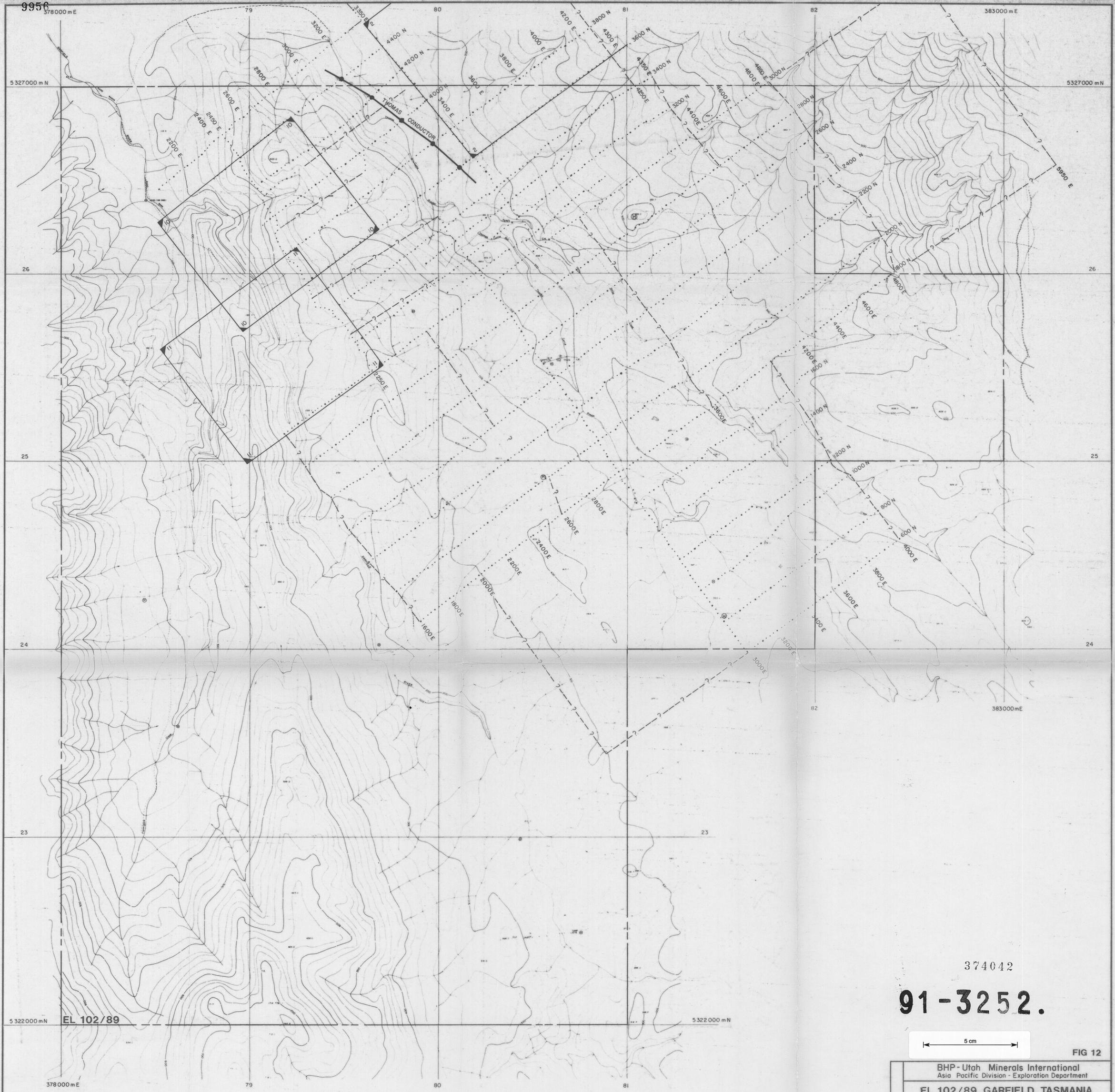
FIG 11



BHP - Utah Minerals International Asia Pacific Division - Exploration Department		
EL 102/89, GARFIELD, TASMANIA		
1990 UTEM		
SURVEY INTERPRETATION		
Prepared J. READ	Date MAY 1990	Centre Melbourne
Drawn:	Project No. B55	Drawing No. AI-2418
Checked:		

EL 102/89

9956



374042

91-3252.

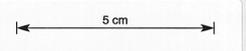


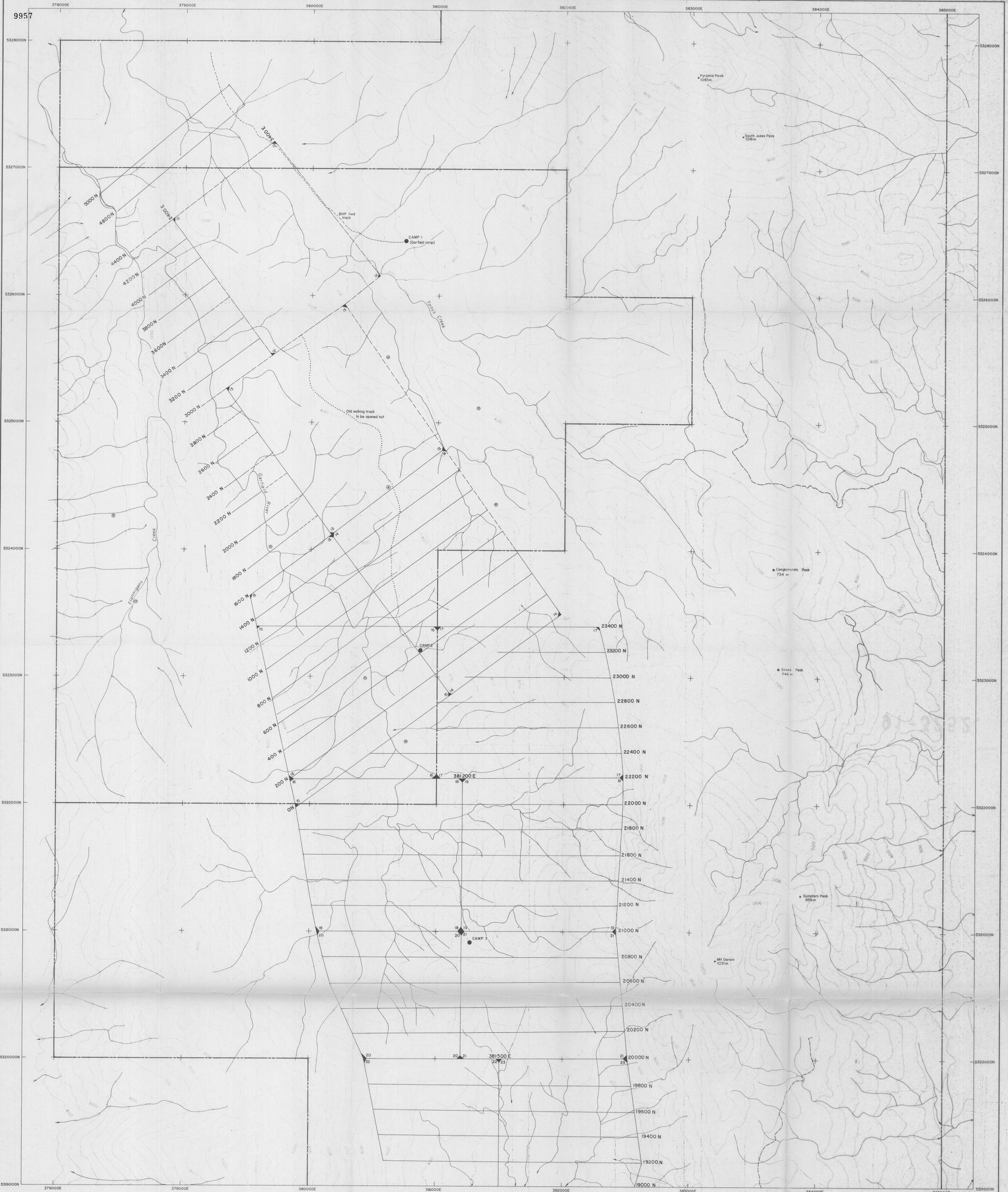
FIG 12

BHP-Utah Minerals International Asia Pacific Division - Exploration Department		
EL 102/89, GARFIELD, TASMANIA FOLLOW-UP UTEM LOOP LOCATIONS AND INTERPRETATION		
Prepared: J.Read	Date: March 90	Centre:
Drawn: P.Digney	Project No:	Drawing No: A1-2470
Checked:		

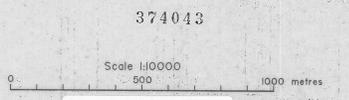
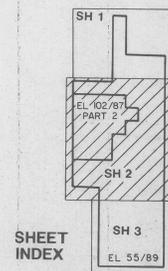
SCALE 1:10000
0 500 1000 metres

5 322 000 m N EL 102/89 5 322 000 m N

378 000 m E 79 80 81 82 383 000 m E
5 327 000 m N 5 327 000 m N
26 26
25 25
24 24
23 23



- UTEM loop corner and loop number
- Previously cut grid line (cut prior to 1990)
- Walking track
- Heliport

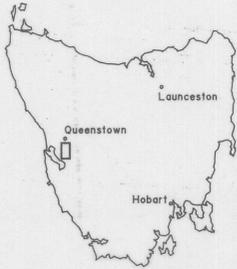
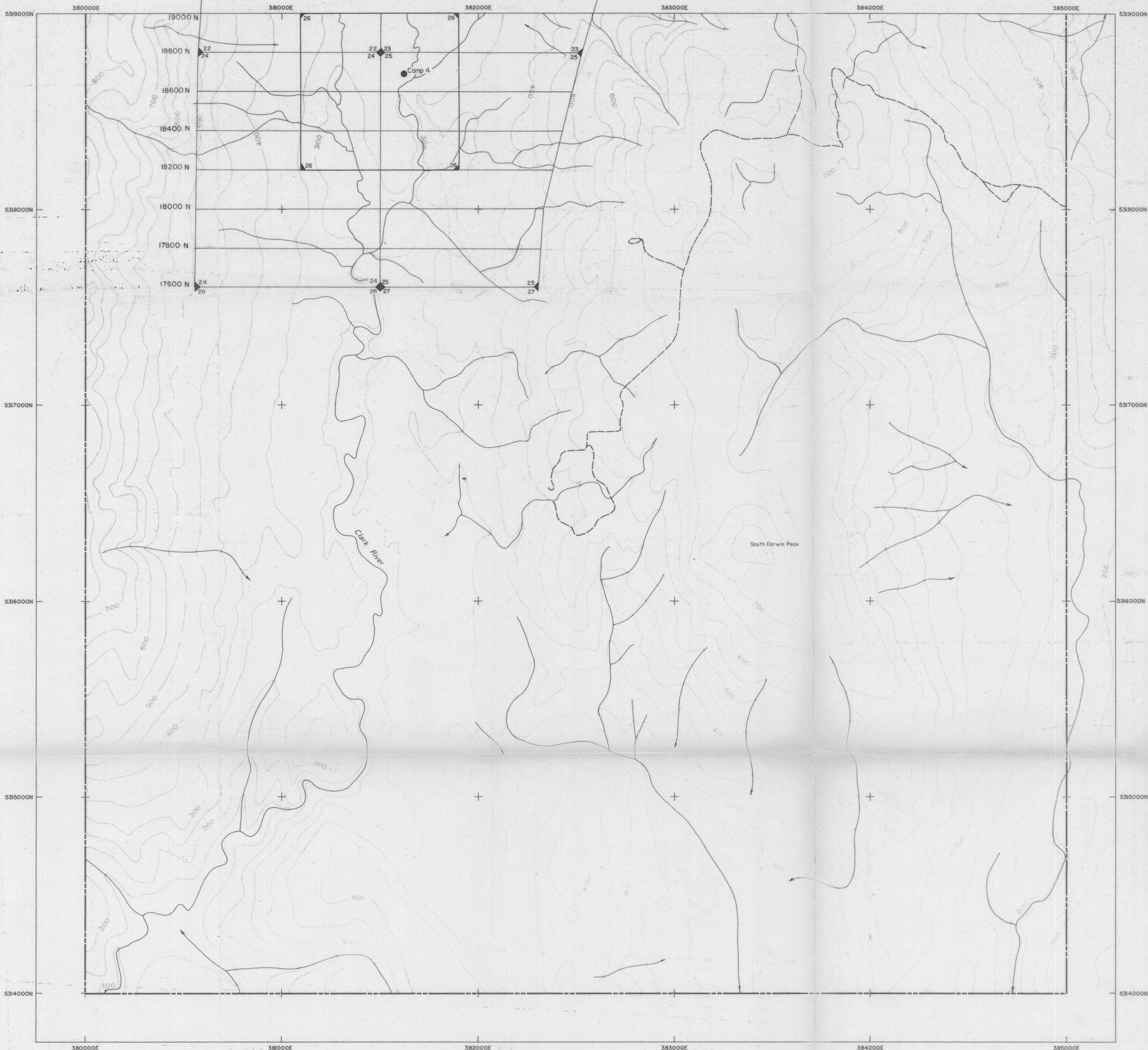


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BHP-Utah Minerals International
Asia Pacific Division - Exploration Department

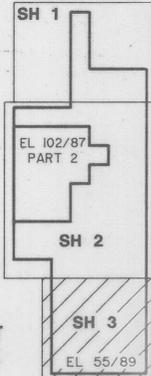
EL 55/89, MT DARWIN, TASMANIA
GRID LINES and UTEM LOOPS
1990 - 1991 UTEM PROGRAM

Prepared: J. Read	Date: July 90	Centre: Melbourne
Drawn: E. Berlow	Project No.:	FIG 13
Checked: J. Read	Drawing No.: AC 14	



UTEM loop corner and loop number

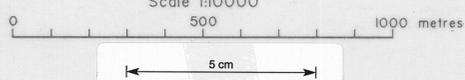
01-2525



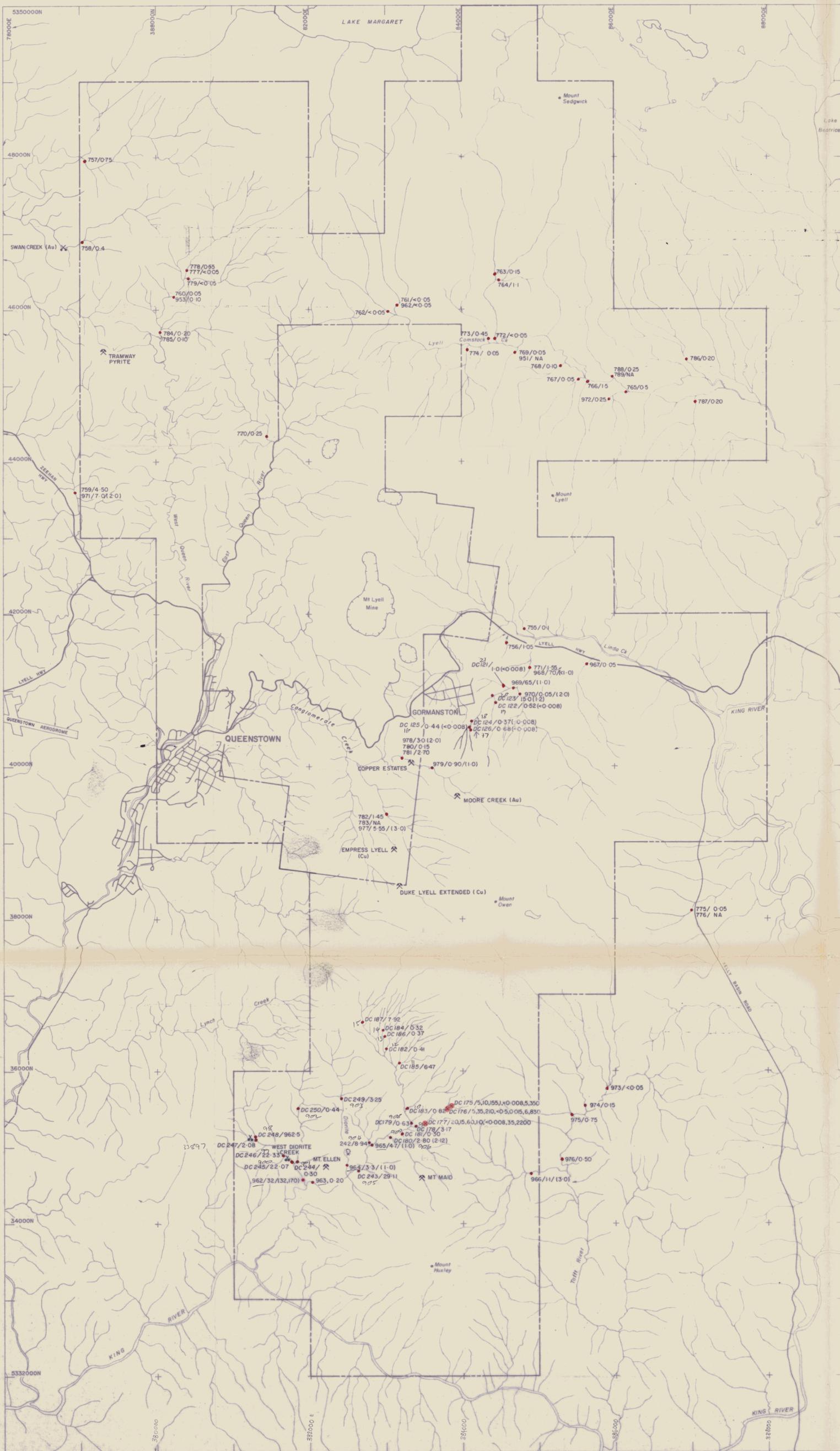
SHEET INDEX

374044

Scale 1:10000



BHP-Utah Minerals International Asia Pacific Division - Exploration Department		
EL 55/89, MT DARWIN, TASMANIA		
GRID LINES and UTEM LOOPS 1990 - 1991 UTEM PROGRAM		
Prepared J. Read	Date: July 90	Centre: Melbourne
Drawn: F. Barlow	Project No.:	FIG 14
Checked: J. Read	Drawing No.: A1-2445	



- DC175/1.0(0.008) Rock chip sample location and number with results. Cu, Pb, Zn, Ag, Au, Ba, As in ppb
- 979/0.90(11.0) Sample location and number (prefixed BX4) with BLEG Au results in ppb and duplicate analyses by fire assay (brackets)
- DC180/2.80(2.12) Follow-up Sample location and number (prefixed DC) with Au BLEG results in ppb and check samples in brackets
- × Alluvial workings (abandoned)
- ⊗ Hard-rock mine/(abandoned) or prospect

BLEG V CARBON ROD RESULTS

PPB	BLEG	CARBON ROD
BX 4762	<0.05	2.00
BX 4763	0.15	1.00
BX 4764	1.10	2.00
BX 4765	0.50	3.00
BX 4766	1.50	3.00
BX 4767	0.05	1.00
BX 4768	0.10	1.00
BX 4769	0.05	1.00
BX 4770	0.25	3.00
BX 4771	1.55	4.00
BX 4772	<0.05	1.00
BX 4780	0.15	65.00
BX 4787	0.20	1.00
BX 4788	0.25	3.00

C-15 33897-921

91-3252.

374045

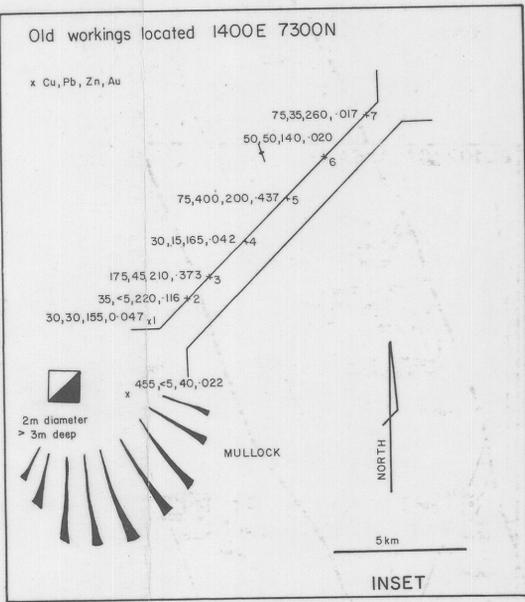


FIG 15

BHP-Utah Minerals International
Asia Pacific Division - Exploration Department

EL 102/87, QUEENSTOWN, TASMANIA
REGIONAL DRAINAGE CHEMISTRY, AREA 1
SAMPLE LOCATIONS & GOLD RESULTS (ppb)

Prepared: A. Wilde/J. Cameron	Date: March 91	Centre: Melbourne
Drawn: M. Rosker	Project No.: 857	Fig 15
Checked: A. Wilde	Drawing No.: AL-2403	



EL102/87 (AREA 3)

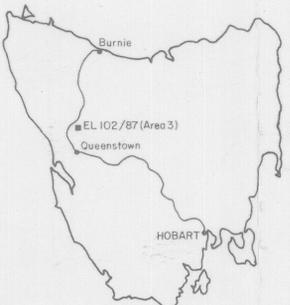
HENTY FAULT ZONE



- QUATERNARY**
- Qg Glacial deposits, mainly till
- CAMBRO-ORDOVICIAN**
- Eo DENISON GROUP, sandstone and conglomerate (Owen Conglomerate)
- CAMBRIAN**
- Erp QUARTZ PORPHYRITIC LAVA
 - Evc FELSIC PYROCLASTIC (?) ROCKS; (flow banded locally brecciated feldspar-pyritic rock (mineralised horizons at Red Hill shown projected to surface from drill holes)
 - Ess FAULT ZONE includes citricitic & pyritic schist, slate, etc
 - EcV CENTRAL VOLCANIC SEQUENCE; contains basalt and breccia. Large part unmapped

- INTRUSIVE**
- Ep ? CAMBRIAN; dolerite

Geology from mapping in northern part of licence. Elsewhere modified after Tasmanian Mines Dept. & Goldfields exploration



374046
91-3252.

BHP-Utah Minerals International
Asia Pacific Division - Exploration Department

**EL102/87, QUEENSTOWN, TASMANIA
AREA 3 (MOXON SADDLE)
GEOLOGY**

Prepared: J. Cameron Date: April '91 Centre: Melbourne
Drawn: F. Barlow Project No.: B57
Checked: Drawing No.: AI-2472

Scale 1:5000
0 100 200 300 400 500 metres

5cm

Geological boundary
Fault
Dip and strike of bedding
Dip and strike of foliation
Diamond drill hole

x DC 45 Rock chip sample location
o DC 78 Pan concentrate sample location

0001

374048

APPENDIX 1

SAMPLE LOCATIONS AND DESCRIPTIONS

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 87	Garfield Grid 3600N/3025E in Thomas Currie River.	Chloritic Schistose feldspar-phyric rhyodacite
DC 88	Garfield Grid 3600N/2600E.	Chlorite schists ex feldspar phyric rhyodacite.
DC 90	As above. 3400N/2590E	Weakly ironstained (1% sulphide). quartz phyric rhyolite, now a sericite schist.
DC 91	As above. 2520E/2800N.	Weathered ironstained sericite, quartz schist (1% sulphide?).
DC 92	As above. 2800N/2285E.	Secondary iron encrustations in sericite- quartz schist (on dry waterfall 10m offline.)
DC 93	As above, but host rock.	Sericite-quartz schist, possibly chloritic but very weathered, trace sulphide.
DC 94	As above. 2800N/2165E.	Iron stained quartz-rich volcanoclastic possible sulphide veins (2%).
DC 95	As above. 2800/2155E	Ironstained quartz-rich volcanoclastic.
DC 100	As above. 3000N/2810E	Ironstained weathered chloritic schist after feldspar rhyodacite
DC 102	As above. 2150N/1600E	Ironstained vesicular? chloritic feldspar- quartz rhyodacite.
DC 104	As above. 2200N/1775E	Weakly ironstained chloritic feldspar-quartz schistose rhyodacite, rare lithics.
DC 105	As above. 2200N/ 1785E	Ironstained moderately schistose chloritic feldspar-quartz rhyodacite possibly some pyrite boxworks.
DC 106	As above. 2200N/1900E	Weakly ironstained, fine grained sericitic schist probably after rhyodacite?
DC 108	Mt Ellen short adit, main shear zone with quartz veins.	Channel sample at head height across 0.8m true width of shear zone with Fe stained quartz veins, some clay alteration.
DC 109	As above, but lower level quartz across shear zone.	Channel sample 0.7m wide with two main veins.
DC 111	Mt Ellen, long adit, 0-5m from portal.	Vertical channel sample taken every 1m of weathered, weakly clay altered rhyolite with gently dipping thin quartz stringer veins.
DC 112	As above, 5-10m.	As above.
DC 113	As above in S cross-cut.	As above, minor quartz veining only.

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 114	As above, 10-15m.	As above.
DC 115	As above, 15-20m.	As above, the interval 19-20m is in relatively fresh rhyolite, minor quartz veinlets only.
DC 116	As above, 20-25m.	As above.
DC 117	As above, 25-30m.	As above.
DC 118	As above, 30-35m.	As above.
DC 119	As above, 35-39m. End of edit cut 39m.	As above.
DC 121	Linda Valley	BLEG follow up 5 KG sample, difficulty in obtaining fines. Panned concentrate sample has some visible pyrite.
DC 122	As above.	BLEG follow up, 5 kg sample. Site above present creek flow only minor heavies in panned concentrates.
DC 123	As above.	BLEG follow up, 5 kg sample. Good site, good heavies in panned concentrates.
DC 124	As above.	BLEG follow up, 5 kg sample. Good site in outcropping Owen Conglomerate. Minor heavies in panned concentrate.
DC 125	As above.	BLEG follow up, 5 kg sample. Reasonable site in Owen Conglomerate. Possible trace gold in heavies of panned concentrate.
DC 126	As above.	BLEG follow up, 5 kg sample. Reasonable site but coarser material. Trace heavies in panned concentrates.
DC 127	<u>Garfield Grid</u> 2635E, 4000N.	Weakly ironstained quartz-phyric rhyolite, schistose in part.
DC 128	2670E, 4000N.	Hematite stained coarse cleaved quartz "eye" tuff? or porphyry. Suggesting chlorite-sericite altered.
DC 129	2750E 4000N.	Chloritic fine grained rhyolitic volcanoclastic.
DC 130	2390E 4200N.	Schistose weakly Fe stained Qtz-phyric rhyolite with sericite (also specimen sample).
DC 131	2290E 4200N.	Prominent Fe stained sericitic rhyolite. Staining after sulphide segregations and disseminations (2%).

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 132	2285E 4200N	Mod-prominent Fe stained sericitic-silicified rhyolite. Staining ex sulphide.
DC 133	2265E 4200N.	Fe stained (ex-sulphide) chloritic feldspar pyrite dacite-rhyodacite?
DC 134	2700E 4800N.	Weak-moderately ironstained leached quartz phyric fine-medium grained volcanoclastic.
DC 135	2650E 4800N.	Weakly pyritic, hm-lim stained kernels to leached sericite volcanoclastic.
DC 136	3050E 1800N.	River outcrop. Quartz veined/silicified? feldspar phyric chloritic lava. Less than 1% disseminated sulphide/pyrite.
DC 137	2525E 4200N	Schistose quartz-phyric sericite \pm weak silicification rhyolite, possible minor-trace Fe staining ex-sulphide.
DC 138	As above.	Silicified feldspar phyric lava with Py and Gn? Pyrite fine-coarse grained euhedral cubes.
DC 139	3000E 1600N.	Massive feldspar phyric lava with limonite infilled vugs and trace sulphide.
DC 140	2440E 4400N	Dark grey fine grained silicified? tuff/volcanoclastic with Fe staining, sulphide pits, rare quartz microveinlets. Suboutcrop.
DC 141	2110E 4400N	Fe stained chloritic feldspar phyric \pm quartz lava? Rare limonitic microveinlets (Specimen also).
DC 142	As above.	Weakly silicified chloritic feldspar \pm quartz phyric rhyodacite (Specimen also).
DC 143	1950E 4400N	Quartz veined sandstone with minor euhedral small casts ex sulphide (specimen also)
DC 144	2215E 4600N	Stream outcrop of feldspar phyric Fe-stained (ex chlorite \pm sulphide) schistose lava.
DC 145	2910E 4600N	West bank of creek. Bleached quartz microveined medium grained quartz \pm feldspar phyric volcanoclastic.
DC 146	3030E 4600N	Suboutcropping grey-brown quartz microveined cherty unit (Specimen also).

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 147	2175E 1800N	Quartz-feldspar phyric ironstained sericitised lava, weakly schistose.
DC 148	2165E 1800N.	Quartz-feldspar phyric lava, ironstained/ pyrite 1-2%.
DC 149	1600E 1800N.	Brown chert-ash/silicified fine grained volcaniclastic cross-cut by Fe/Mn stained vuggy quartz veins <5cm wide.
DC 150	2700E 000N.	Intensely ironstained feldspar phyric lava.
DC 151	2850E 000N	Quartz-sericite altered fine grained volcaniclastic, rare quartz microveins.
DC 152	1140E 000N	Weak-moderately ironstained chloritic quartz- feldspar phyric lava. Patchy silicification and limonite (<1%) veinlets.
DC 153	1000E 000N	Weakly silicified chloritic quartz-feldspar phyric lava. Minor \leq 11% disseminated and microveins of limonite expyrite?
DC 154	945E 000N	Quartz-feldspar phyric sericitic volcanic. 3% disseminated sulphide-limonite/hematite.
DC 155	800E 000N	As above with 2% coarse grained disseminated pyrite and angular ironstained inclusions.
DC 156	2975E 1400N	Feldspar-quartz phyric chloritic lava containing ironstained vugs, weak silification?
DC 157	2725E 1200N	Suboutcrop siliceous autobrecciated pink- white medium grained volcanic. Breccia matrix quartz-chlorite.
DC 158	2660E 1200N	Weakly silicified fine-medium grained feldspar phyric lava/volcaniclastic with disseminated euhedral pyrite.
DC 159	2475E 1200N	Quartz \pm feldspar phyric lava crosscut by chalcedonic silica veins containing 2-3% py + Fe-oxides in vugs/boxworks.
DC 160	1270E 1200N	Quartz-feldspar phyric chloritic volcanic. Fest. ex chlorite or sulphide.
DC 161	1760E 23400N	Coarse grained feldspar phyric \pm quartz ironstained cleaved volcanic.

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 162	1830E 22200N	Sheared-cleaved feldspar-sericite schist, 5-7% disseminated fine grained pyrite.
DC 163	1875E 22200N	Feldspar ± quartz phyrlic sericitic lava/volcaniclastic? Ironstained - limonite ex ≤ 1% pyrite in vugs.
DC 164	2155E 21600N	Cleaved silicified, chloritic volcanic with 2% disseminated euhedral pyrite.
DC 165	2160E 21600N	Silicified ironstained/limonitic volcanic.
DC 166	2175E 21600N	Silica-sericite pyrite altered volcanic.
DC 167	2330E 21800N	Aphyric chloritic lava, <1% fine grained pyrite-Mt. Darwin lava.
DC 168	1940E 21800N	10-15m wide band of black pyritic shale.
DC 169	1940E 21800N	Suboutcropping black shale boulders.
DC 170	1740E 0200N	Weakly silicified quartz ± feldspar phyrlic ironstained rhyolite.
DC 171	3475E 1200N	Silicified brecciated chloritic feldspar phyrlic dacite lava.
DC 172	3480E 1200N	Silicified medium grained feldspar phyrlic pyritic (<1%) lava.
DC 173	3290E 1800N	Silicified quartz rich hematite sandstone.
DC 174	Mt Huxley - King River Tk	3m channel sample. 5 cm wide Mn/Fe quartz veins in volcanic mud flow deposit. Veins flat lying.
DC 175	Mt Ellen region	20 cm brecciated quartz vein in feldspar rich volcanic.
DC 176	As above.	Numerous quartz veins 5/m cross cutting chloritic medium grained feldspar phyrlic volcaniclastic/lava.
DC 177	As above.	Float. Iron stained feldspar phyrlic volcaniclastic boxwork limonite.
DC 178-DC 187	Mt Ellen Prospect	Follow up BLEG stream samples.
DC 188	Garfield/Clark Valley Grid 2190E 20800N	Fe stained chloritic feldspar rich volcanic - dacite lava? Minor iron staining.
DC 189	2380E 21000N	Suboutcrop chloritic, iron stained feldspar phyrlic dacite crosscut by hm/lim. veinlets.

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 190	2290E 21000N	Suboutcrop of quartz-sulphide veined lappilli tuff/pebble conglomerate.
DC 191	1435E 20000N	Brecciated silicified quartz-feldspar rhyolite crosscut by limonite vuggy quartz veins.
DC 192	1400E 20000N	As above. 1% sulphide and boxwork limonite.
DC 193	1275E 20000N	Quartz-sericite rhyolite with ironstaining ex sulphide, minor shearing.
DC 194	940E 20000N	Sheared feldspar-quartz-chlorite iron stained rhyolite/rhyodacite.
DC 195	880E 20000N	Silicified ironstained quartz phyrlic rhyolite, weak ironstained boxwork structure.
DC 196	425E 20200N	Suboutcrop volcanic pebble breccia of quartz-feldspar \pm muscovite porphyry and rhyolite clasts within fine grained hematite volcanic derived matrix. Trace sulphide.
DC 197	1070E 20400N	Weakly silicified ironstained quartz-feldspar phyrlic rhyolite. Weak sericite and ironstaining.
DC 198	920E 20400N	Fe stained quartz-sericite schist. Quartz-manganese-limonite veining and fracture coating.
DC 199	2720E 2600N	Sericite-quartz-feldspar-pyrite schist. 2-5% pyrite.
DC 200	1840E 3400N	Fine grained chloritic quartz-feldspar phyrlic volcanoclastic/volcanic sandstone containing 1-2% pyrite cubes.
DC 201	990E 20800N	Siliceous, cherty quartz veins crosscutting sericitic rhyolite.
DC 202	375E 20800N	Iron stained medium-coarse grained volcanoclastic cross-cut by quartz microveins.
DC 203	515E 20800N	Poorly sorted feldspar rich chloritic volcanoclastic cross cut by 2 cm quartz veins.
DC 204	Creek Traverse 3400N to the east.	Interbedded quartz-sericite-pyrite altered volcanoclastic 2-3% fine grained pyrite.
DC 205	As above.	Small cascade, silicified pyritic quartz phyrlic sericite schist. 5-7% fine grained py - disseminated and along schistosity.

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 206	As above.	Top of cascade, pyritic-quartz-feldspar volcanoclastic. Minor sericite.
DC 207	As above.	Silicified bleached quartz phyrlic ironstained pyritic volcanoclastic. Minor clays.
DC 208	As above.	Small cascade. Silicified quartz-feldspar phyrlic schistose volcanoclastic. 1% pyrite, gossanous boxwork limonite selvage.
DC 209	As above, east running stream.	Fine grained feldspar quartz phyrlic chloritic volcanoclastic with 1-2% pyrite cubes.
DC 210	As above, main creek.	Pyritic (2-3%) fine grained sericitic volcanoclastic.
DC 211	As above, 2nd east running stream.	Fine-medium grained sericitic schistose pyritic volcanoclastic. 1-2% py.
DC 212	As above.	Zone of quartz blow veining. Bleached quartz-sericite-pyrite schist. 2-3% pyrite associated with silica.
DC 213	As above, main creek.	Small waterfall. Lithic-pebble volcanoclastic with quartz-feldspar rich matrix. Lithics include rhyolite pebbles. 2-5% pyrite.
DC 214	As above.	Small cascade. Fine grained quartz feldspar phyrlic volcanoclastic schist. 1-2% fine disseminated pyrite.
DC 215	As above.	Pyritic quartz pebbles in weathered sericite schist. 2-3% pyrite - possible shear zone.
DC 216	As above.	Intensely pyritic quartz-feldspar phyrlic volcanoclastic. 10-20% disseminated pyrite in veins and along cleavage.
DC 217	West loop line between 4000N and 4200N.	Sericite-quartz-pyrite altered rhyolite. Pyrite (3%) in veinlets and euhedral grains.
DC 218	1240E 19800N	Iron stained, limonite/manganese coated breccia/shear zone in rhyolite.
DC 219	2575E 19725N	10m wide black shale unit, 1-2% pyrite.
DC 220	As above.	10m upstream. Feldspar rich siliceous pyritic volcanoclastic.
DC 221	2275E 19800N	Massive grey-white fine grained feldspar phyrlic volcanic. 1-2% disseminated and microvein pyrite. Common Fe/Mn staining.

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 222	2275E 19800N	Silicified pyritic-fine grained volcanic.
DC 223	1350 - 1275E 19100-19150N	Grab sample. Iron stained quartz-feld-sericite medium-coarse grained volcaniclastic.
DC 224	2300E 19375N	Silicified pyritic volcaniclastic. 2-3% fine grained disseminated euhedral pyrite.
DC 225	Main River 2300E	Hm-mt-py veined volcanic.
DC 226	2300-2318E 19200N	Pyritic black shale.
DC 227	2240E 19200N	Iron stained siliceous vuggy feld-quartz-chl volcaniclastic. Trace - 1% pyrite.
DC 228	1375E 17800N	Fine grained quartz \pm feld. phyric ser-qtz altered volcaniclastic with limonite veinlets ex pyrite?
DC 229	1637E 1800N	Pink red hematitic volcaniclastic rare feld phenocrysts, 1-2% euhedral pyrite.
DC 230	1660E 18200N	Stream outcrop hematite-pyrite (<1%) chlorite feldspar phyric volcaniclastic/epiclastic.
DC 231	2175E 18400N	Sub-outcrop fine grained feldspar phyric lava - Mt Darwin rhyolite <u>or</u> chloritic volcaniclastic. Trace pyrite.
DC 232	1775E 18400N	Sub-outcrop weathered medium-coarse grained lithic-feldspar volcaniclastic, trace hematite.
DC 233	1100-1125E 18325N	Iron stained quartz eye sericite schist.
DC 234	1425E 18400N	As above.
DC 235	1450E 18400N	Weakly silicified brecciated sericitic rhyolite
DC 236	2280E 1900N	Pyritic black shale
DC 237	1325-1425E 17600N	Rock chip sample traverse. Iron stained qtz \pm feld phyric schistose lava. Minor limonite in vugs after feldspar/pyrite.
DC 238	1500E 17940N	Weakly silicified sericitic volcanic (rhyolite). Iron stained, trace fine grained pyrite.
DC 239	1990E 3800N	Massive qtz-feld-mica rhyolite lava crosscut by 5 cm wide quartz veins. 5-10% pyrite adjacent to veins, trace disseminated in host.

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 240	2325E 4000N	Sub-outcrop fine grained qtz-ser schist. Iron oxide/limonite staining.
DC 241	3600E 2125N	Black carbonaceous pyritic (+ marcasite) puggy clay - weathered Gordon Limestone?
DC 242-DC 250	Mt Ellen Prospect	Follow-up BLEG samples.
DC 401	<u>Diamond Drillhole WS-2</u> 81.00-82.00	Pyrite veining and pyrite-carbonate veining, pyrite segregations in shale and local interbedded sandy units.
DC 402	82.00-83.00	As above.
DC 403	83.00-84.00	As above.
DC 404	84.00-85.00	As above.
DC 405	85.00 - 86.00	As above.
DC 406	106.00-107.00	As above.
DC 407	107.00-108.00	As above.
DC 408	108.00-109.00	As above.
DC 409	123.00-124.00	As above.
DC 410	124.00-125.00	As above.
DC 411	125.00-126.00	As above.
DC 412	126.00-127.00	As above.
DC 413	127.00-128.00	As above.
DC 414	143.00-144.00	As above.
DC 415	144.00-145.00	As above.
DC 416	145.00-146.00	As above.
DC 417	146.00-147.00	As above.
DC 418	160.00-161.00	As above.
DC 419	161.00-162.00	As above.
DC 420	162.00-163.00	As above.
DC 421	163.00-164.00	As above.

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 422	178.00-179.00	Andesitic volcanoclastics?
DC 423	179.00-180.00	As above.
DC 424	180.00-181.00	As above.
	<u>Garfield/Clark Valley Grids</u>	
DC 425	2135E 400N	Hand specimen. Grey green weakly chloritic fine grained non porphyritic volcanoclastic (dacitic).
DC 426	2175E 400N	In creek. Weakly silicified, cherty fine grained feldspar volcanoclastic with minor iron staining and local pyrite segregation (< 1%).
DC 427	2190E 400N	Waterfall by track. Fine grained weathered sericite-chlorite volcanoclastic with trace pyrite and galena? and chlorite veinlets.
DC 428	2350E 400N	Hand specimen. Fine grained weathered chloritic feldspar phyrlic volcanoclastic or dacite/rhyodacite.
DC 429	2375E 400N	Fine grained weak-moderate chloritic feldspar phyrlic dacite or volcanoclastic. Possible trace galena? or leucorene-ilmenite (1%).
DC 430	2785E 400N	Hand specimen, Thomas Currie. Feldspar \pm quartz dacite lava. Trace py, chlorite.
DC 431	2890E 400N	Cherty silicified feldspar rhyodacite/dacite with some chlorite and disseminated - vein pyrite and hematite (1-2%).
DC 432	3000E 400N	Hand specimen. Chloritic feldspar phyrlic dacite. Chlorite as veins and 'fiamme' like wisps.
DC 433	3375E 400N	Thomas Currie Rivulet. Strongly cleaved and crenulated sandstone - schist with hematite veining and disseminations. Shear zone.
DC 434	2375E 600N	Hand specimen. Cleaved chloritic fine-medium grained feldspar phyrlic dacite/dacitic-volcanoclastic.
DC 435	2115E 1000N	Weakly ironstained porphyritic quartz sericite rhyolite schist.
DC 436	2590E 1000N	Hand specimen. Porphyritic pink feldspar \pm quartz phyrlic rhyodacite.

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 437	2815E 1000N	Hand specimen. Coarse porphyritic feldspar phyrac dacite with vitric chloritised matrix.
DC 438	1770E 22600N	In creek. Sil-ser schist ex volcanoclastic? Minor quartz veins and sulphide.
DC 439	1965E 22600N	Moderately sil-ser volcanoclastic with local sulphide-silica veins.
DC 490	2020E 22600N	Sil-ser iron stained schist after dacite? Minor hm/lim after sulphide ($\leq 1\%$).
DC 441	1785E 22400N	Sil-ser schist.
DC 442	1070E 22400N	Hand specimen. Rhyolite lava breccia. Pink quartz phyrac fragments in rock flour matrix.
DC 443	450E 21600N	Strongly schistose crenulated sil-ser quartz rhyolite schist with local iron staining ex sulphide ($< 1\%$).
DC 444	400E 21600E	Sil-ser altered rhyolite. 2% iron staining ex sulphide. Vuggy appearance.
DC 445	325E 21800N	Garfield River. Strong-moderately silicified sericitic quartz phyrac rhyolite. Iron staining ex 1-2% sulphide.
DC 447	385E 21800N	Cliff face. Moderately silicified rhyolite with some hm ex 1% sulphide.
DC 448	655E 21800N	River. Moderately silicified sericite quartz rhyolite schist. Iron staining (hm) after sulphide 1-3%.
DC 449	3285E 1400N	Weathered chlorite schist after andesite? or andesitic tuff?
DC 450	740E 21400N	Weakly schistose quartz-feldspar rhyolite. Rare boxwork limonite staining ($< 1\%$).
DC 451	670E 21400N	Weakly iron stained qtz-ser rhyolite schist.
DC 452	560E 21400N	Moderately iron stained quartz rhyolite schist.
DC 453	545E 21400N	Garfield River. Weak-moderate iron stained qtz-ser rhyolite schist. Locally silicified.
DC 454	290E 21400N	Hand specimen. Massive fresh quartz phyrac rhyolite.
DC 455	200E 21400N	Hand specimen. Feldspar phyrac andesite?

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 456	075E 21400N	Weakly ironstained silicified rhyolite.
DC 457	1590E 21400N	Hand specimen. Massive medium grained feldspar phyric volcaniclastic with glassy matrix.
DC 458	1815E 21400N	10m wide black shale with diagenetic pyrite on joints and locally in veins.
DC 459	1825E 21400N	Chloritic feldspar phyric volcaniclastic with 2% fine grained disseminated pyrite.
DC 460	1925E 21400N	Hand specimen. Fine grained volcaniclastic with irregular carbonate? alteration growths.
DC 416	1685E 21200N	Hand specimen. Feldspar phyric volcaniclastic.
DC 462	3540E 1000N	Dark sheared hematitic sandstone. Shear zone - see DC 433.
DC 463	3330E 800N	Strongly schistose iron stained chloritic feldspar phyric dacite. Trace sulphide/silica?
DC 464	3525E 800N	Hand specimen. Fine grained chloritic dacitic volcaniclastic.
DC 465	1425E 22800N	Fine grained cherty feldspar phyric dacitic volcaniclastic cross cut by vuggy qtz-sulphide vein.
DC 466	1475E 22800N	As above.
DC 467	2450E 22800N	Hand specimen. Feldspar phyric Mt Darwin rhyodacite. Cleaved and locally flow banded.
DC 468	2450E 2300N	Hand specimen. Vitric chloritic and chlorite veined porphyritic feldspar dacite.
DC 469	1635E 23000N	Hand specimen. Volcaniclastic breccia.
DC 470	1585E 23000N	Fine grained cherty lithic? volcaniclastic.
DC 471	1290E 23000N	Hand specimen. Feldspar phyric chloritic volcaniclastic -volcaniclastic breccia.
DC 472	1625E 22600N	Hand specimen. Pink vitric chloritic volcaniclastic.
DC 473	1715E 22600N	Creek. Moderately silicified sericite-chlorite volcaniclastic schist. Local disseminated py and vein py (1%).

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
DC 474	1740E 22610N	Creek. Moderately sil-ser quartz-feldspar phyrlic volcanoclastic. Minor quartz veins and sulphide (<1%).
DC 475	1750E 22600N	As above.
DC 476	1565E 21200N	Strongly silicified quartz rhyolite, 2% pyrite.
DC 477	1053E 21200N	Walking track. Weak iron stained qtz-ser schist.
DC 478	1745E 20000N	Hand specimen. Quartz-feldspar-biotite rhyolite.
DC 479	1780E 20000N	Weak-moderate iron stained and qtz-lim veined quartz-feldspar phyrlic rhyolite.
DC 480	1895E 20000N	Hand specimen. Feldspar ± quartz rhyodacite lava.
DC 481	2260E 20000N	River outcrop. Contact between silicified (cherty) feldspar-quartz volcanoclastic with 2% fine grained pyrite and bedded shale with 3% pyrite.
DC 482	2255E 20200N	Pyritic black shale.
DC 483	1025E 20200N	Weakly iron stained sericite quartz-feldspar rhyolite with minor sulphide boxworks.
DC 484	1290E 20400N	Locally weakly silicified pyritic (1%) quartz-feldspar phyrlic rhyolite.
DC 485	1385E 20400N	Hand specimen. Pink fine grained devitrified feldspar ± quartz rhyodacite/volcanoclastic?
DC 486	2000E 20600N	Hand specimen. Fine grained locally feldspar porphyritic rhyodacite? with trace quartz grains - volcanoclastic?
DC 487	1315E 20600N	Moderately silicified sericite quartz rhyolite schist. Minor iron staining ex sulphide (<1%).
DC 488	230E 21200N	Hand specimen. Feldspar phyrlic volcanoclastic.
DC 489	3050E 2800N	Fine grained ser-chl-py feldspar phyrlic volcanoclastic. Limonite + hematite <2%.
DC 490	1545E 2800N	Iron stained ser rhyolite schist. 5-8% sulphide along schistosity.
DC 491	2450E 2990N	In creek. Sil-ser quartz-lithic schistose

<u>Sample No.</u>	<u>Location</u>	<u>Description</u>
		volcaniclastic with 5-8% pyrite.
DC 492	2475E 2985N	Small gully. Strongly transposed lithic ser-sil-py schist ex volcaniclastic? 3-5% pyrite.
DC 493	2500E 2960N	Mylonitic chl-ser schist ex volcaniclastic. 1-3% py. minor quartz phenocrysts.
DC 494	2435E 2990N	Pyritic sericite schist. 1-3% py.
DC 495	2415E 2995N	Strong-medium pyritic sericite schist. 3-25% pyrite locally.
DC 496	2385E 2995N	Hand specimen in creek junction. Chloritic feldspar schist after volcaniclastic. Trace sulphide.
DC 497	2180E 3000N	Medium grained moderately iron stained quartz phyric schistose rhyolite/volcaniclastic? 2-3% sulphide.

APPENDIX TWO

PETROGRAPHY REPORT -
GARFIELD/CLARK VALLEY SAMPLES

0017

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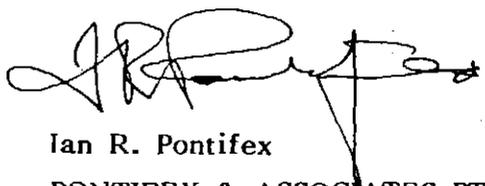
YOUR REFERENCE : Your letter dated November 9th, 1990

MATERIAL : Rock Samples Mt. Read Volcanic Belt,
Tasmania.

IDENTIFICATION : MRL 23627 to MRL 23651

WORK REQUESTED : Thin and polished thin section preparation
as specified, brief descriptions.

SAMPLES & SECTIONS : Returned to you with this report.



Ian R. Pontifex

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SUMMARY COMMENTS

This report discussed twenty five rock samples labelled MRL 23627-23651, from the western succession of the Mt. Read Volcanic Belt, Tasmania. Seventeen of these rocks were examined in normal thin sections and eight in polished thin sections.

Lithological Groups (see table attached)

Felsic volcanics, probably ranging from siliceous andesites to rhyolites, and including possible to probable ignimbrites as well as lavas and tuffs, comprise the bulk of the samples (twenty three rocks). One basalt (MRL 23646) and one sediment (23643) are also present. The felsic volcanics range from aphyric (four samples) to strongly porphyritic (thirteen samples) with five sparsely porphyritic samples. A lithic tuff (23645) also has sparse quartz crystal fragments. Sample 23651 is difficult to interpret but may be a phreatomagmatic lapilli tuff with a juvenile possibly pumiceous component in the form of fluidal lapilli altered to sericite. It does not appear to be a conglomerate unless transport was minimal.

Interrelated Samples

Samples MRL 23628, 40, 41 and 42 form an interrelated closely spaced group and apparently represent the same unit. Similarly samples MRL 23629, 39 and 44, possibly together with 23630 form a closely spaced interrelated group. MRL 23630 differs from the others in this second group, mainly in having rare quartz phenocrysts (one in the thin section examined).

Sulphides and alteration

Sulphides are rare in this suite except in MRL 23637, which contains about 1% sulphide, including both pyrite and chalcopyrite. Alteration is predominantly to quartz and sericite, with minor leucoxene. Chlorite and/or carbonate occur in some samples and albitised plagioclase is common.

Summary Comments continued :

The less frequent alteration products are distributed as follows :

Chlorite : MRL 23627 (veins), 23639, 23646 (basalt)

Carbonate : MRL 23642, 23644, 45, 46 (basalt), 47; 23651

Adularia : MRL 23629, 23638 (includes primary potassic feldspar)

List of Lithology Types

(A) Felsic (Andesitic to rhyolitic) lavas, ignimbrite and tuffs.

- (1) Aphyric : with possible fiamme or pumice fragments (possible ignimbrites)
MRL 236, 34*, 35*, 37*, 48*
- (2) Sparsely porphyritic
 - (i) plagioclase only (dacites and andesites)
MRL 23628, 40, 41, 42, 49
 - (ii) quartz only
MRL 23645** (lithic tuff, some pumice)
- (3) Strongly porphyritic
 - (i) Plagioclase dominant, no quartz (?ankerite + dacite)
MRL 23629*, 36¹, 38², 39*, 44^{3*}
 - (ii) Plagioclase dominant, very minor to minor quartz (dacites)
MRL 23630, 47*, 51** (47 and 51 contain biotite)
 - (iii) Quartz dominant over plagioclase (?rhyolites or rhyodacites)
MRL 23625*, 31*, 32
 - (iv) Quartz dominant, no plagioclase (?rhyolites)
MRL 23633, 50*

Summary Comments continued :

(B) Basalt, vesicular

MRL 23646

(C) Shale with silty lenses

MRL 23643

* ignimbrite/possible ignimbrite

** tuff; Q3651 is possibly a phreatomagmatic lapilli tuff with a pumiceous juvenile component)

1. andesite (MRL 23636)

2. potassic andesite/latite (MRL 23638)

0021

INDIVIDUAL DESCRIPTIONS

23627 : DC 142
2110E, 4400N

Pyroclastic, possibly ignimbritic rock with small lapilli to >10mm in size. Quartz phenocrysts > plagioclase. Sericite quartz alteration and veins of quartz and/or chlorite + limonite.

Field Note : Brecciated, chloritic feldspar + quartz phyric lava. Minor clays Fe-staining.

The fragments in this rock are from 1mm to >10mm long and are elongate parallel to a weak schistosity. They range from phenocryst-poor to phenocryst-rich with quartz phenocrysts more abundant than albite + sericite altered plagioclase. The quartz phenocrysts are to 5mm in diameter and commonly deeply embayed, with quartz + sericite + chlorite + smectites in the embayment. One fragment consists largely of a totally fragmented quartz phenocryst. Rare leucoxenised magnetite phenocrysts are present.

The groundmasses are mostly quartz and sericite and there is very little matrix. Veins of quartz and/or chlorite are common as are porous veins with quartz and limonite lined cavities.

Rare sulphide patches occur in lenses of limonite.

23628 : DC 427
2190E, 0400N

Silicified, sericitised sparsely porphyritic andesite or dacite with possibly weak tectonic brecciation.

Field Note : Fine gr. weak sericite-chlorite volcanoclastic, minor chlorite veins, trace pyrite and trace galena?

Sparsely distributed albitised plagioclase phenocrysts to 2mm long are present in this rock. There are also oxidised/leucoxenised microphenocrysts. The groundmass has been altered to granular fine quartz with sericite, and locally clear quartz. An apparent fragmental texture appears to reflect movement along irregularly distributed sericitic shears and leucoxene-decorated stylolites.

No sulphides are present in this rock.

23629 : DC 431
2890E, 0400N

Possible ignimbrite with sericite rich fiamme and fractured felspar phenocrysts altered to adularia + albite and carbonate. Quartz-sericite + adularia altered groundmass with fine carbonate. Trace pyrite.

Field Note : Cherty/silicified felspar physis rhyodacite/dacite. Some chlorite disseminated/vein pyrite and haematite (>1%).

The phenocrysts in this rock are up to 4mm long and have been altered to adularia and/or carbonate, locally with cores of albite. The matrix or groundmass is heterogeneous with lenticular sericite-rich perniceous fiamme to 8mm long and silicified possible lithic fragments to 5mm diameter with very minor adularia. Sericite-clouded fine grained quartz is abundant but small rhombs of carbonate are abundant grains of leucoxene are scattered sparsely.

There are traces of fine pyrite in this rock.

23630 : DC 436
2590E, 1000N

Lava : phenocrysts of plagioclase (albitised)
>> quartz : microphenocrysts of magnetite.
Veins and patches of quartz. Probable
dacite (albite-quartz alteration).

Field Note : Porphyritic pink feldspar ± fine quartz phyric rhyodacite.

The dominant phenocrysts in this rock are of plagioclase, altered to albite and very minor sericite. They occur singly or in clusters and are small (0.5 - 2mm long). A single phenocryst of quartz, 2mm in diameter and embayed, is present in the thin section but microphenocrysts of magnetite are common, especially within aggregates of plagioclase.

The groundmass is heterogeneous but very fine grained and consists of quartz, probable albite, clays and fine magnetite.

Quartz veins to 1mm wide are present and ragged patches of quartz occur in the groundmass.

23631 : DC 442
81070E, 22400N

Lapilli tuff or breccia of quartz porphyritic rhyolite fragments with micro phenocrysts of magnetite >> apatite and rare phenocrysts of biotite.

Field Note : Rhyolite lava breccia? With pink quartz phyric fragments in finer matrix.

The fragments in this rock are from 1 to 20mm in size (ash and lapilli) and contain phenocrysts of quartz to 2mm in grain size, with a bipyramidal weakly resorbed habit. Microphenocrysts of magnetite are common but microphenocrysts of apatite are rare. Rare phenocrysts of biotite have been altered to clay, leucoxene and limonite. Rare plagioclase phenocrysts to 2mm long have been altered to albite and/or sericite. The groundmasses are rich in alkali feldspar with less abundant quartz and fine oxides. A sericite-rich matrix with minor quartz is present and quartz crystal fragments are common, about 0.5mm in size.

23632 : DC444
80450E, 21600N

Quartz-sericite-(albite) altered quartz porphyritic lava with conjugate schistosity at 60° to each other.

Field Note : Silicified-sericite altered rhyolite with 2% Fe-staining after sulphide as vuggy fine grained limonite stained silica.

Bipyramidal phenocrysts of quartz 0.4 to 4mm in size are common in this rock. The larger ones are commonly resorbed. Rare plagioclase phenocrysts have been altered to sericite and albite, and possible ferromagnesian phenocrysts (including biotite) to quartz, sericite, limonite and leucoxene.

The groundmass is sericite-clouded granular quartz with sericite defining two conjugate schistosity at 60° to one another. The schistosity intersecting the acute angle between these planes has developed only in altered phenocrysts. Some leached out areas may have been occupied by carbonate and there are rare zircons. No sulphides were observed in this rock.

23633 : DC 445
3025E, 21800N

Sparsely quartz-porphyritic lava with abundant veins of columnar quartz, and limonite after probable carbonate ± pyrite.

Field Note : Strong moderately silicified sericite quartz rhyolite, Fe stained ex-sulphide 1-2% associated with cherty silica.

The sparse quartz phenocrysts in this rock are up to 2mm in size and rounded to irregular in shape. Rare zircon crystals are present and the groundmass is a fine grained heterogeneous aggregate of quartz and sericite with minor limonite. Abundant subparallel veins of columnar quartz are present, from 0.2 to 1mm wide, locally with lenses of albite, or leached out lenses lined by limonite. Most of the limonite in this rock has been derived from patches of small carbonate rhombs but some has been derived from pyrite.

23634 : DC 462
3540E, 1000N

Quartz-rich sericitic rock either a crystal tuff or a tuffaceous sediment, with lenses (?fiamme) of sericite, and patches of oxidised magnetite.

Field Note : Dark purple haematitic sandstone? sheared.

This rock is difficult to interpret. Although it is rich in reasonably well sorted angular quartz grains, 0.2 - 1mm in size, it also contains elongate fragments of sericite 0.5-3mm long, and rare patches of oxidised magnetite crystals, to 1.5mm in size. There also appear to be sericite-limonite altered grains to 0.5mm in size. This suggests that the rock could be a crystal tuff with some lithic components, but could also be to some extent reworked. A matrix of sericite and limonite is present.

The sericite lenses could be small 'fiamme', similar to those in ignimbrites.

23635 : DC 466
81475E, 22800N

Quartz-sericite altered aphanitic rock with sericite lenses and sericite-filled, quartz-rimmed possible vesicles. Rare totally sericitised feldspar phenocrysts.

Field Note : Fine grained cherty volcanoclastic with some feldspar phenocrysts.
Cut by sulphide vein with minor sulphide dissemination.

Phenocrysts are rare in this rock but appear to have been feldspar, totally altered to fine sericitic clays. Microphenocrysts of magnetite, partly leached and partly altered to leucoxene, are rare. Irregular lenses of sericite, and leached out lenses to 4mm long are of obscure origin (?fiamme) but circular patches of sericite + limonite to 1mm diameter, rimmed by clear quartz, appear to have been vesicles. Most of the rock is granular quartz clouded by sericite, and fine leucoxene. No sulphides were observed.

23636 : DC 467
82450E, 22800N

Schistose porphyritic volcanic rock, possibly broadly andesitic, with sericite after plagioclase phenocrysts, chlorite after ferromagnesian phenocrysts and leucoxene after microphenocrysts of magnetite.

Field Note : Cleaved, locally fow-banded Mt. Darwin rhyodacite.

A fine schistose quartz-sericite aggregate has totally replaced the groundmass of this rock. Phenocrysts are abundant but there were no quartz phenocrysts.

Abundant felspar phenocrysts to 4mm long have been altered to sericite + limonite and minor ferromagnesian phenocrysts to 2mm long, have been altered to chlorite + leucoxene + limonite. Rare microphenocrysts of magnetite have been altered to leucoxene.

A single possible fragment of silicified pumice is present, 2mm long.

Heterogeneities in the groundmass probably reflect shearing rather than flow banding.

23637 : DC 473
1715E, 22600N

Quartz-sericite-carbonate altered aphyric
vesicular siliceous ?lava or ignimbrite with
irregular lenses of sericite \pm carbonate.
Minor pyrite.

Field Note : Moderately silicified sericite chlorite volcanoclastic, schistose in
part with local disseminated pyrite (1%) and rare vein sulphide.

Irregular lenses of sericite \pm minor carbonate to 5mm long are scattered and
have a uniform orientation, parallel to, or at $<15^\circ$ to, the schistosity. These
lenses are possibly fiamme (e.g. in an ignimbrite) but do not have a clearly
vesicular texture, as they do in many of the other rocks in this batch in
which they occur. Moreover, there are abundant roughly circular to elliptical
patches, 0.4 to 3mm in diameter, which may represent vesicles and contain
clear quartz and/or carbonate. The bulk of the rock is sericite - clouded
granular quartz with minor carbonate and trace lenses of leucoxene. Most
of the minor pyrite in this rock is in the vesicle-like patches. Some of the
pyrite has been fractured and veined by chalcopyrite and separate grains of
chalcopyrite are also present. The pyrite grains are mostly 0.1 to 0.5mm in
size.

23638 : H.S.
1650E, 1800N

Hornblende-plagioclase porphyritic potassic andesite or latite with microphenocrysts of apatite and magnetite. Clay-albite alteration.

Field Note : Grey green hornblende andesite, rare xenoliths.

Phenocrysts of plagioclase 1-3mm long, altered to clays and albite, are extremely abundant in this rock, constituting about 25-30%. Hornblende phenocrysts to 2mm long, have been locally altered to uralitic actinolite (some of these were possibly clinopyroxene phenocrysts). Microphenocrysts of magnetite are abundant but most of the microphenocrysts of apatite have been leached out.

The groundmass appears to be rich in alkali feldspar and quartz, but has been clouded by clays. Irregular patches of quartz are present and there are thin veins of adularia, quartz and sericite.

23639 : H.S.
2900E, 1200N

Plagioclase porphyritic broadly andesitic rock with suggestins of pumiceous fragments, poorly preserved (possibly ignimbrite or tuff?)

Field Note : Coarse grained pink feldspar rich dacite, minor chlorite.

The phenocrysts in this rock are dominantly plagioclase, altered to albite and occurring singly or in clusters with oxidised and/or leucoxenised oxide microphenocrysts, mostly probably magnetite. Rare patches of chlorite + sericite are present, locally enclosing limonite after pyrite crystals with pressure shadows of columnar quartz. The groundmass is fine grained, with clays and quartz + albite. Suggestions of pumice fragments to 4mm long occur within this groundmass, suggesting that the original rock was possibly an ignimbrite or an air-fall tuff.

23640 : H.S.
2400E, 0200N

Sparsely porphyritic fragmental or andesitic to dacitic possible lava or tuff, with quartz-sericite-albite alteration and minor leucoxene

Field Note : Dark grey felspar phyric dacitic volcanoclastic, Fe-stained.

Although this rock is clearly fragmental, it is possibly a flow-breccia rather than a pyroclastic. The fragments range from 0.2mm to >10mm in size in a fine sericite-rich matrix with an anastomosing schistosity.

Albitised phenocrysts of plagioclase to 1.5mm long are quite rare as are partly oxidised, partly leucoxenised microphenocrysts of magnetite. The groundmass consists of fine granular quartz and sericite.

Small cavities in the rock locally contain quartz crystals.

23641 : H.S.
2025E, 000N

Weakly plagioclase porphyritic probable andesite or dacite with small mafic xenoliths. Clay quartz alteration.

Field Note : Fe-stained weathered feldspar, minor Fe-filled vugs - silicified.

This rock appears to be a quartz-sericite altered very sparsely porphyritic lava, with rare partly leached, albitised plagioclase phenocrysts. Possible glomeroporphyritic clusters to 5mm long include sericitised probable ferromagnesian crystals in addition to albitised and weakly sericitised felspar.

There are a very few definite xenoliths to 4 x 2mm with an apparent doleritic texture, again with ferromagnesian minerals altered to sericitic clays and leucoxenised oxide grains.

The groundmass is mostly quartz and sericite with minor albitised felspar laths.

23642 : H.S.
2350E, 000N

Silicified-sericitised sparsely porphyritic possible dacite cf. 23641, weakly sheared and brecciated, with patches of carbonate (locally leached and limonite lined) and of chlorite + quartz. Oxidised magnetite grains.

Field Notes : Aphyric rhyolite/volcaniclastic, minor Fe-filled vugs-silicified.

Sparse albitised, weakly sericitised plagioclase phenocrysts occur singly or in small clusters in this rock, as in No. 23641, in a dominantly quartz-sericite altered groundmass with some albitised felspar laths and fine opaque grains.

Larger oxidised magnetite grains (?microphenocrysts) are also present.

Lenses of carbonate to 5mm long are common and have been in places leached, leaving cavities lined by limonite. Sericite occurs along small shear zones and microfractures giving a finely brecciated appearance to parts of the rock.

23643 : H.S.
2725E, 000N

Quartz-sericite slate derived from a shale with silty lenses and spots possibly representing retrogressed porphyroblast. Limonitic sericitic shearzones.

Fine grained rhyo-dacitic volcaniclastic. Possible shale contact. Fe stained.

There is no evidence of this rock having been a volcaniclastic. It is dominantly fine quartz and sericite with a slaty cleavage, and lenses containing silt-sized quartz grains (<0.05mm in size). Small spots to 0.4mm in size, locally outlined by spotty limonite, may have been porphyroblasts.

Thin quartz veins are present and there are diffuse sericite rich zones, possibly shears, containing limonite-lined fractures. Lenses of quartz + limonite are present in some of these zones.

23644 : H.S.
2850E, 000N

Quartz-sericite altered plagioclase porphyritic
possible ignimbrite with sericitic fiamme.

Field Note : Silicified-sericite altered feldspar (now limonite infilled) phyrlic
lava. Weak schistosity.

This is an unusual rock with abundant plagioclase phenocrysts 1-4mm in size, altered to albite and limonite. The limonite is almost certainly after carbonate. The matrix is a quartz-sericite schist with an extremely heterogeneous distribution of sericite - partly in shears and partly within fiamme. The fiamme appear to represent partly compressed pumice fragments to 7mm long and suggest that the rock was an ignimbrite.

23645 : H.S.
1825E, 21600N

Sheared crystal-lithic tuff with quartz,
sericite, albite and minor chlorite, and
carbonate; including quartz-sericite altered
possibly pumice fragments,

Field Note : Dark green, ?chloritic, fine grained feldspathic volcanic/siltstone.

There is very minor chlorite in this rock, replacing lithic fragments 0.5mm long. Most of the fragments have been replaced variously by quartz, sericite and/or albite and are 0.2 - 0.5mm in size. A very few quartz crystal fragments and rare leucogenised oxide grains are present, and quartz-sericite altered possible pumice fragments from 1 to 5mm long, are scattered, locally with quartz filled vesicles, and minor carbonate.

The sericite- is strongly schistose but a weak second schist exiting at 25° to the main schistosity is present.

23646 : H.S.
1950E, 21800N

Chlorite-carbonate-sericite-altered vesicular
basalt.

Field Note : Chloritic, altered? vesicular andesite. Minor pyrite (<1%) as disseminated grains and vug infillings.

There are no phenocrysts in this rock, which is almost certainly an altered basalt. It is dominated by carbonate \pm sericite pseudomorphs of plagioclase laths about 0.2mm long, with interstitial chlorite and leucoxene. Abundant vesicles, from 0.2 to 2mm in diameter, are present and mostly contain sericite \pm carbonate. Some contain sericite and chlorite \pm quartz, with a radiating texture indicating the former presence of zeolites.

One area of the rock is carbonate-free with only sericite, chlorite and leucoxene. Minor quartz occurs in some of the vesicles in this area and in a vein. A sericite-carbonate vein is present in the carbonate bearing part of the rock.

Traces of pyrite and chalcopyrite, both rimmed by limonite, are present.

23647 : H.S. Probable ignimbrite, quartz-felspar
 1200E, 22,200N porphyritic with quartz-albite-sericite
 alteration.

Field Note : Fine medium grained rhyolite.

Sericite-rich altered pumice fragments to 15mm long are present in this rock, with phenocrysts of quartz and albitised plagioclase. More silicified fragments are also present but are less clearly differentiated from the matrix.

They have larger more clearly bipyramidal quartz phenocrysts - plagioclase phenocrysts altered to albite with minor sericite and carbonate, and rare clay-limonite-leucoxene altered biotite crystals. Some of the fragments are particularly rich in carbonate patches. there are rare crystals of apatite.

23648 : H.S. Sericite schist rock with irregular quartz
 1900E, 22,200N veins. Possibly derived from a pumiceous
 rock.

Field Note : Sericite-quartz schist containing up to 1% disseminated pyrite,
 minor vugs and sparry quartz.

Abundant irregular, partly disrupted quartz veins from 0.1 - 2mm wide are present in this sample. Some of the veins have internal cavities or vugs with a lining of quartz crystals apparently very rich in small bubbles, comprising perhaps 60-70% of the crystal. These textures are unusual if not unique. Other more typical, possibly leached out, cavities occur in other veins. The host rock is schistose very fine sericite with some textures outlined by fine quartz and ultrafine opaque dust, suggesting that microvesicular pumice may have been present in the original rock. No sulphides were observed.

23649 : H.S.
2300E, 22,200N

Quartz-sericite altered sparsely porphyritic
probable lava cf. 23641-42.

Field Note : Grey green aphyric-feldspar phyrlic volcanoclastic/lava.

Sparse albite-sericite altered plagioclase phenocrysts to 3mm long are present in this rock, the bulk of which is composed of sericite-clouded granular quartz. Rare possible ferromagnesian phenocrysts have been altered to clays, limonite and leucoxene. There are scattered patches and euhedral crystals of clear quartz, and anastomosing limonite-lined fractures, possibly partly stylolitic.

23650 : H.S.
79800E, 0300N

Sheared possible ignimbrite or deformed
lava with fragmented quartz phenocrysts
and limonitised pulled-apart pyrite-quartz
lenses.

Field Note : Quartz-phyric volcanoclastic/lava.

Individual quartz phenocrysts in this rock have been fragmented and strung out into lenses up to 10mm long, set in sericite \pm quartz, with leached out patches possibly once occupied by carbonate. It is not clear whether this fragmentation is a primary igneous feature or whether it represents tectonic dismemberment due to extension along the schistosity of the host. Lenses of limonite after pyrite have also been fragmented, pulled apart and healed by sericite, suggesting a tectonic origin for the fragmentation. Chloritised biotite phenocrysts to 4mm long have also been extended parallel to the foliation.

The groundmass is a quartz-sericite schist with traces of chlorite and rare zircons.

23651 : HS.
80350E, 21600N

Fragmental rock, possibly of
phreatomagmatic origin, less probably
epiclastic, with silicified and/or sericitised
and/or chloritised and/or carbonate altered
fragments.

The fragments in this rock include quartz-chlorite altered pumiceous clasts to 10mm in size (lapilli) with phenocrysts of quartz and plagioclase, or patches of granophyre. These rocks are schistose and may represent a juvenile magmatic component of this rock. They could have been reworked but are very ragged and deformed and may have been still fluid or at least plastic when deposited. Angular fragments altered to quartz and/or sericite and/or carbonate are common and typically contain albitised feldspar phenocrysts and/or quartz-clay-limonite leucoxene altered biotite phenocrysts. Quartz crystal fragments are abundant and 0.2 to 3mm in size.

There are rare quartz veins and rare grains of pyrite.

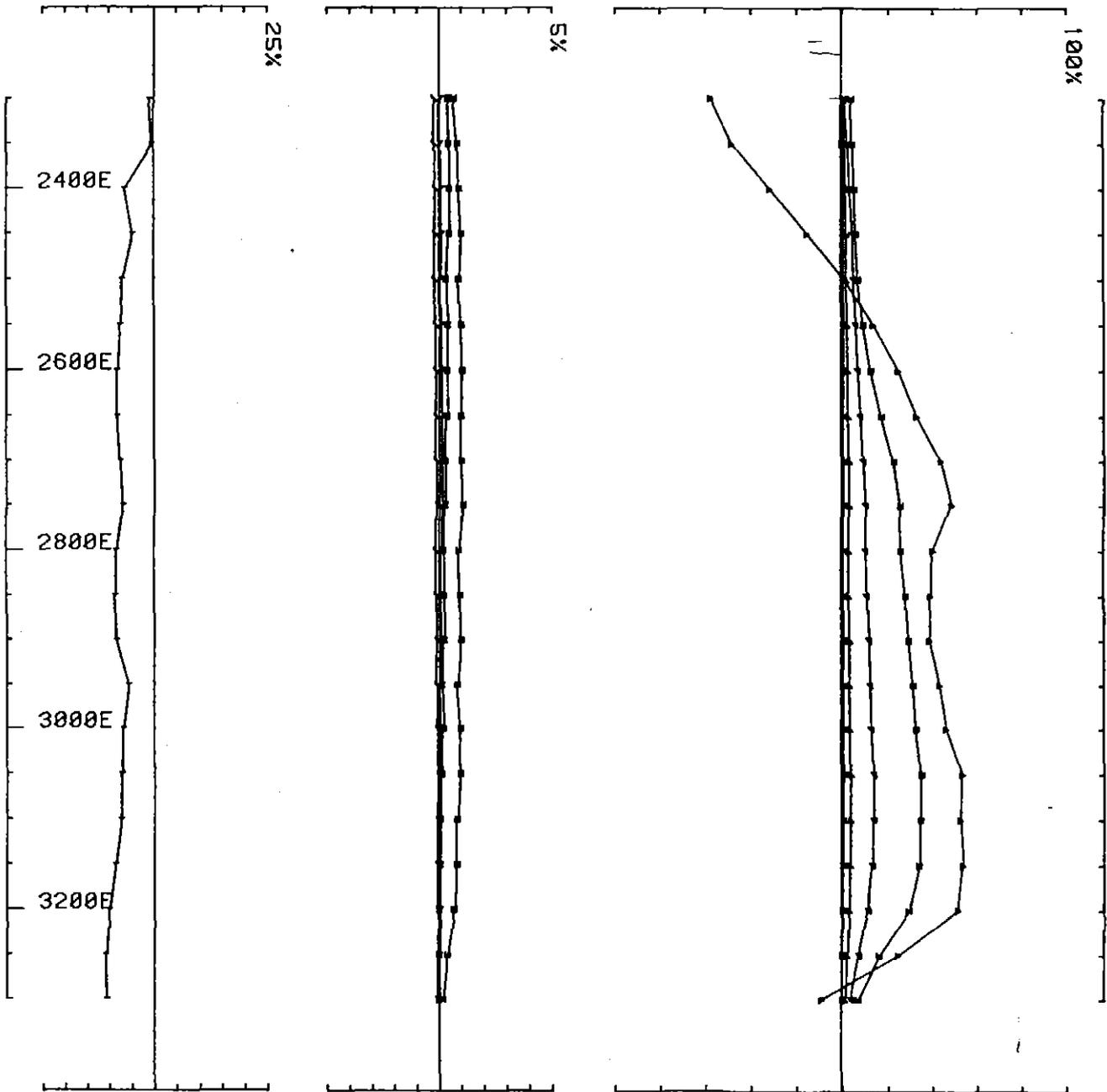
Texturally, this rock resembles a lithic-rich phreatomagmatic lapilli tuff with juvenile pumice fragments and older silicified etc. volcanic fragments.

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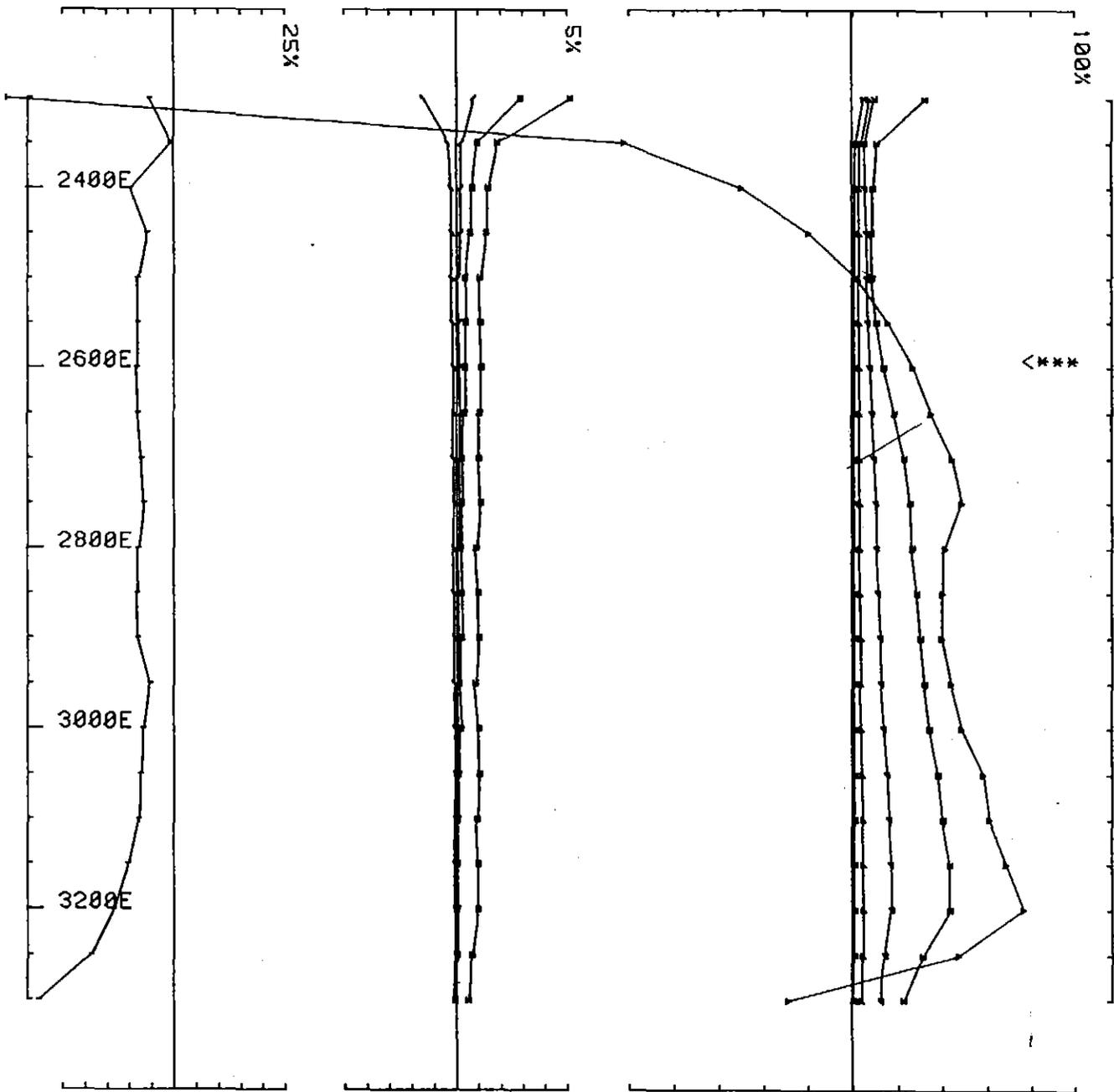
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APPENDIX 3

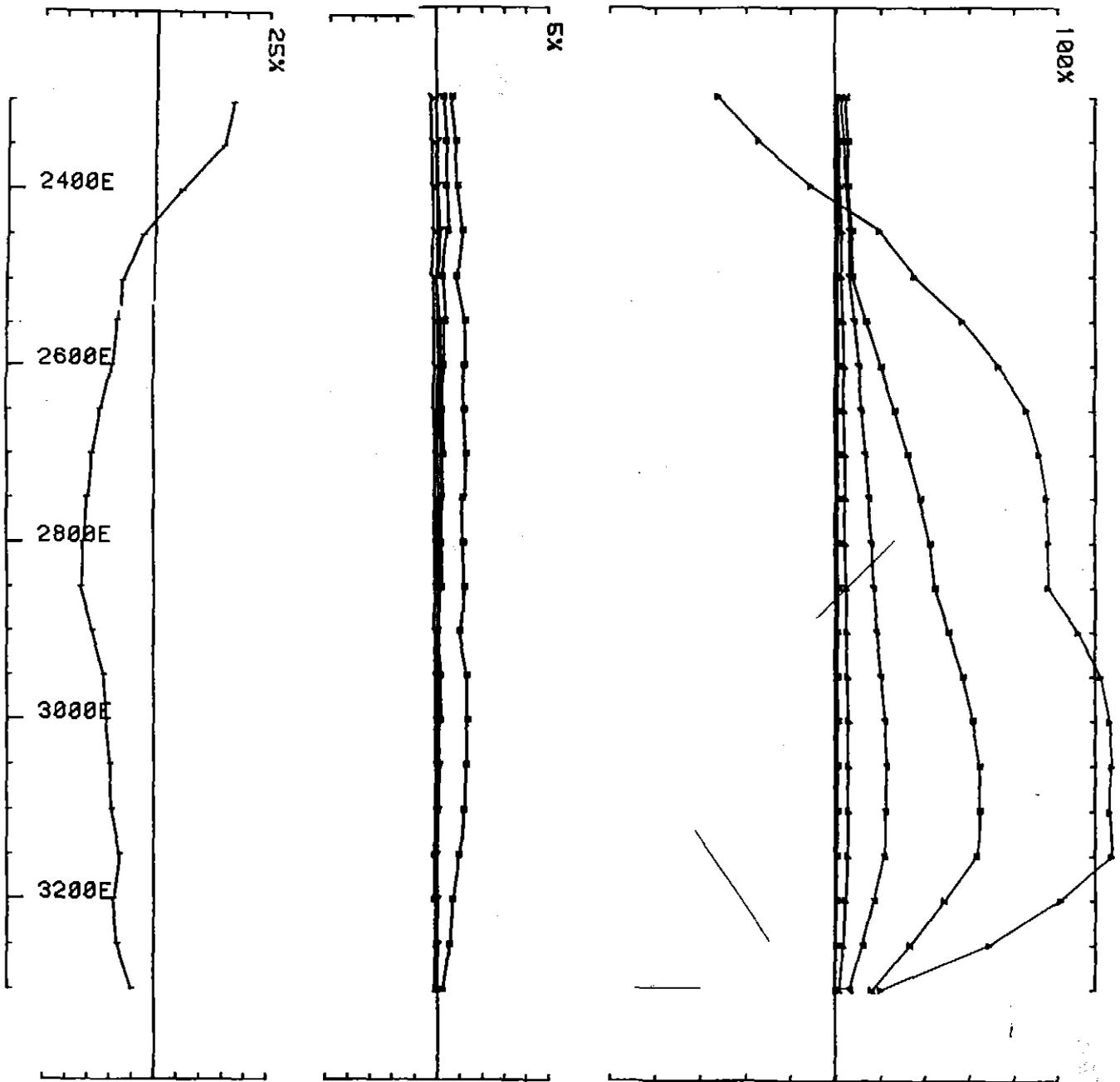
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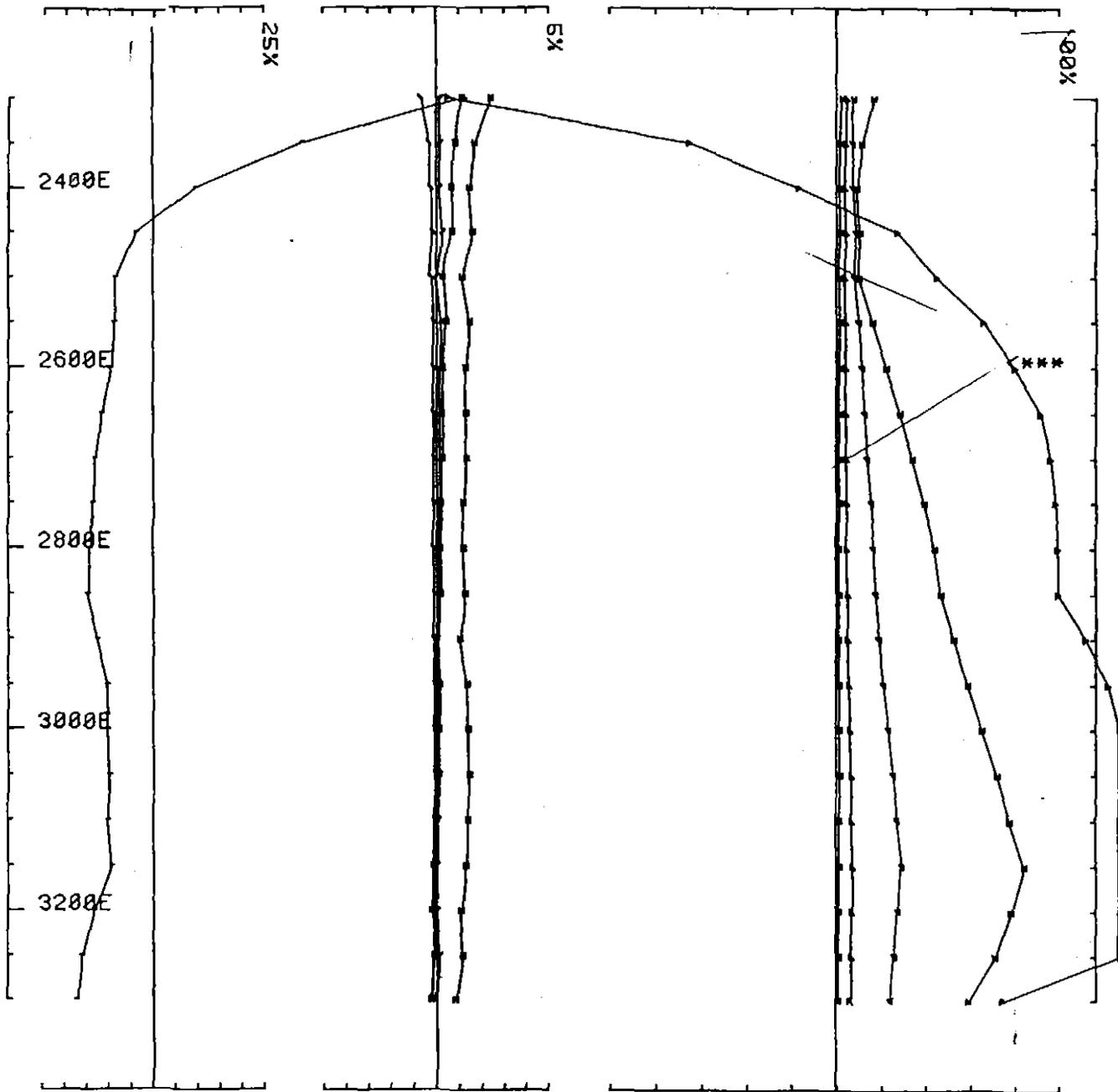
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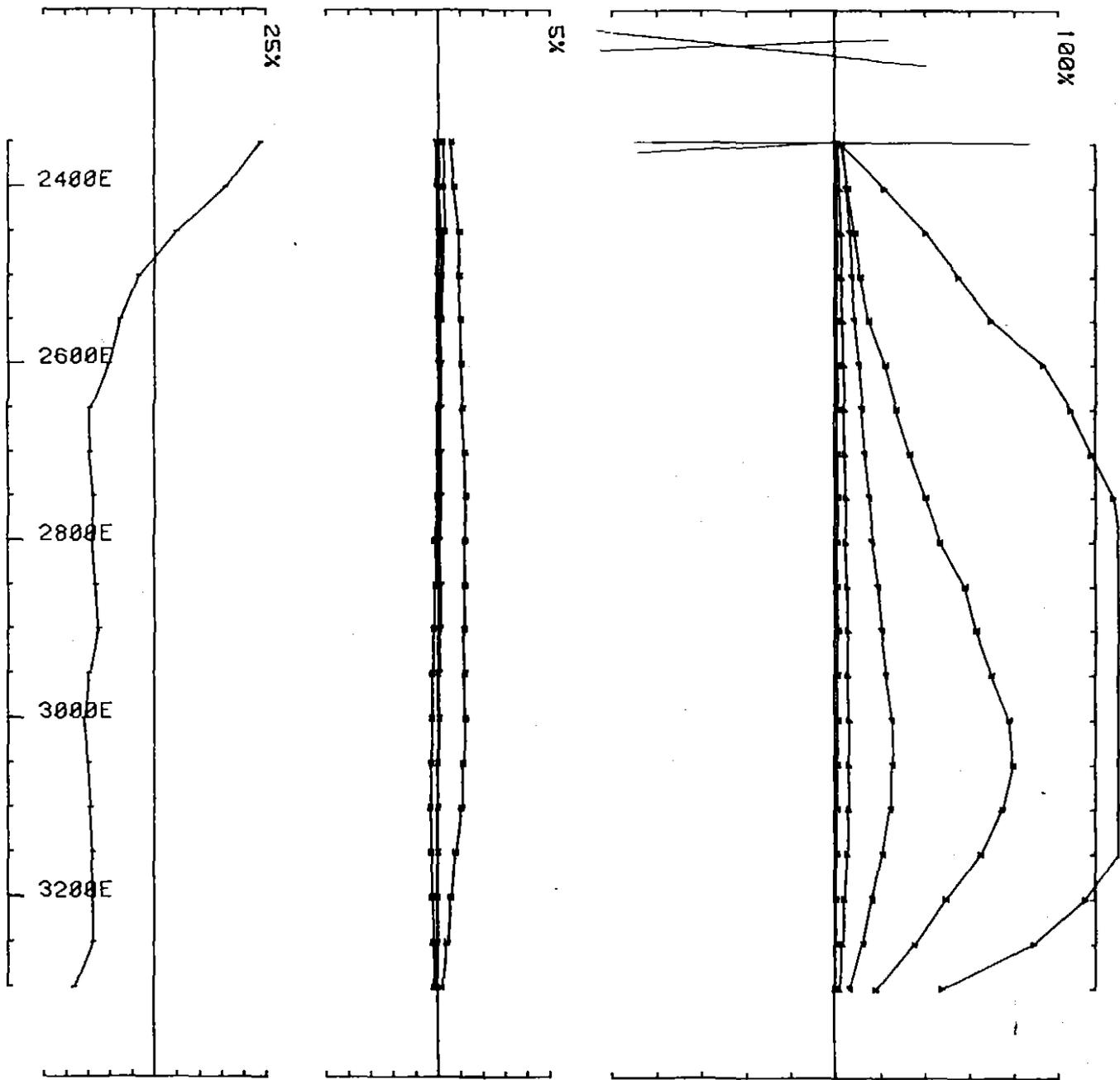
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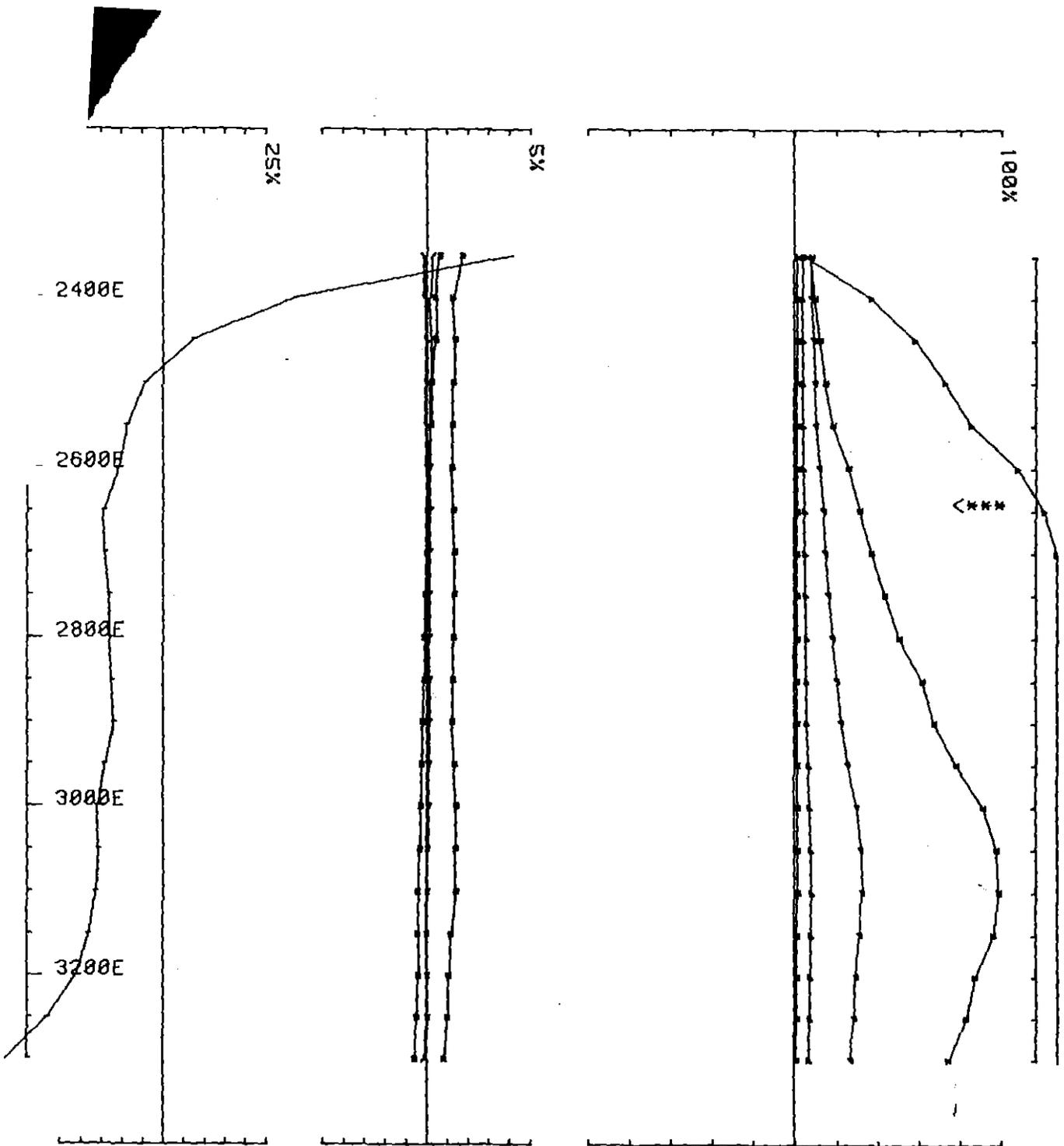
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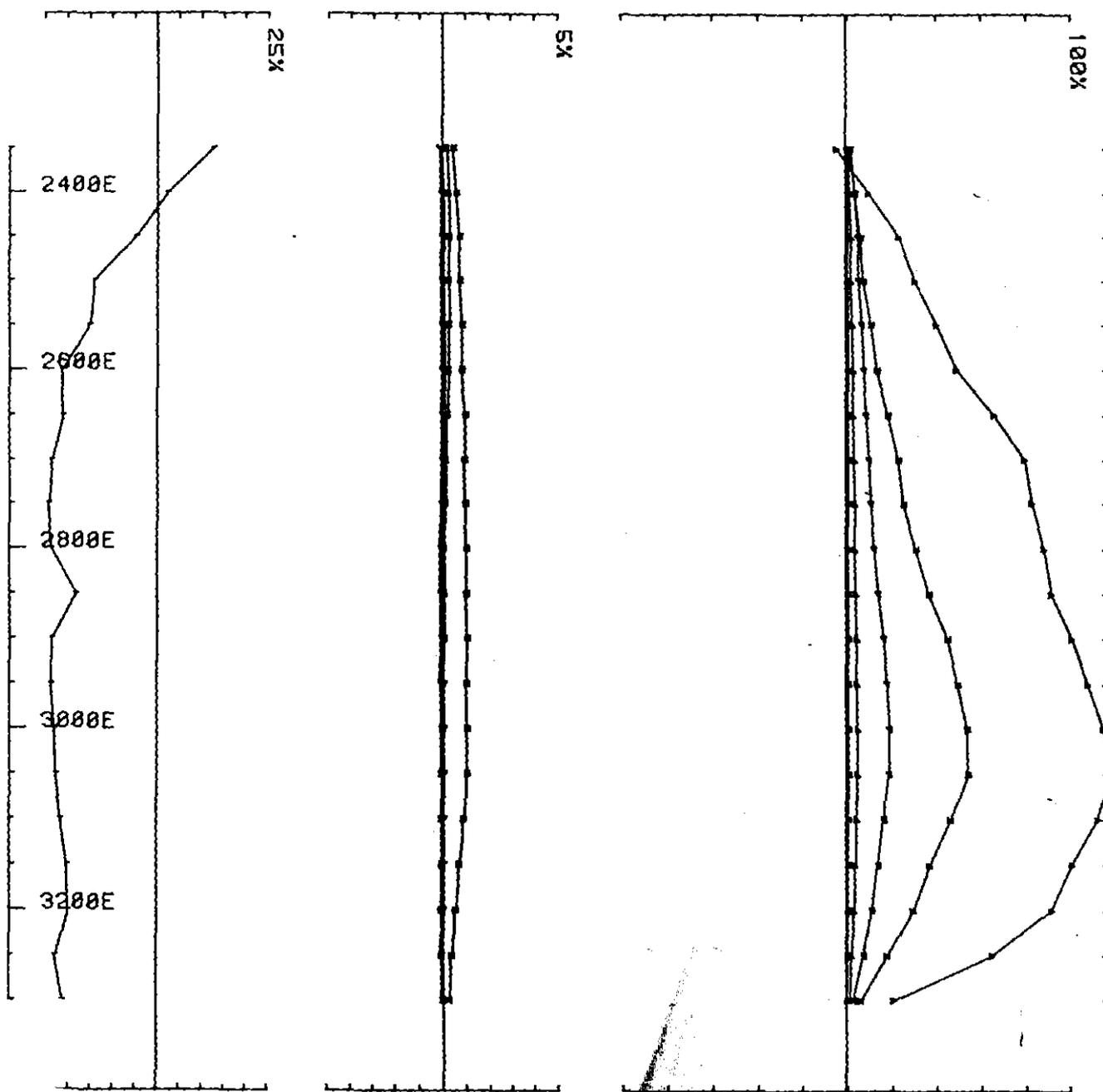
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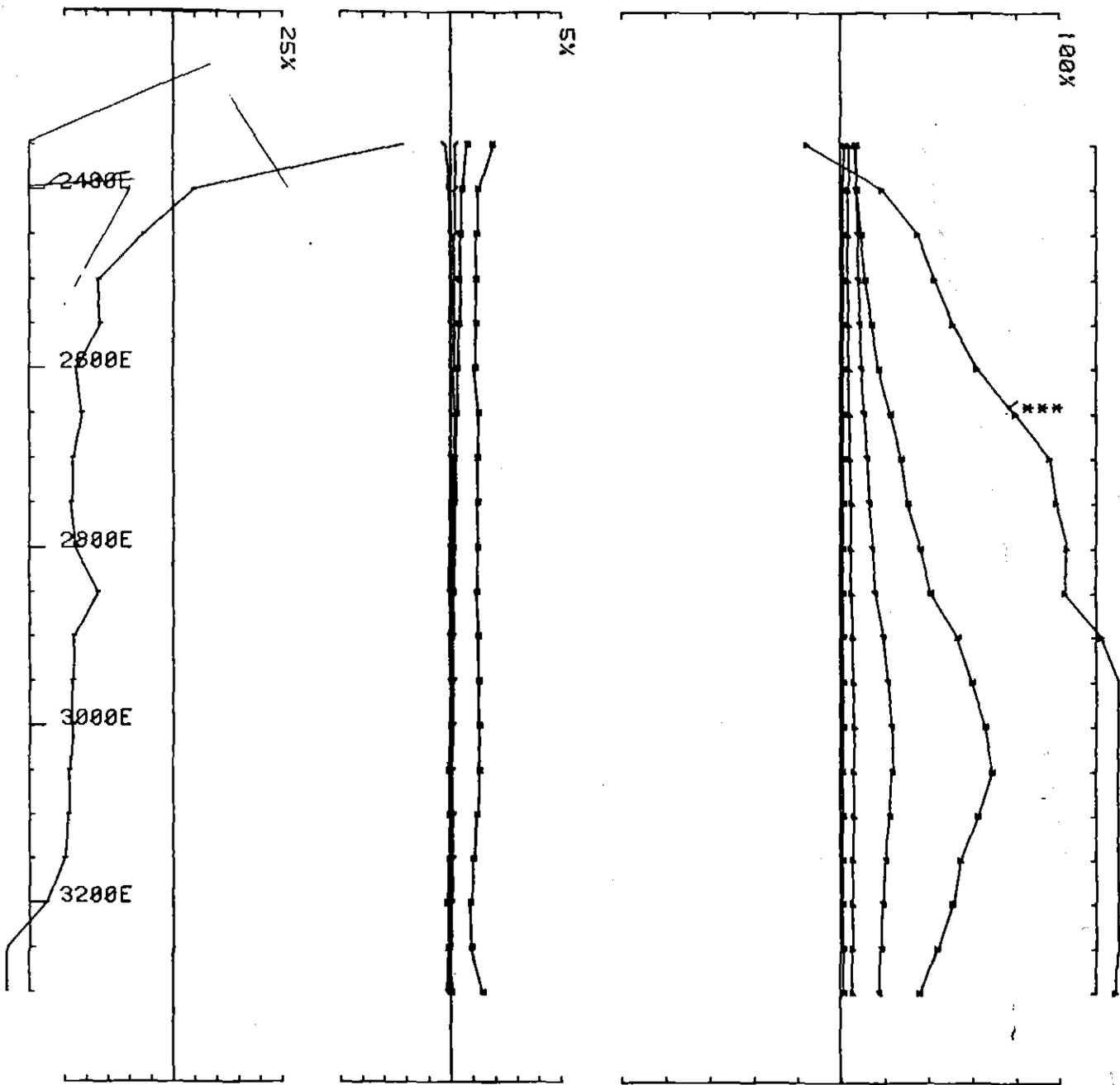
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SURVEY at GARFIELD PROJECT for BHP - UTAH

by RL, PL, ST Job 9056 base freq (hz) 26.230 MAR 90

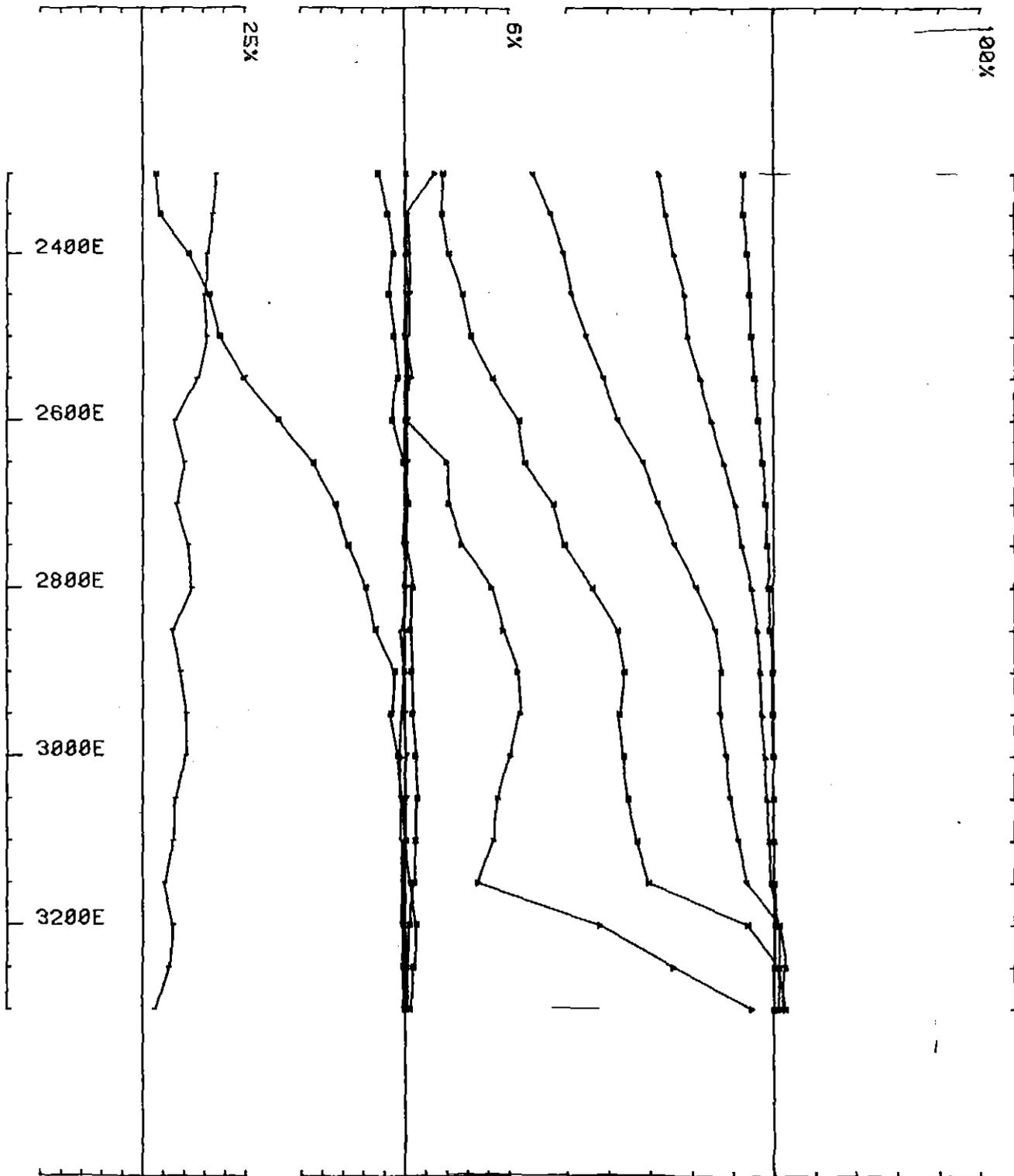
Line 4400N component Hz secondary field Ch 1 contin. norm.



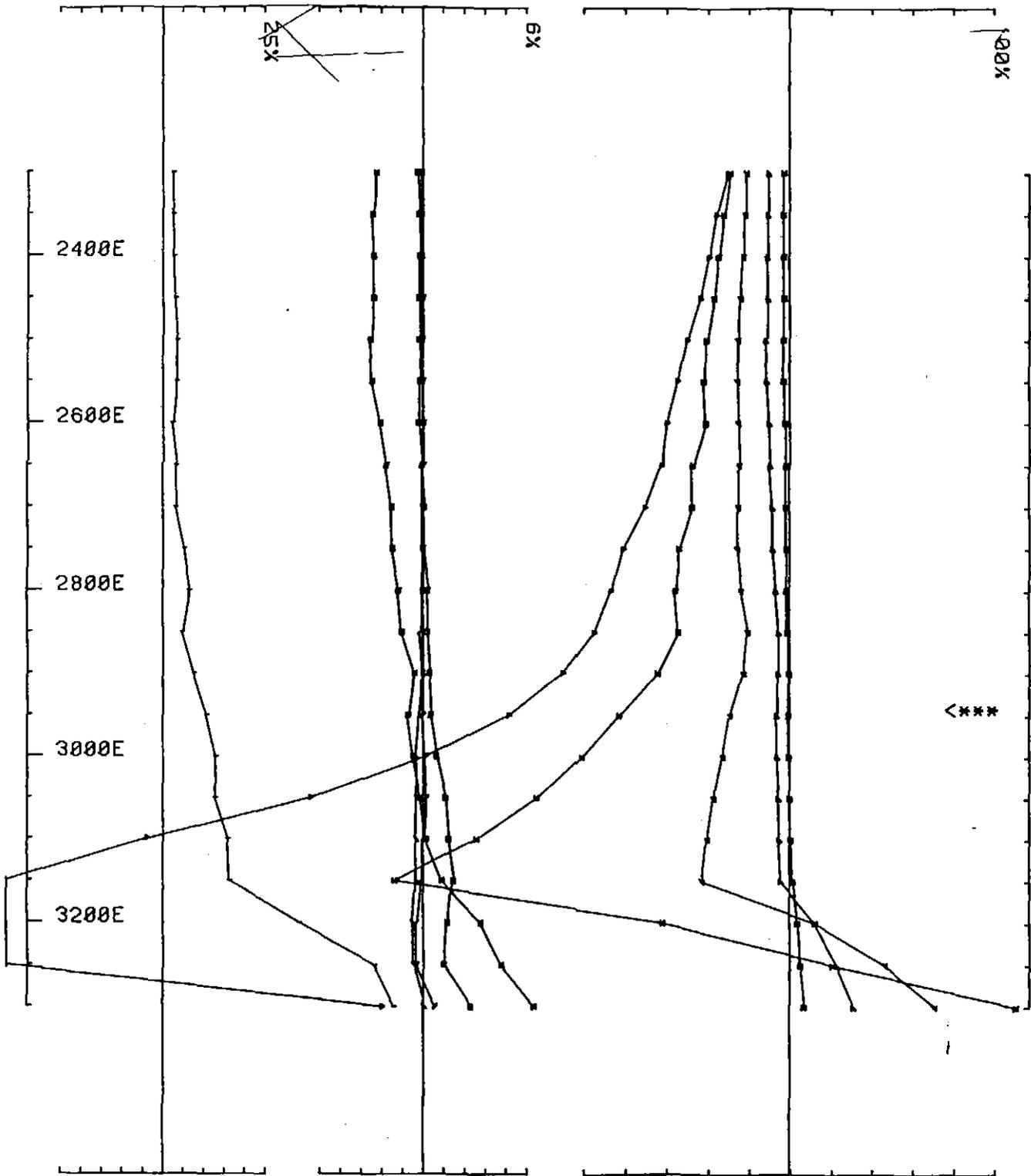
UTEM SURVEY at GARFIELD PROJECT for BHP - UTAH

conducted by RL, PL, ST Job 9056 base freq (hz) 26.230 MAR 90

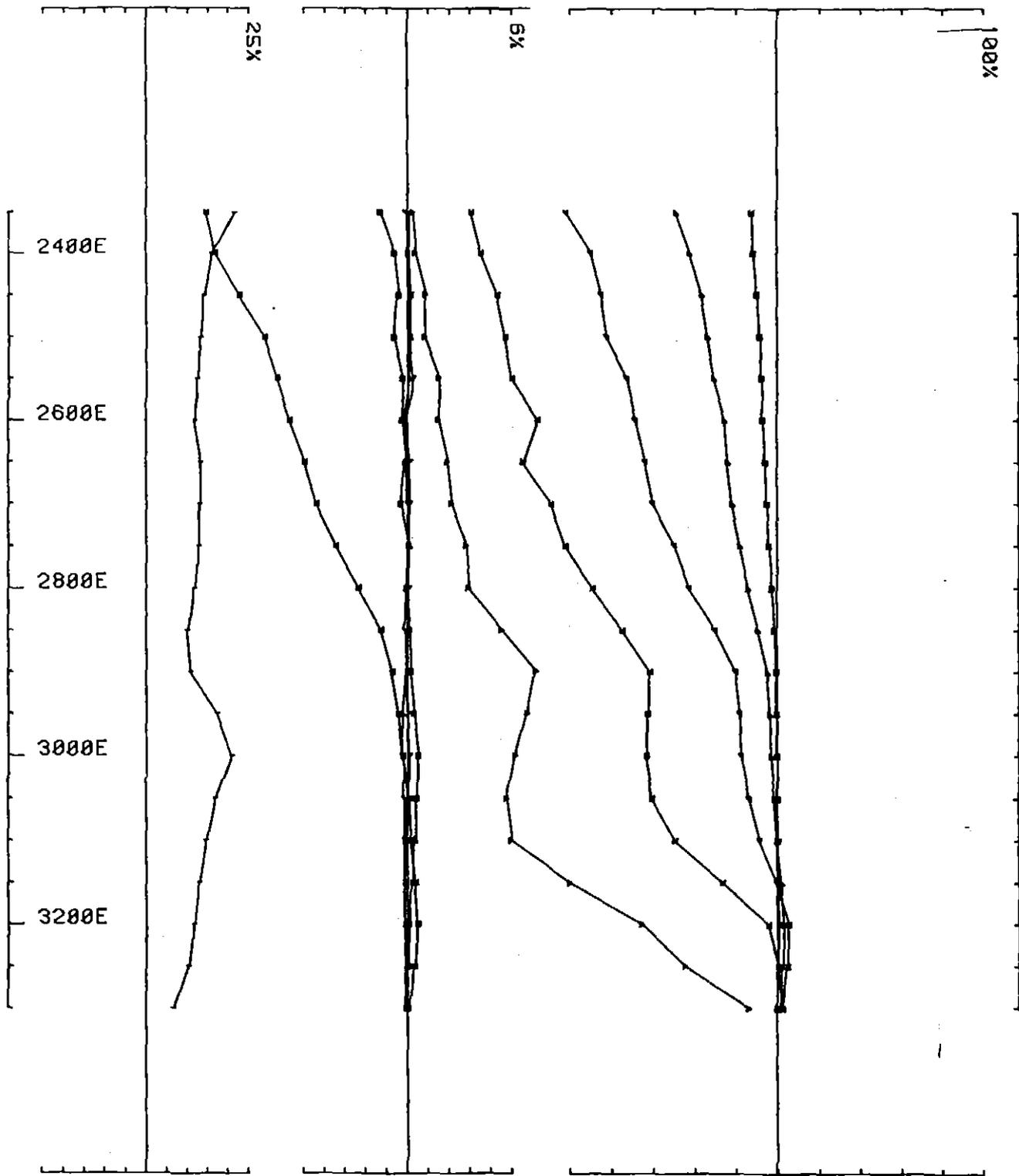
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UTEM SURVEY at GARFIELD PROJECT for BHP-UTAH MINERALS
conducted by ST RL PL Job 9856 base freq (hz) 26.230 MAR 90
loop no 0002 line 4000N component Hz secondary field Ch 1 contin. norm.



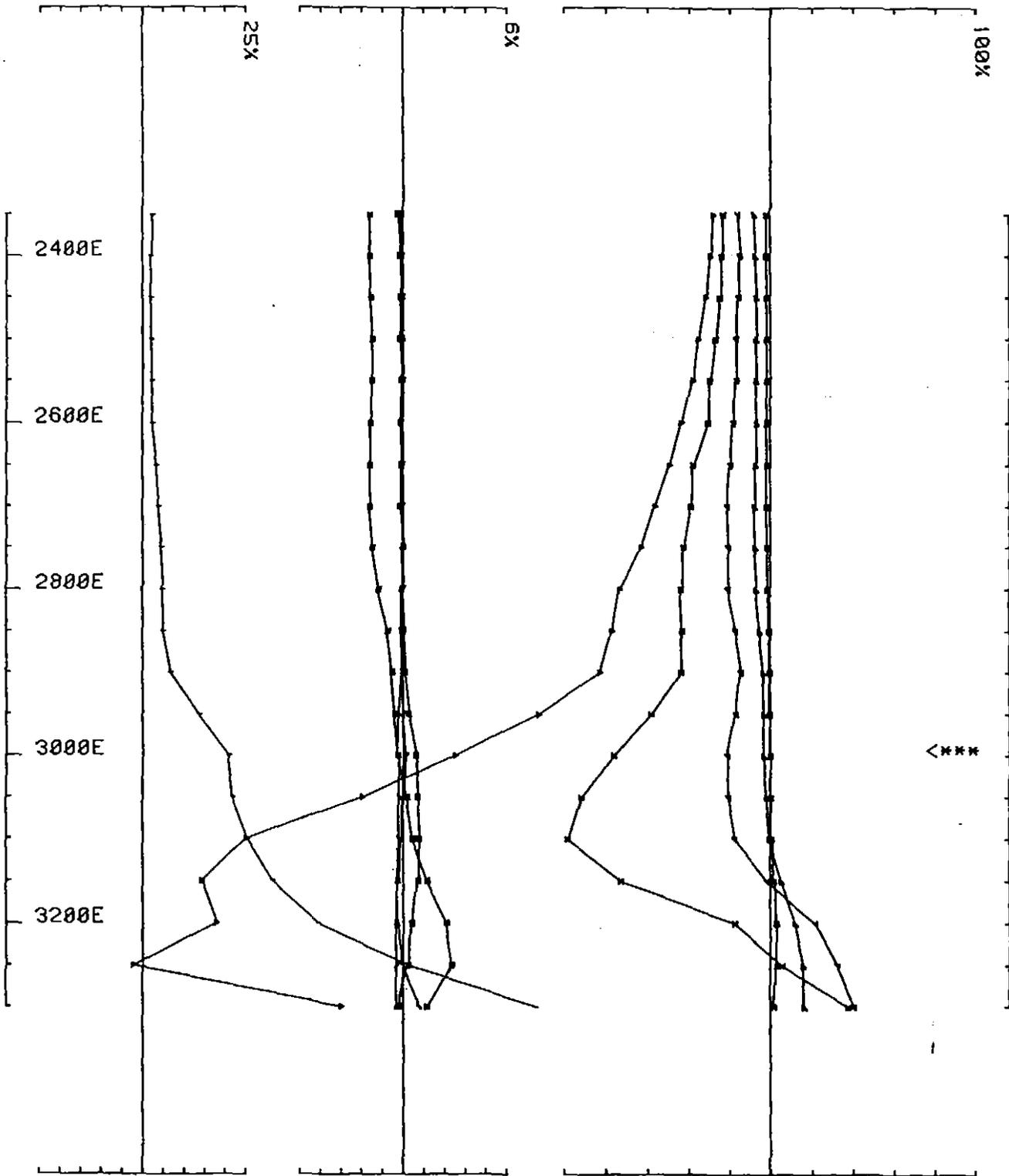
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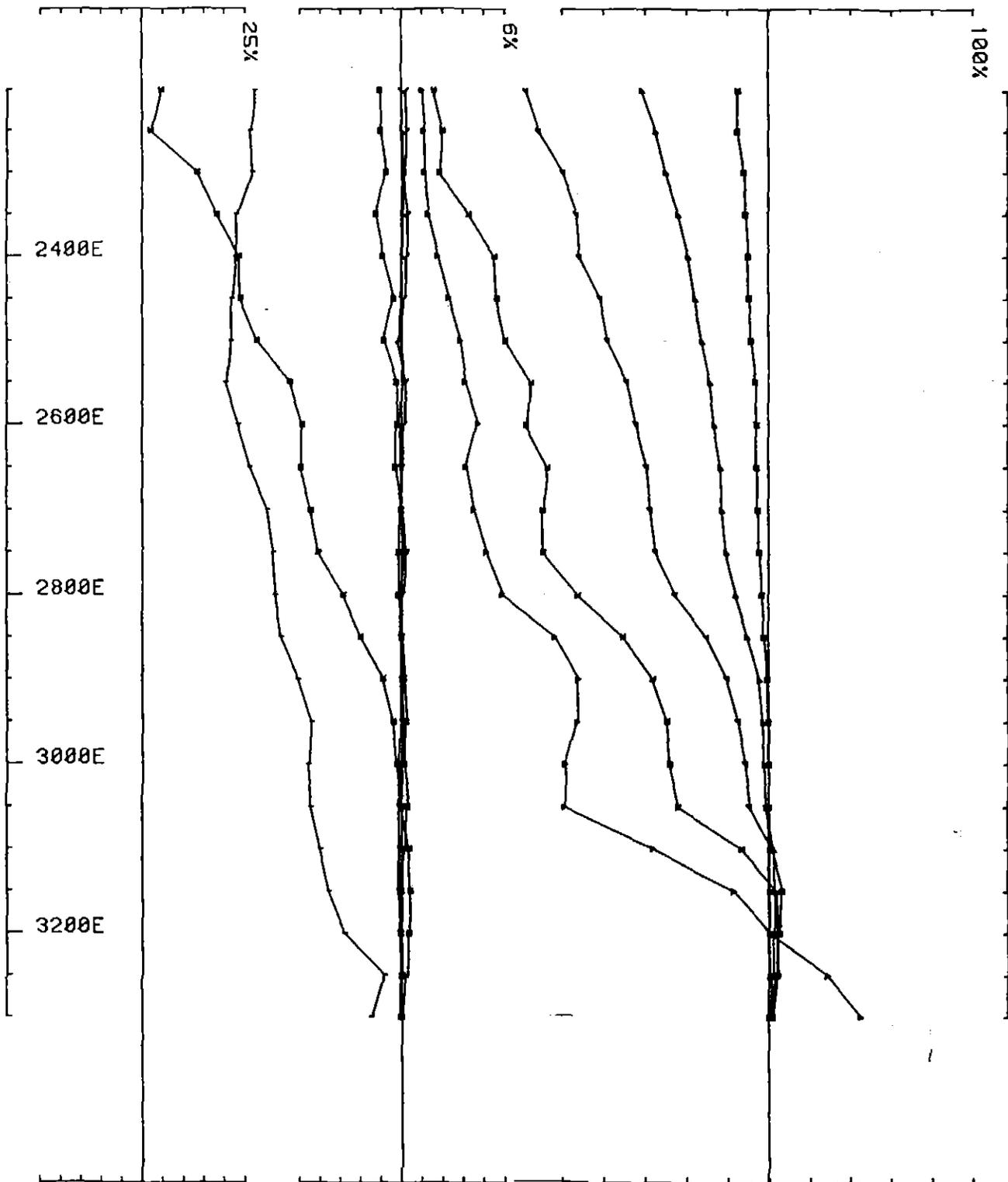
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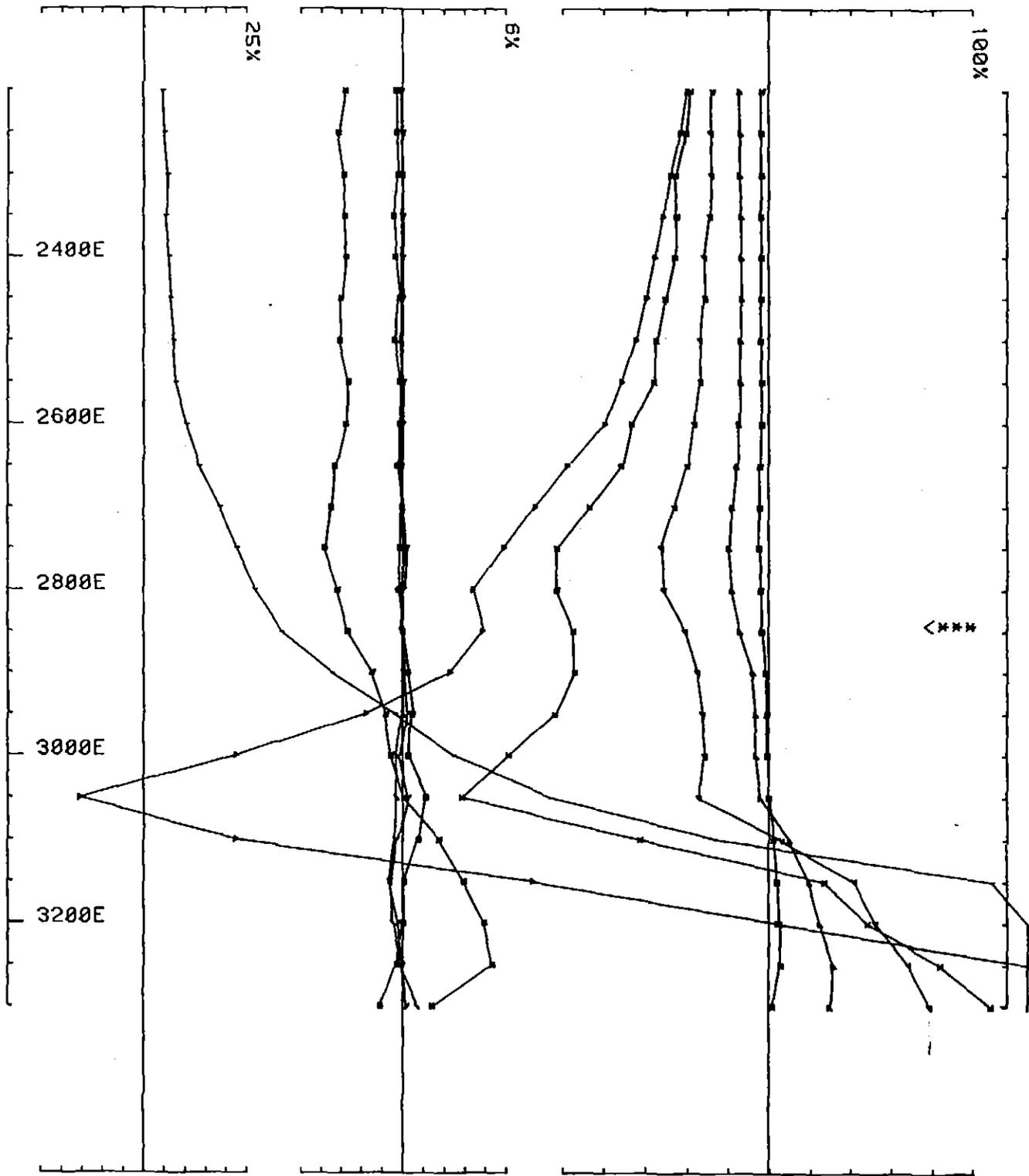
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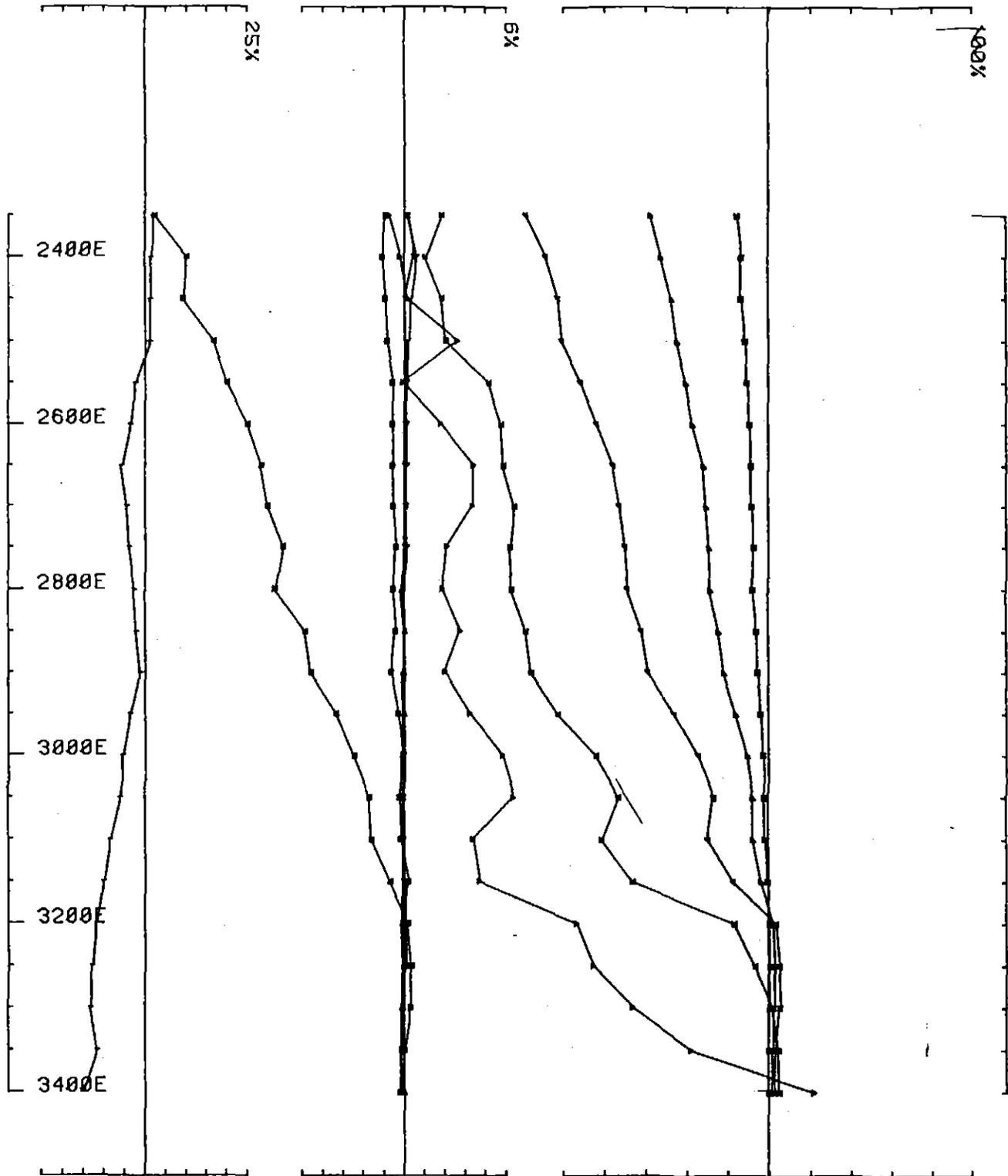
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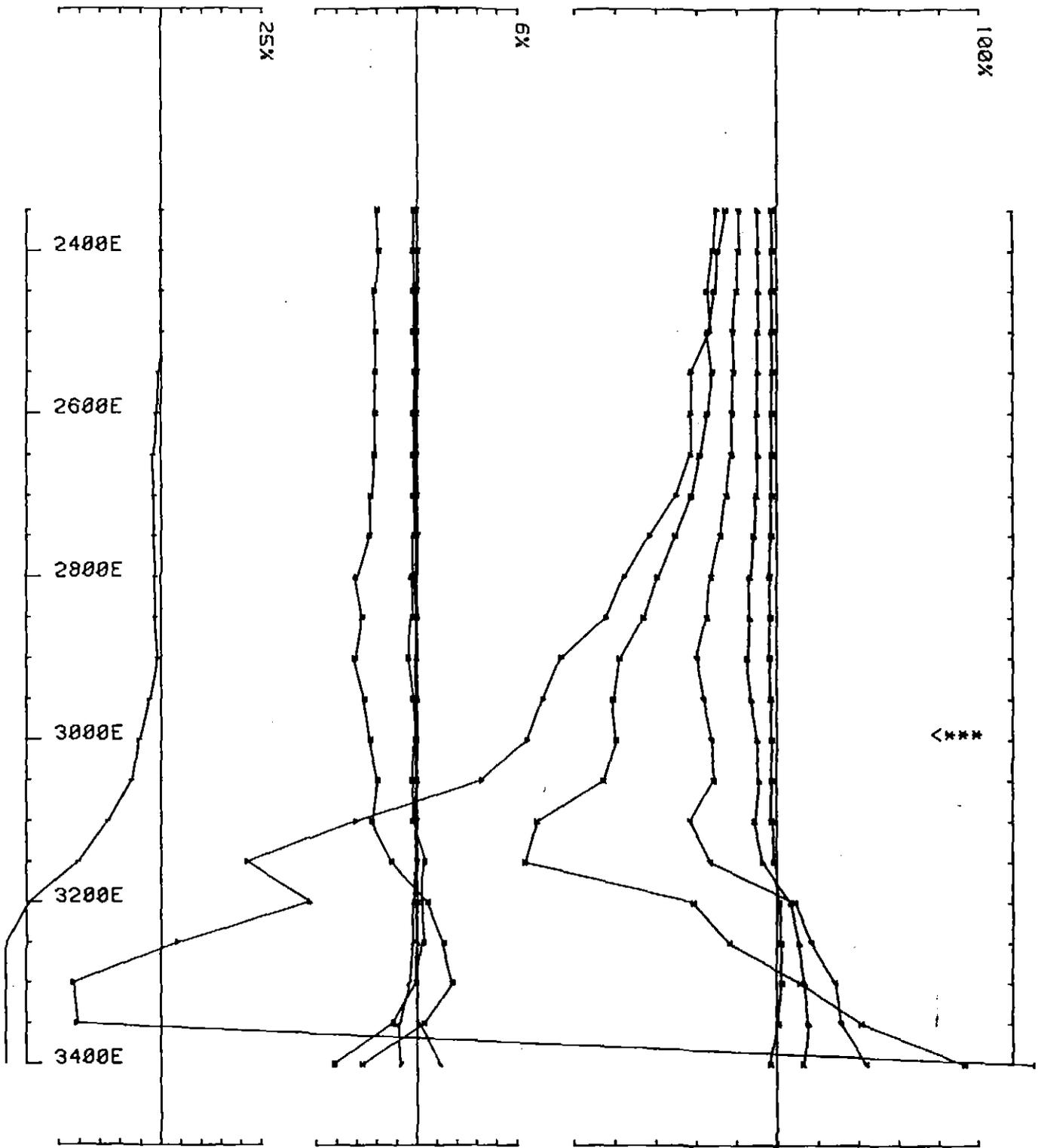
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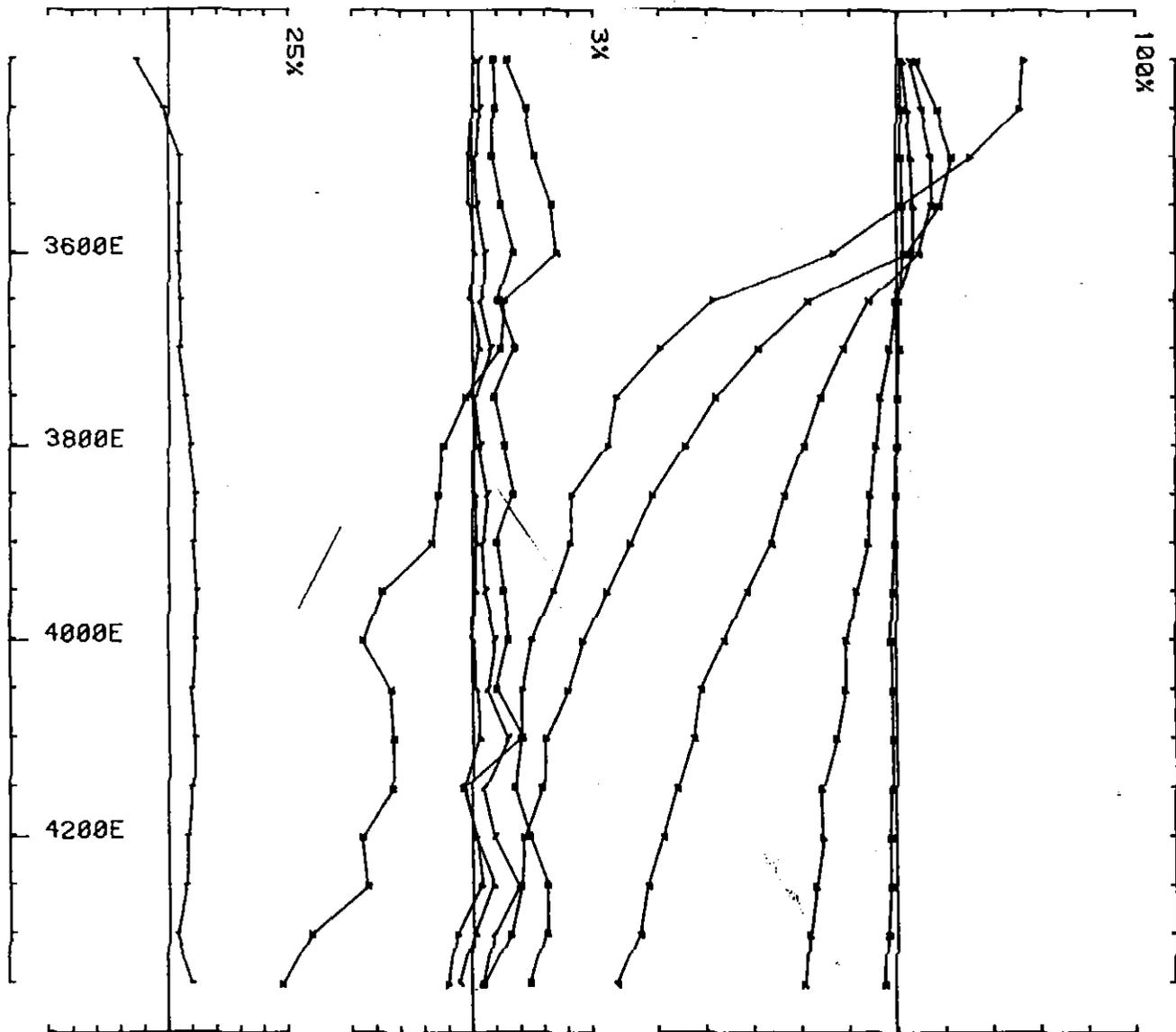
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UTEM SURVEY at GARFIELD PROJECT for BHP-UTAH MINERALS
conducted by ST RL PL job 9056 base freq (hz) 26.230 MAR 90
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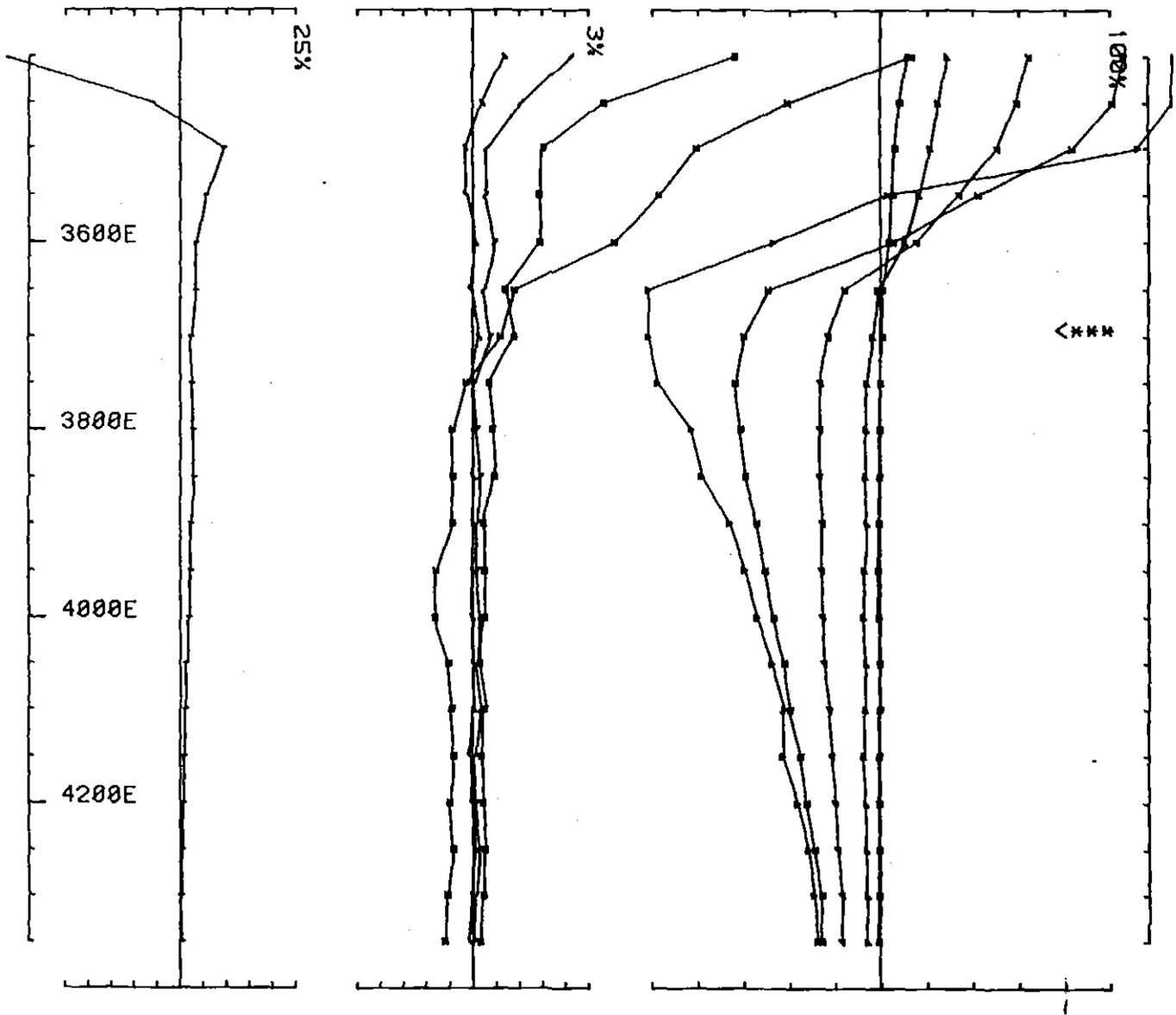
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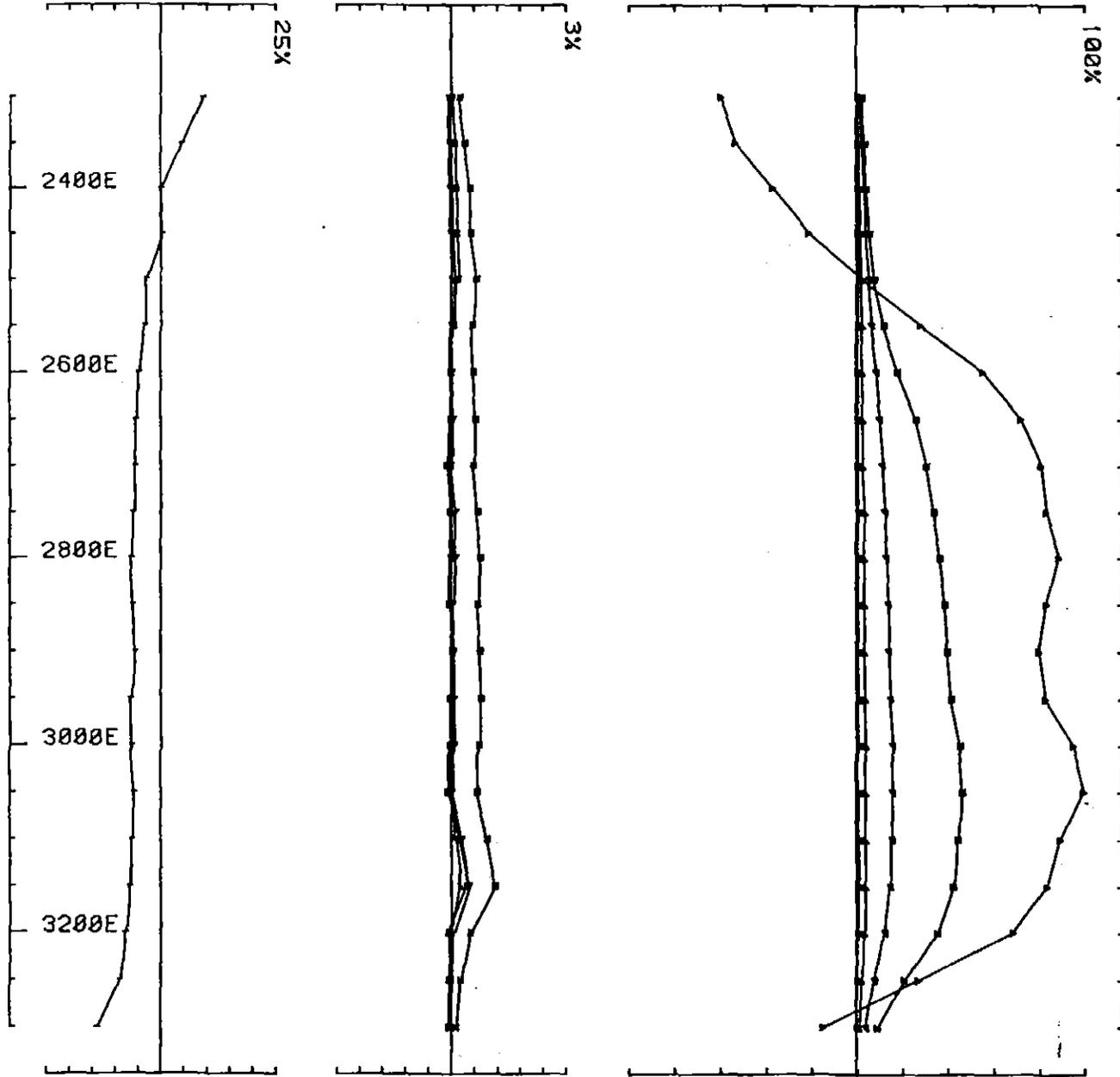
UTEM SURVEY at GARFIELD PROJECT for BHP - UTAH MINERALS

conducted by RL, PL, ST Job 9056 base freq (hz) 26.230

loop no 0003 line 3800N component Hz secondary field Ch 1 contin. - none



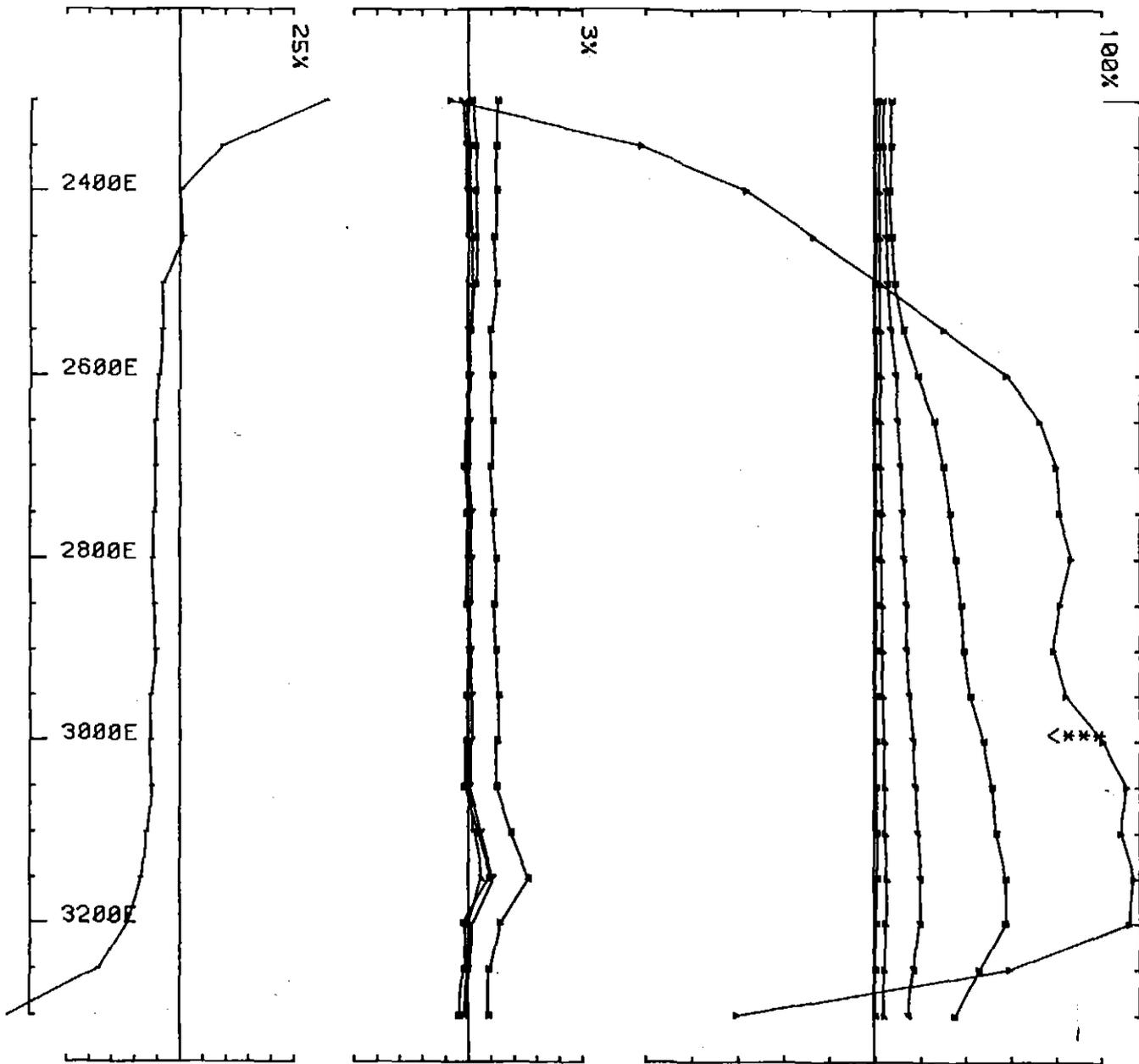
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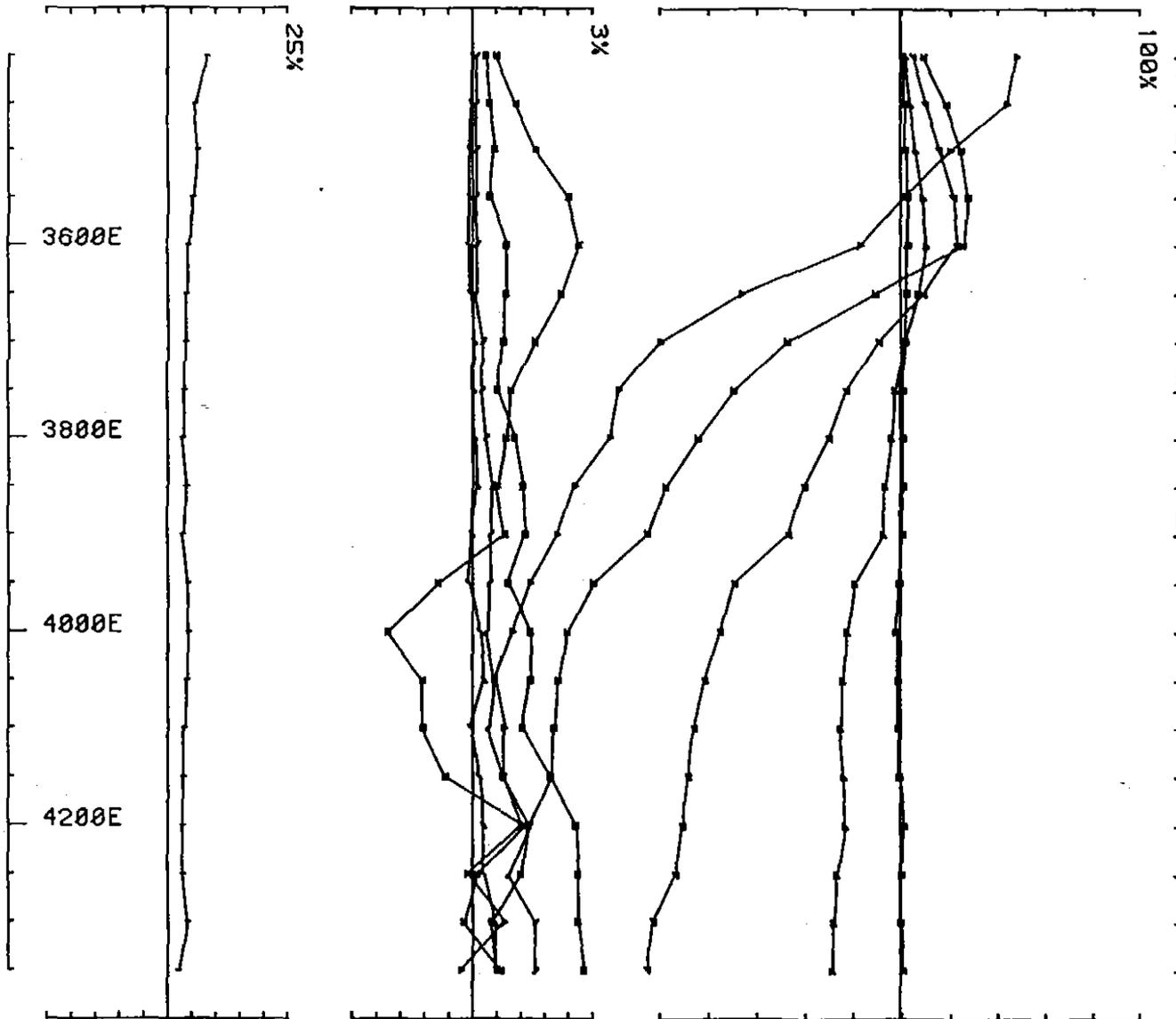
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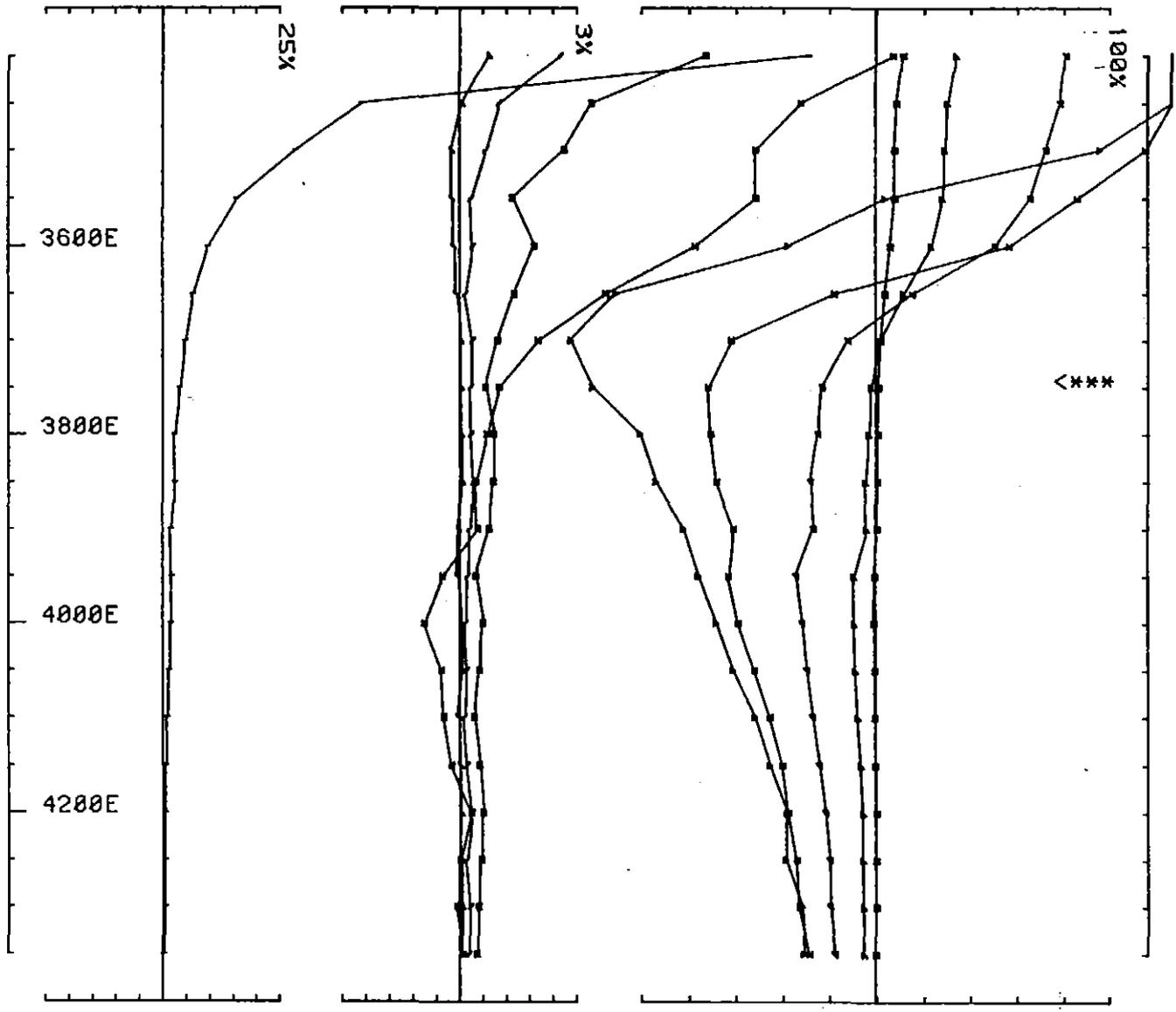
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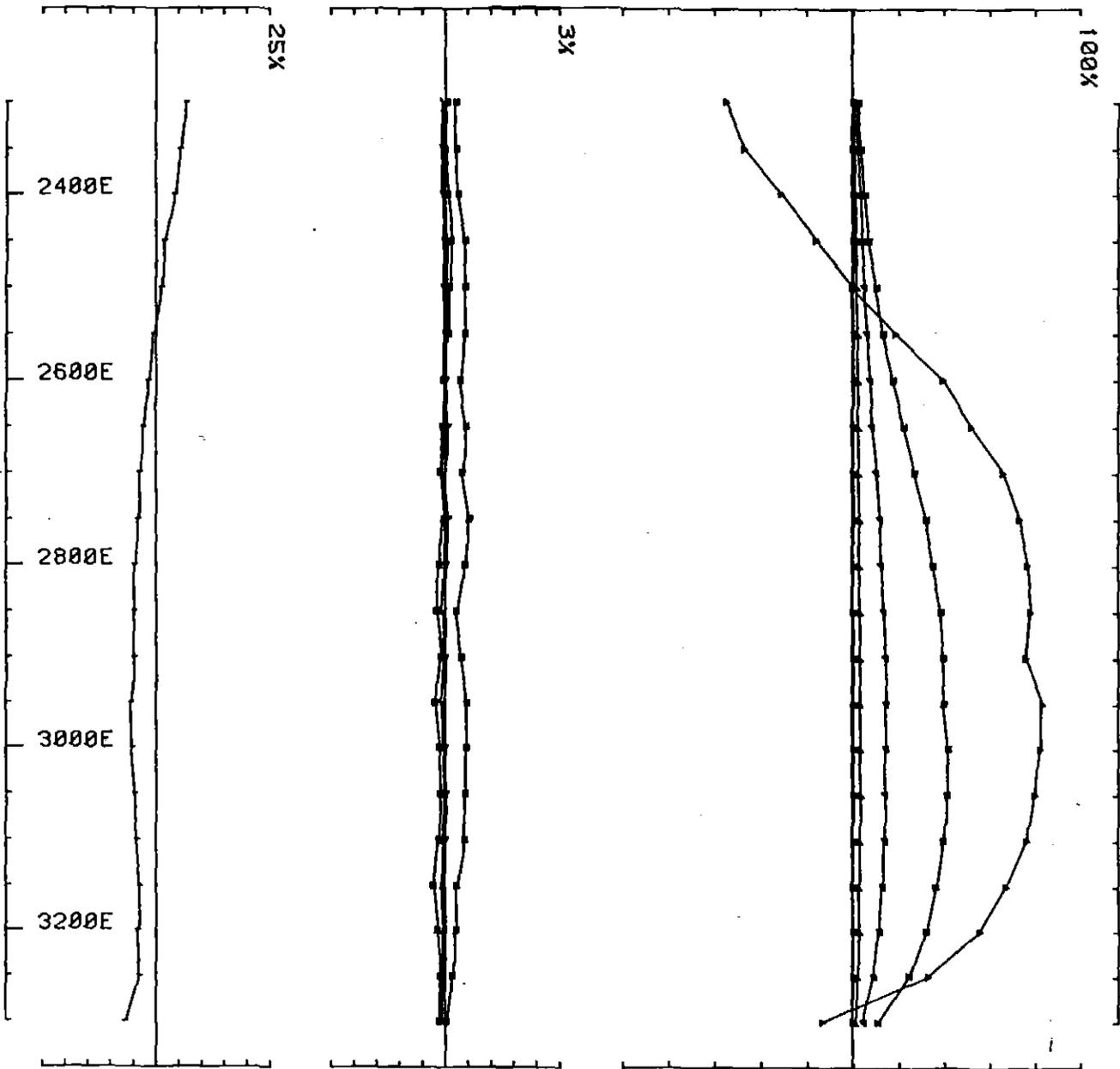
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conducted by RL, PL, ST job 9056 base freq (hz) 26.230
loop no 0003 line 3600N component Hz secondary field Ch 1 point norm.



UTEM SURVEY at GARFIELD PROJECT for BHP - UTAH MINERALS
conducted by RL, PL, ST job 9056 base freq (hz) 26.230
loop no 0003 line 3600N component Hz secondary field Ch 1 contin. norm.



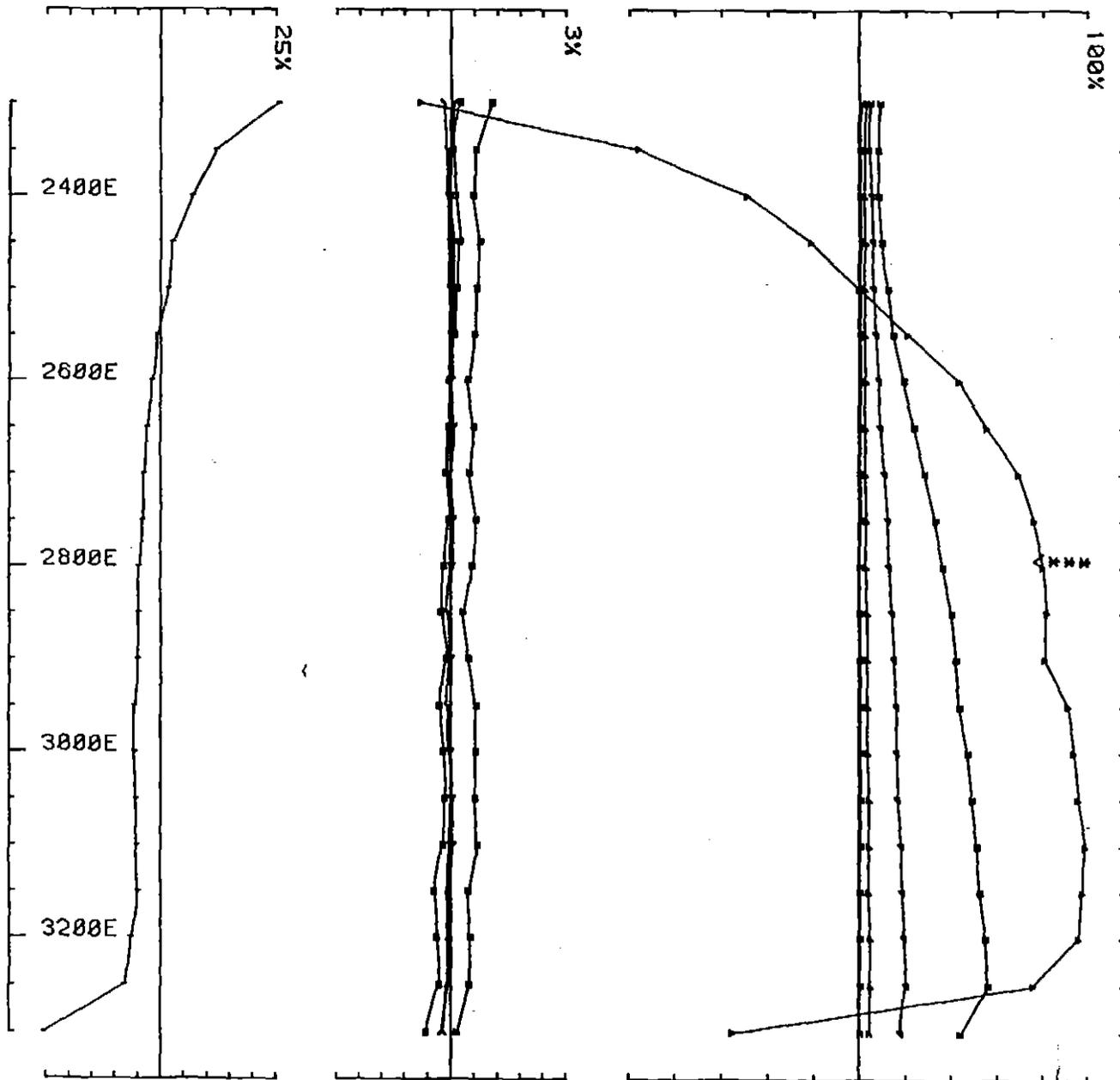
UTEM SURVEY at GARFIELD PROJECT for BHP - UTAH MINERALS
conducted by RL, PL, ST job 9056 base freq (hz) 26.230
loop no 0003 line 3600N component Hz secondary field Ch 1 point norm.



UTEM SURVEY at GARFIELD PROJECT for BHP - UTAH MINERALS

conducted by RL, PL, ST Job 9056 base freq (hz) 26.230

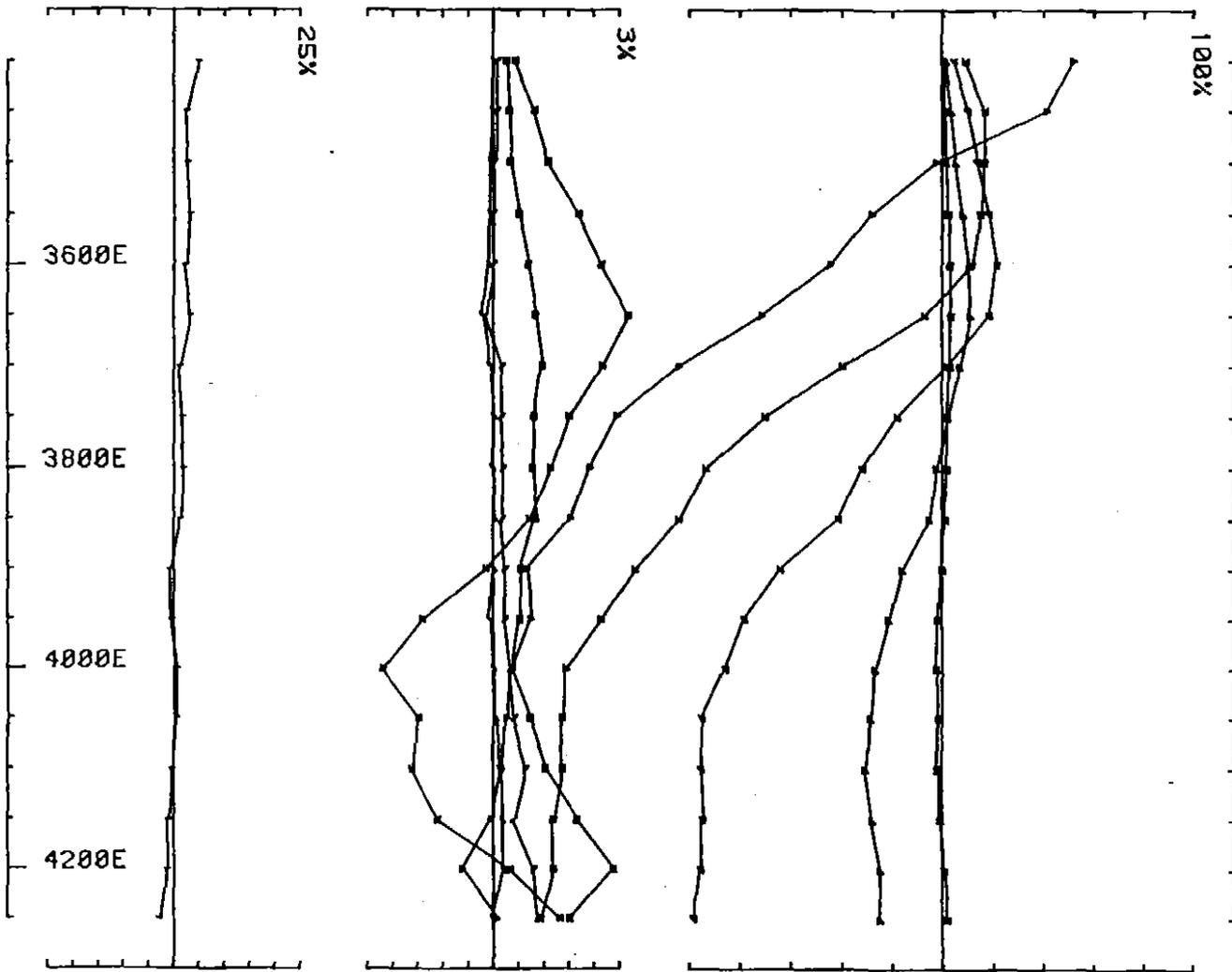
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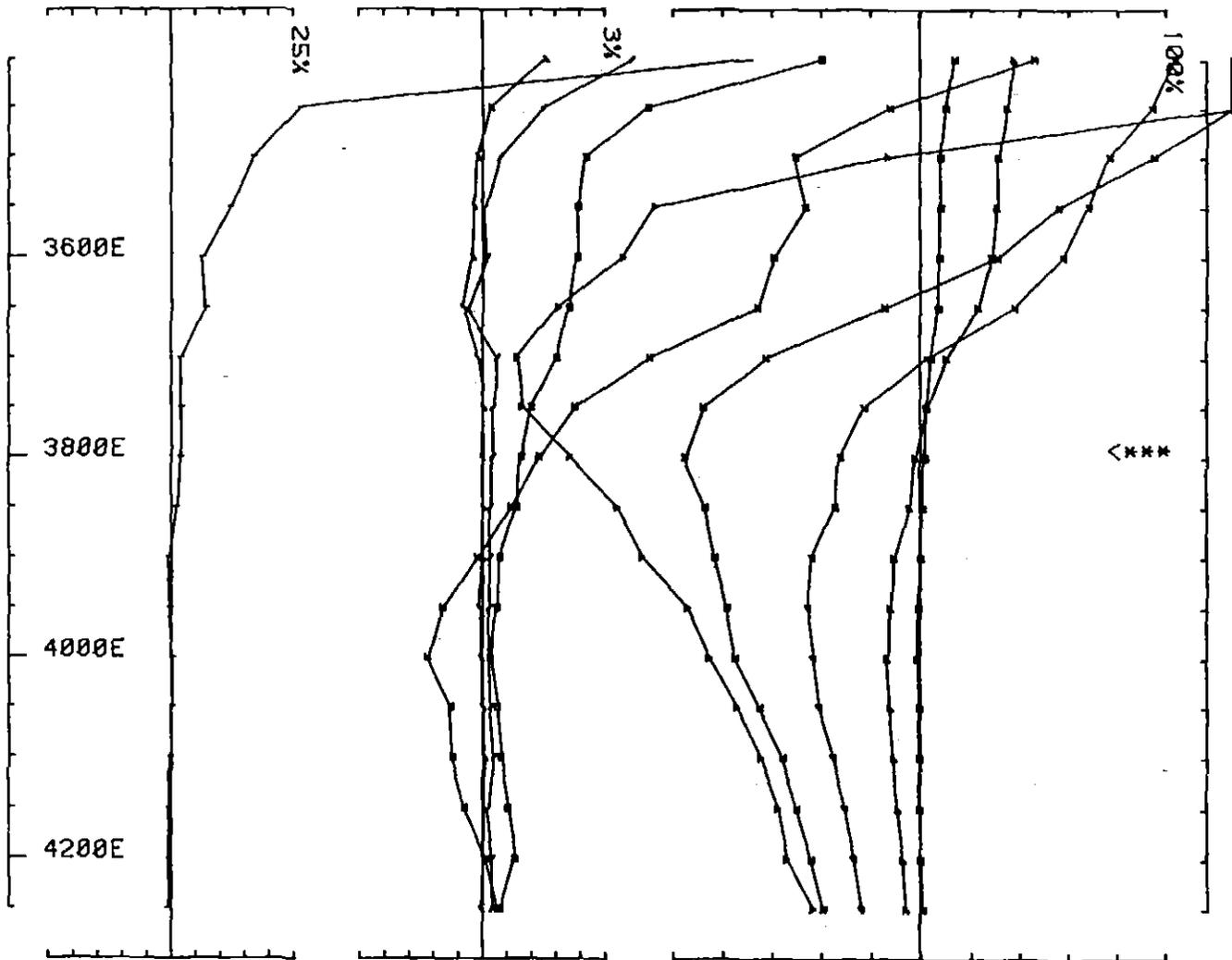
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conducted by RL, PL, ST Job 9056 base freq (hz) 26.230

loop no 0003 line 3400N component Hz secondary field Ch 1 point norm.



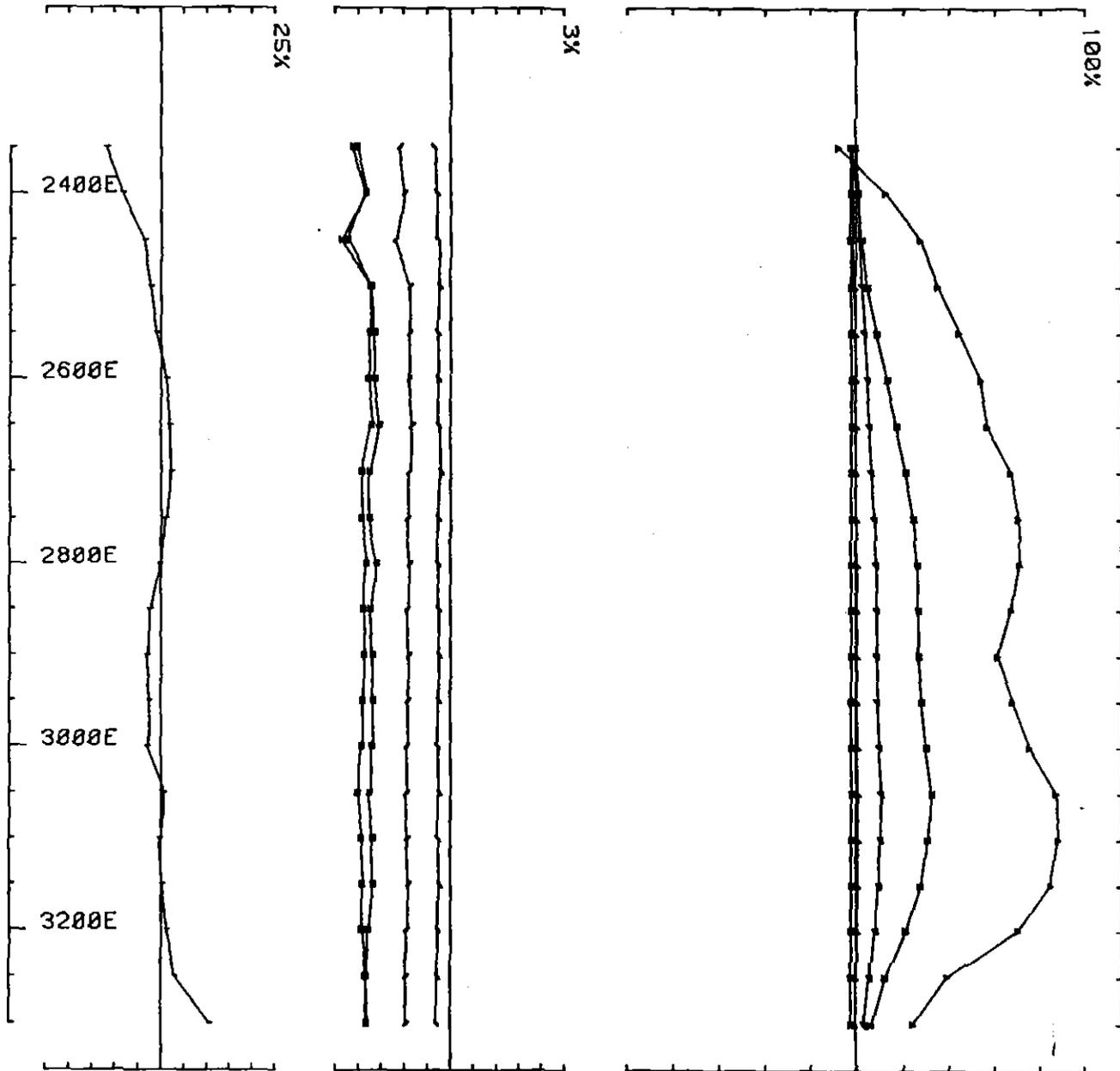
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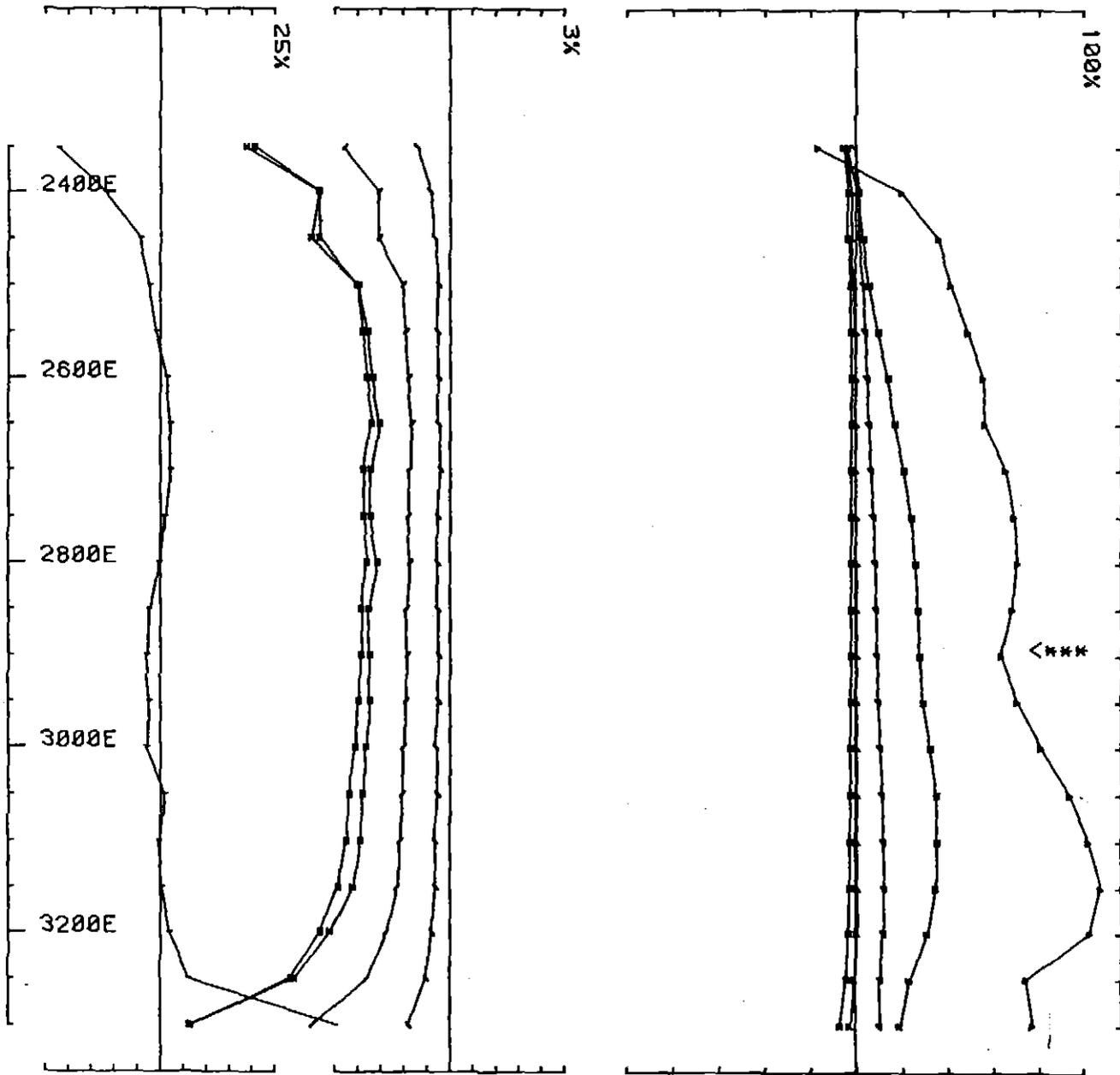
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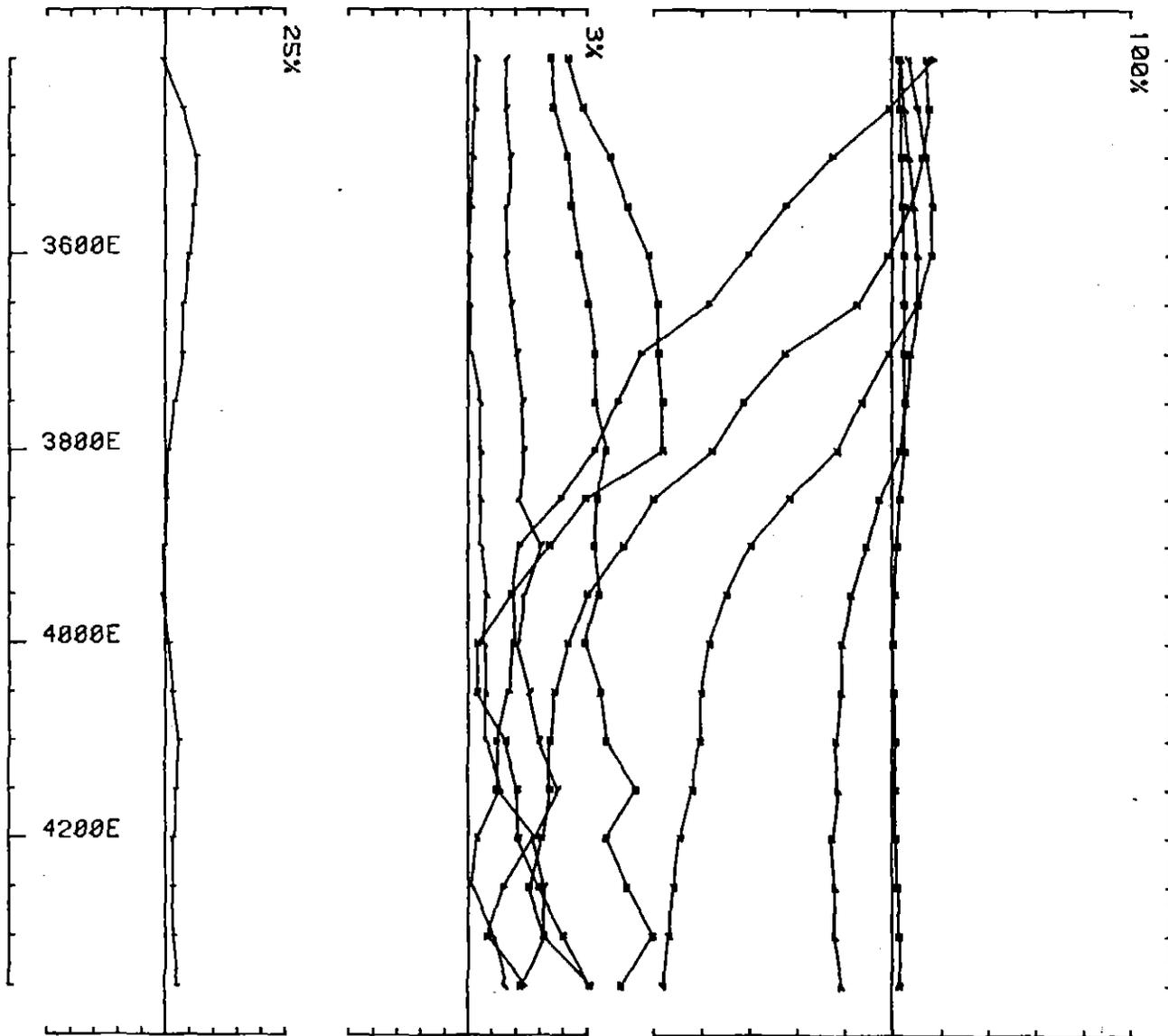
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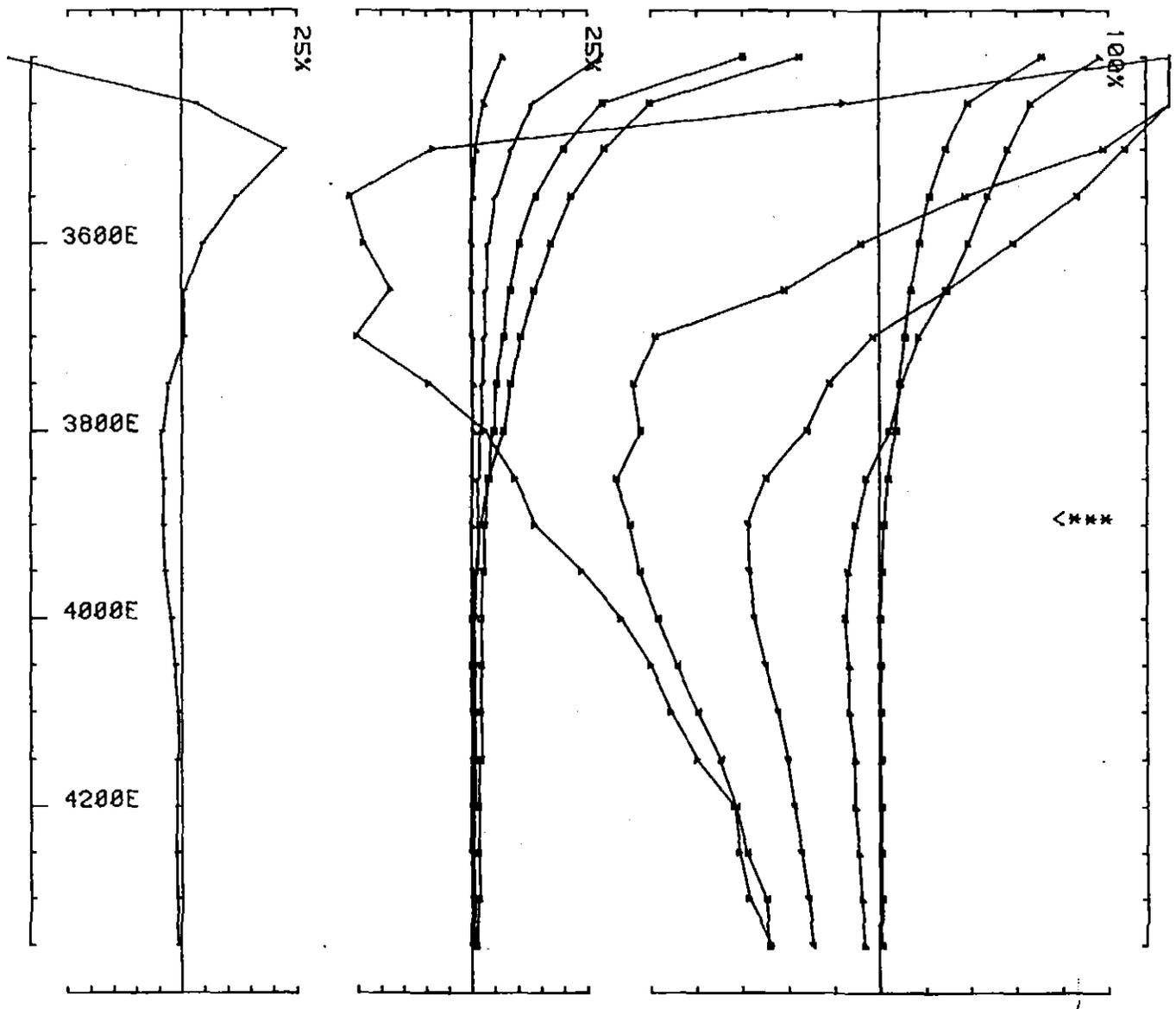
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UTEM SURVEY at GARFIELD PROJECT for BHP - UTAH MINERALS
conducted by RL, PL, ST Job 9056 base freq (hz) 26.230
loop no 0003 line 3200N component Hz secondary field Ch 1 point norm.



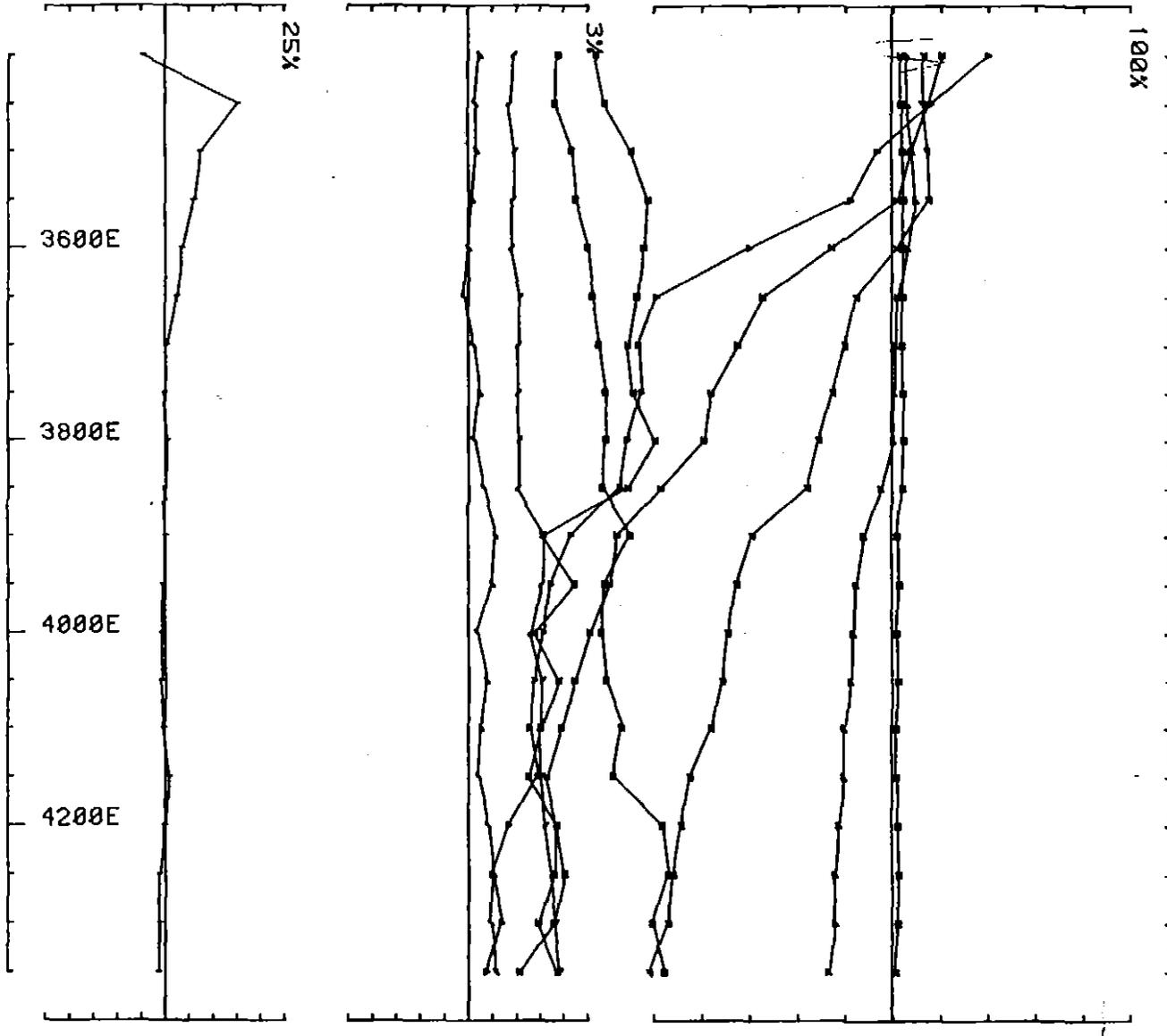
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conducted by RL, PL, ST job 9056 base freq (hz) 26.230
loop no 0003 line 3200N component Hz secondary field Ch 1 contin. norm.



UTEM SURVEY of GARFIELD PROJECT for BHP - UTAH MINERALS

conducted by RL, PL, ST Job 9056 base freq (hz) 26.230

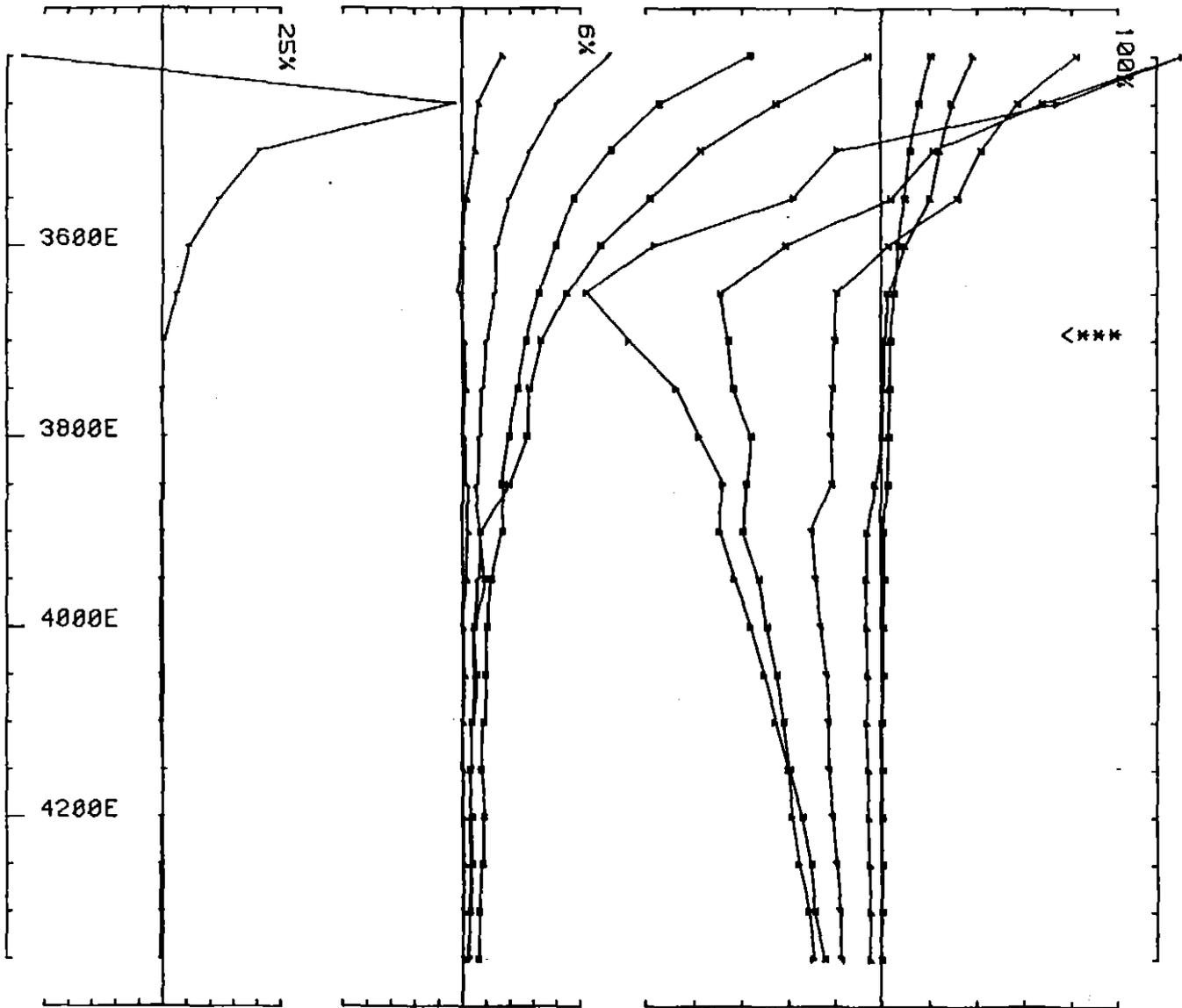
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UTEM SURVEY at GARFIELD PROJECT for BHP - UTAH MINERALS

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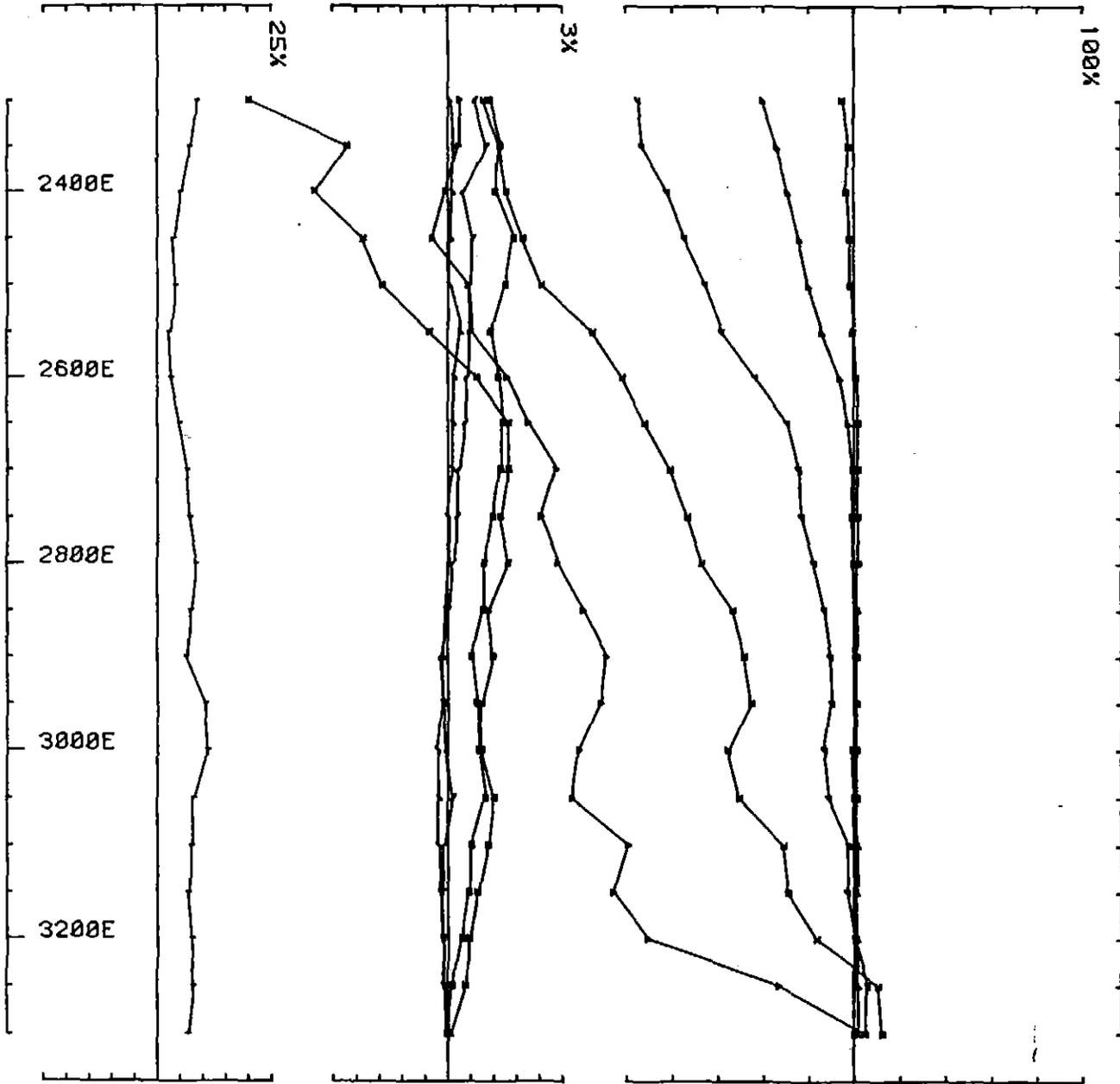
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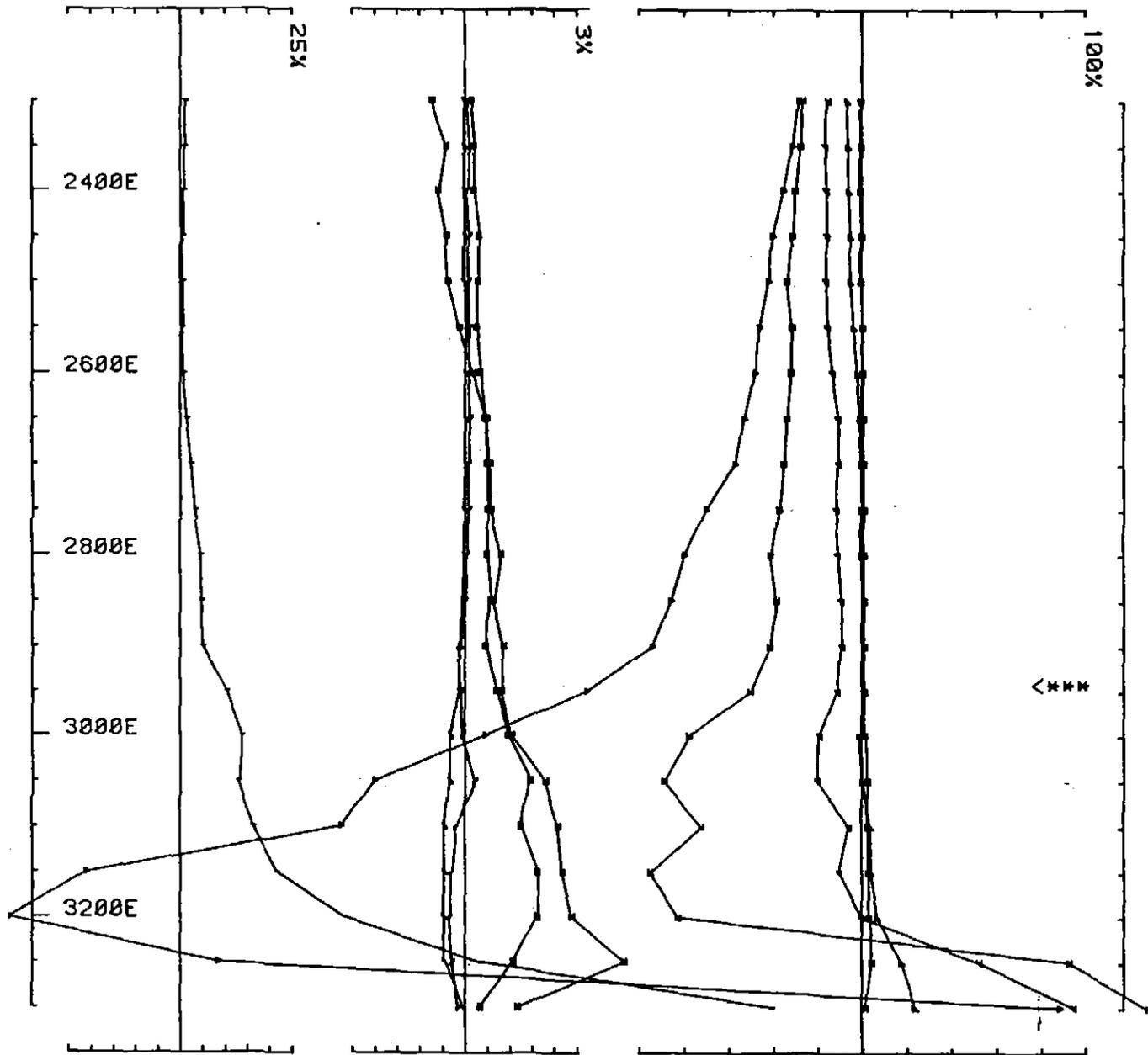
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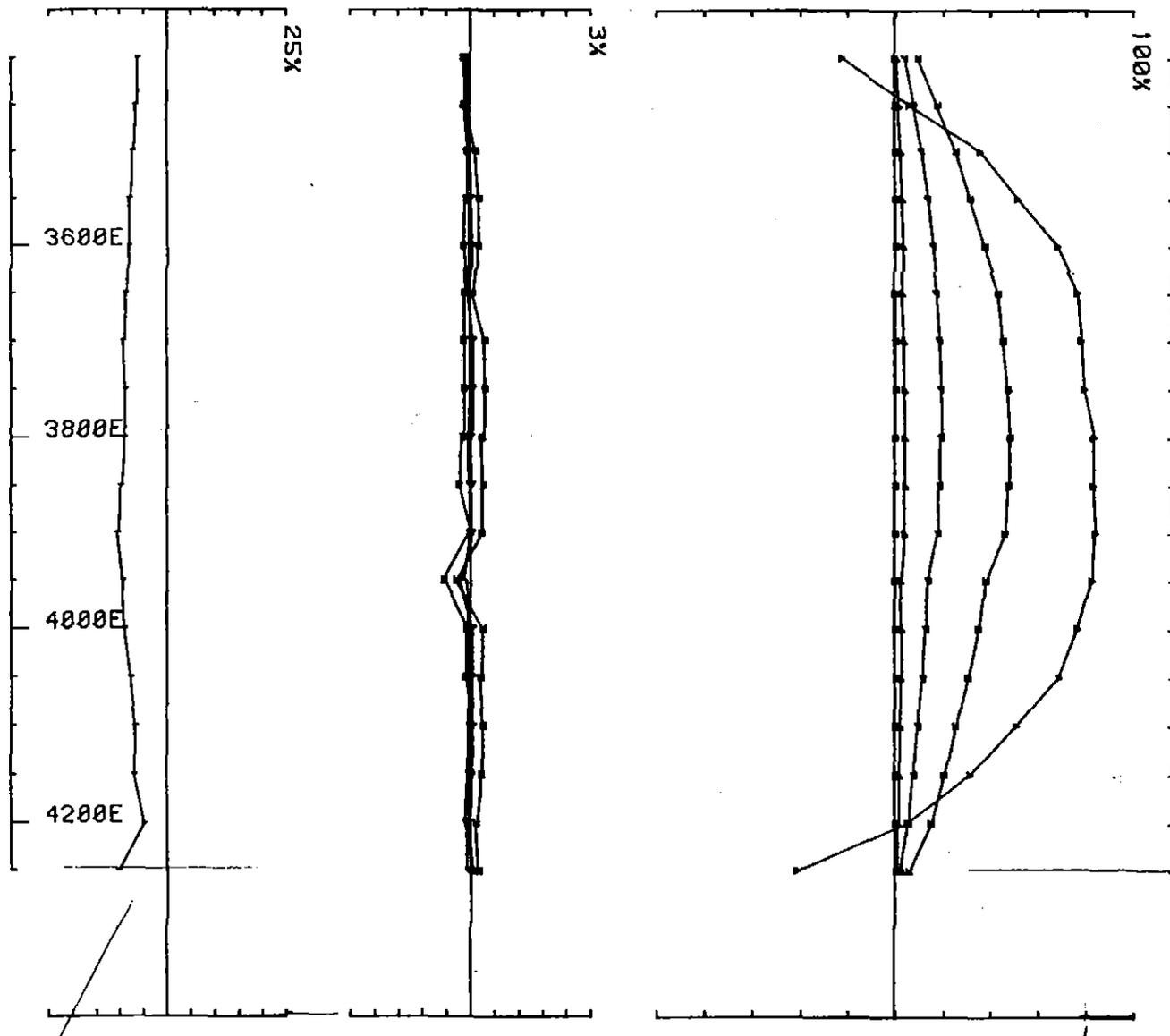
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UTEM SURVEY at GARFIELD PROJECT for BHP-UTAH MINERALS
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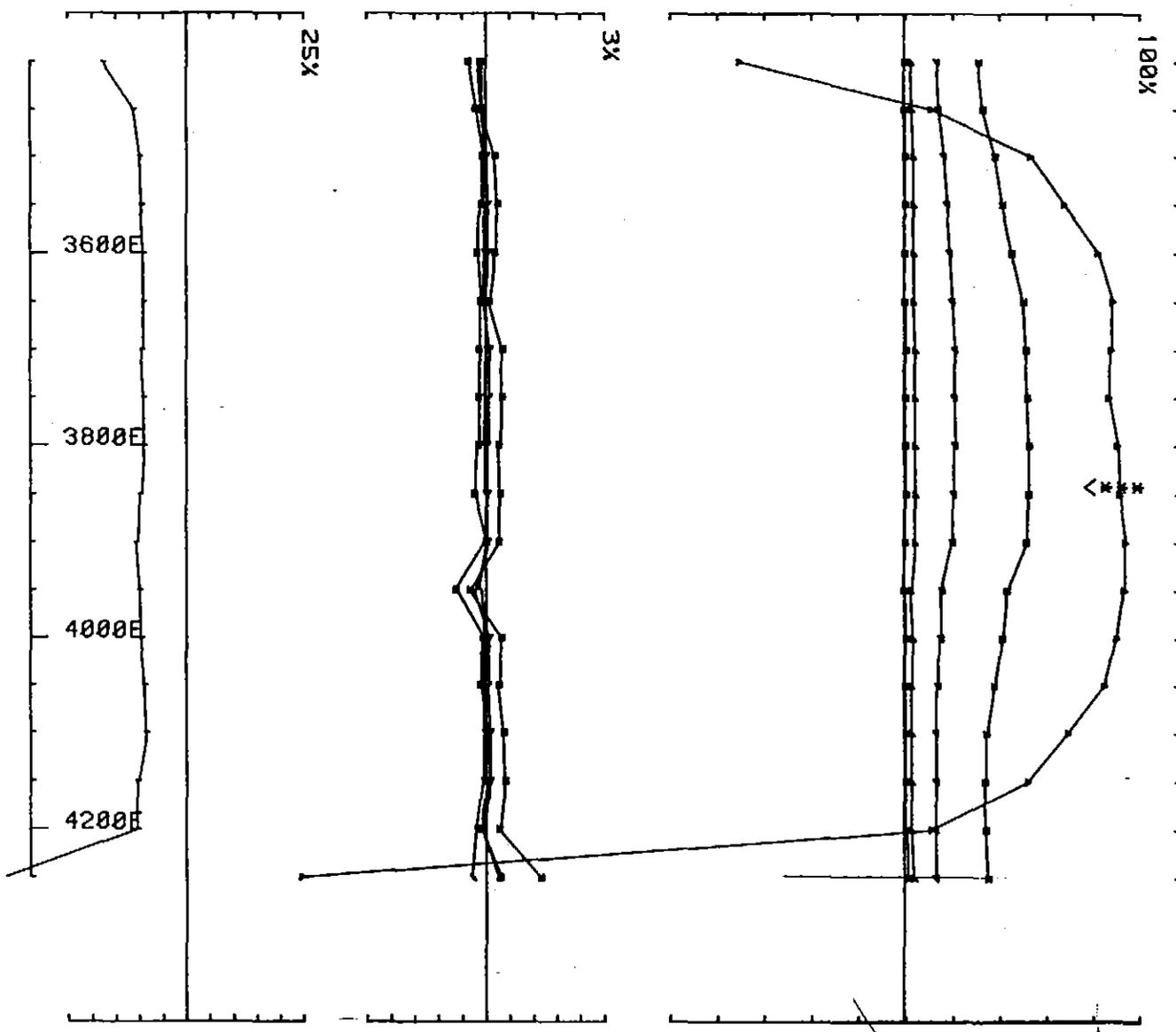
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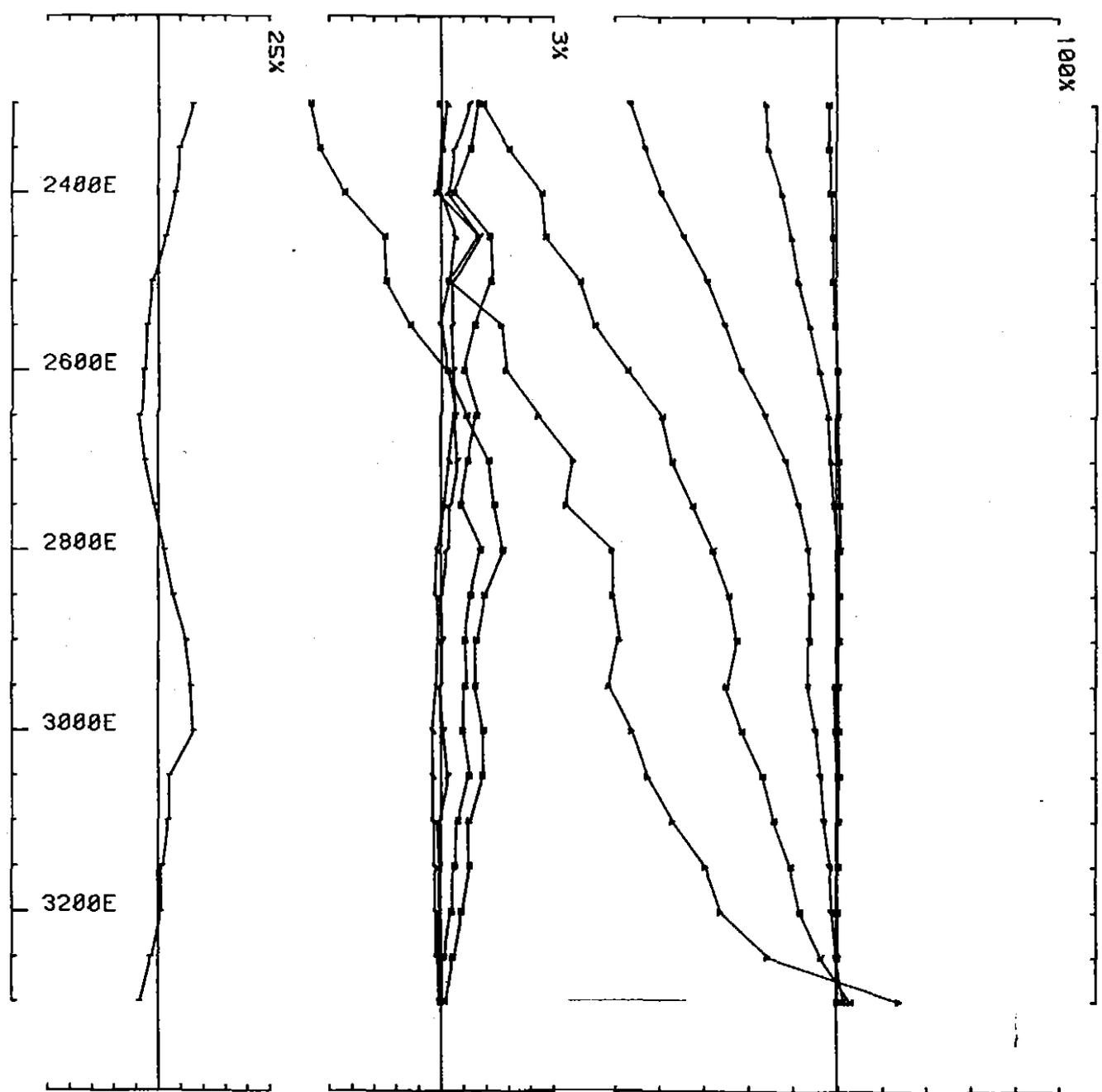
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0072

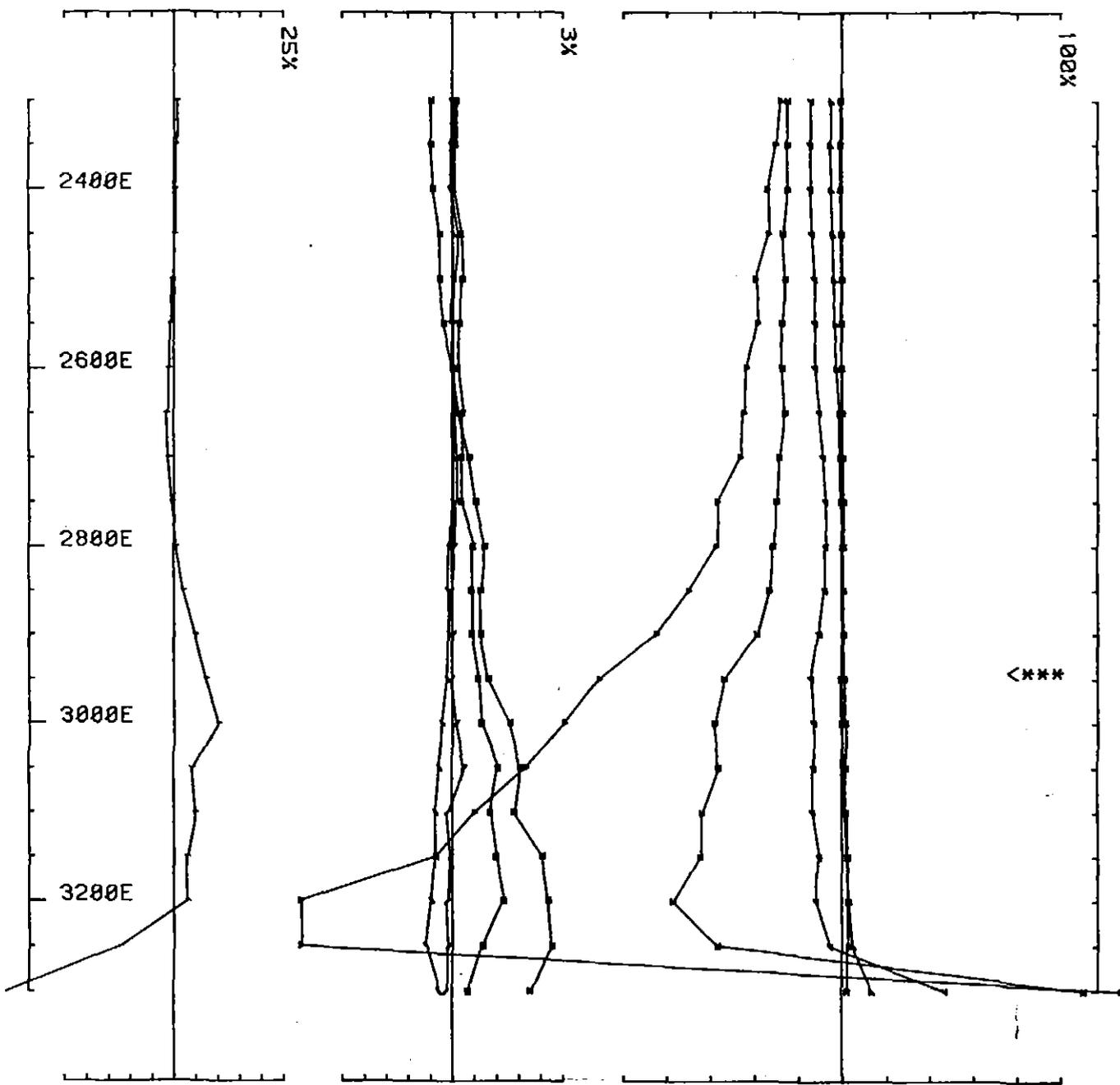
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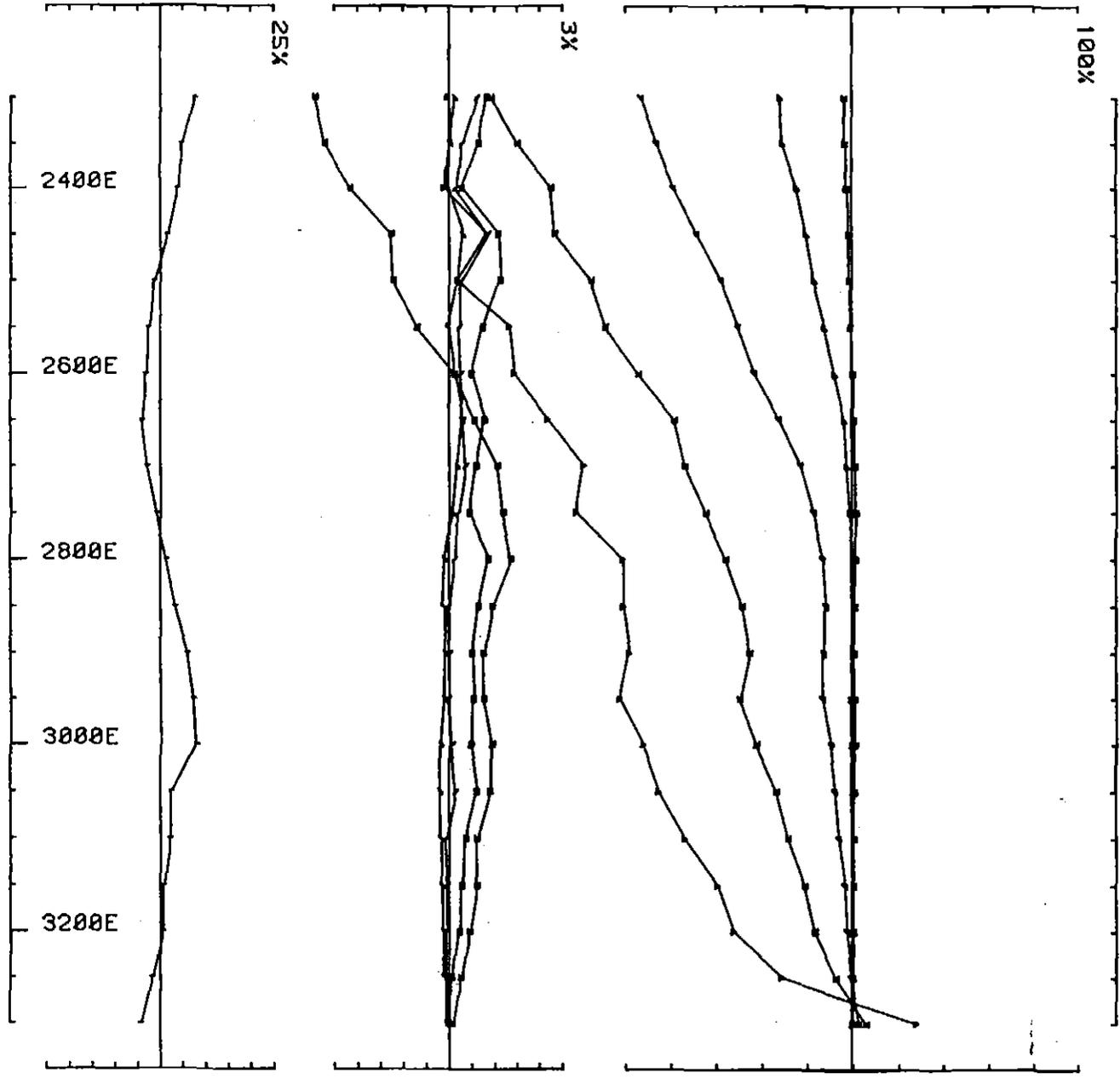
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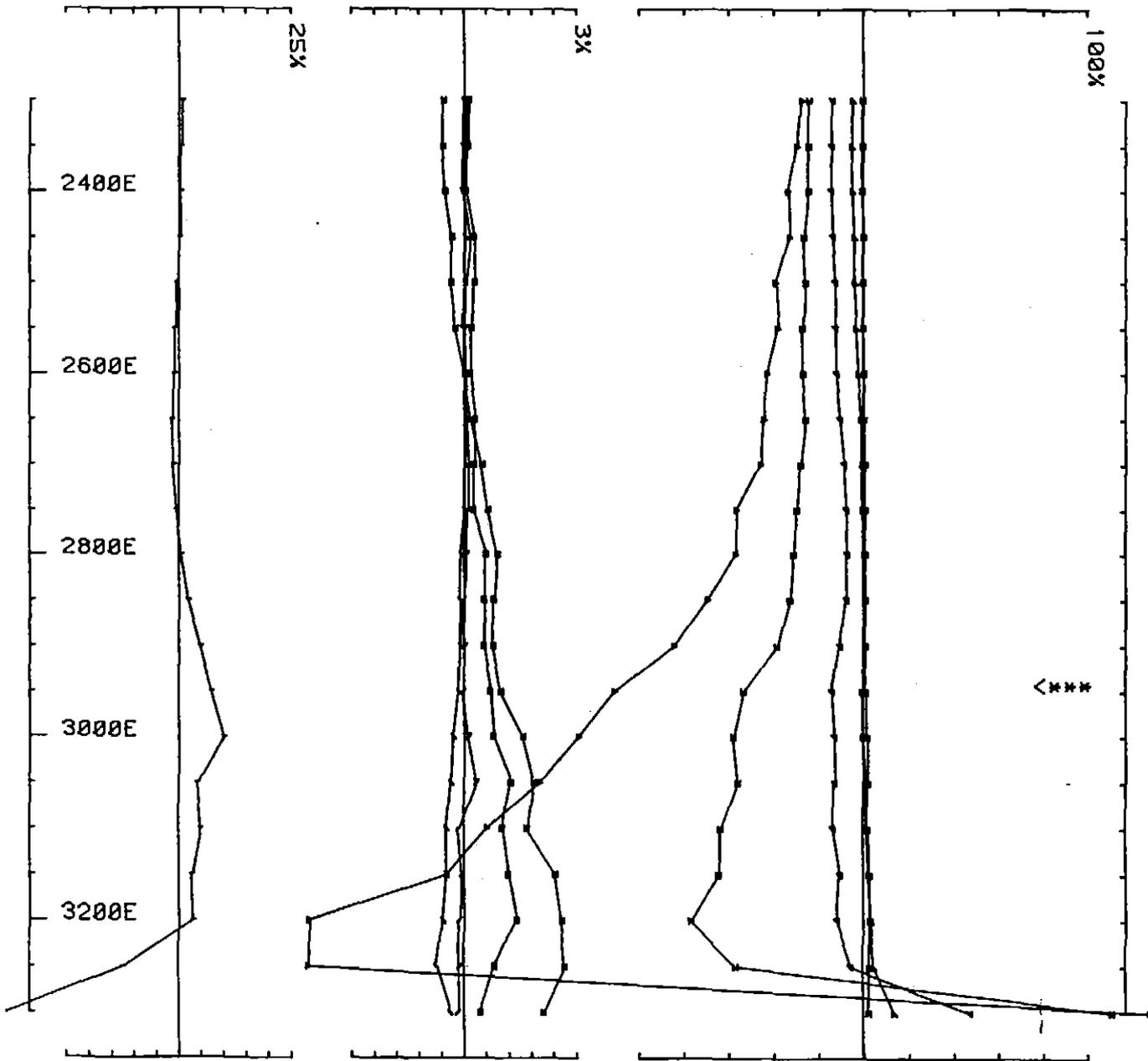
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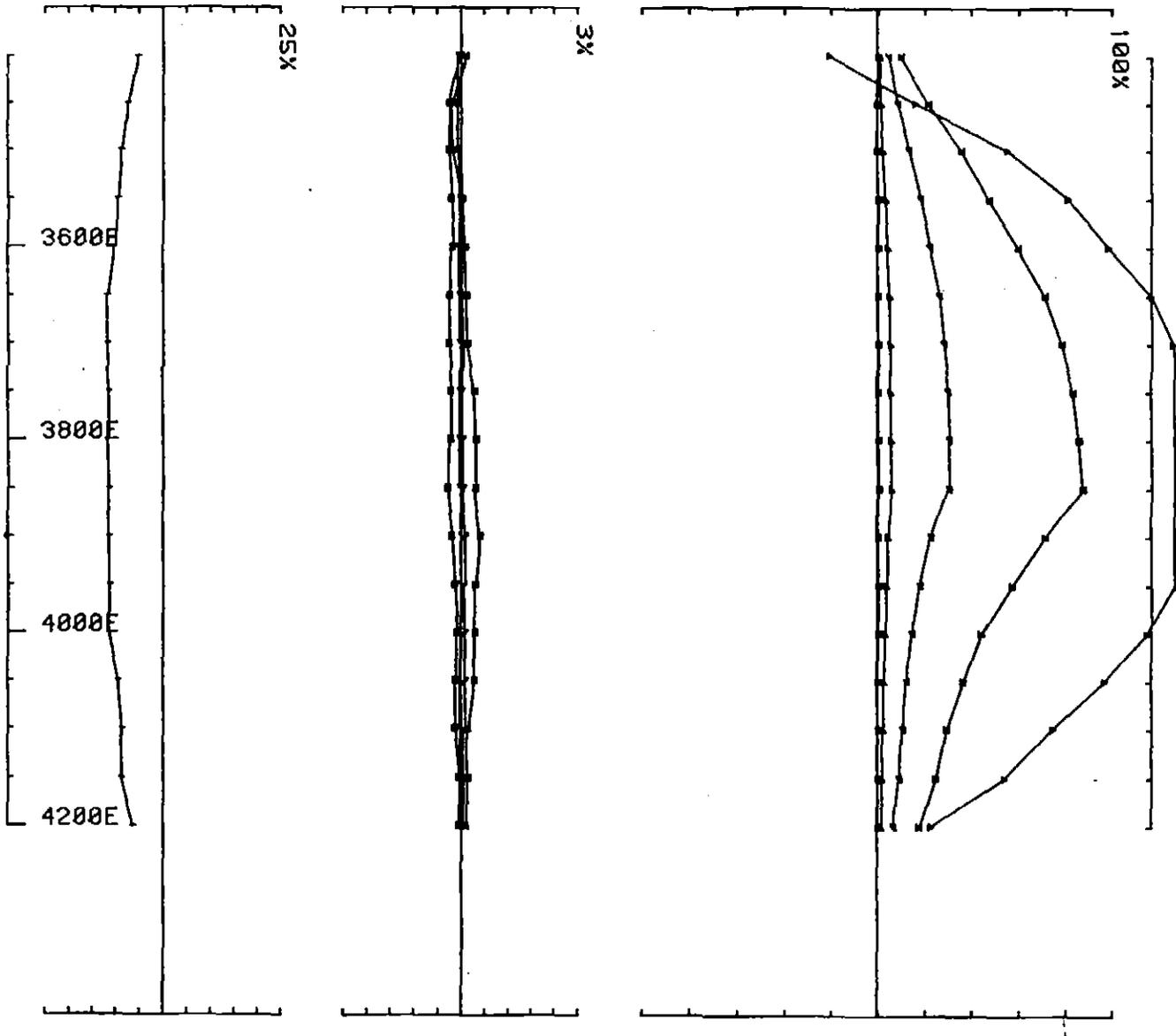
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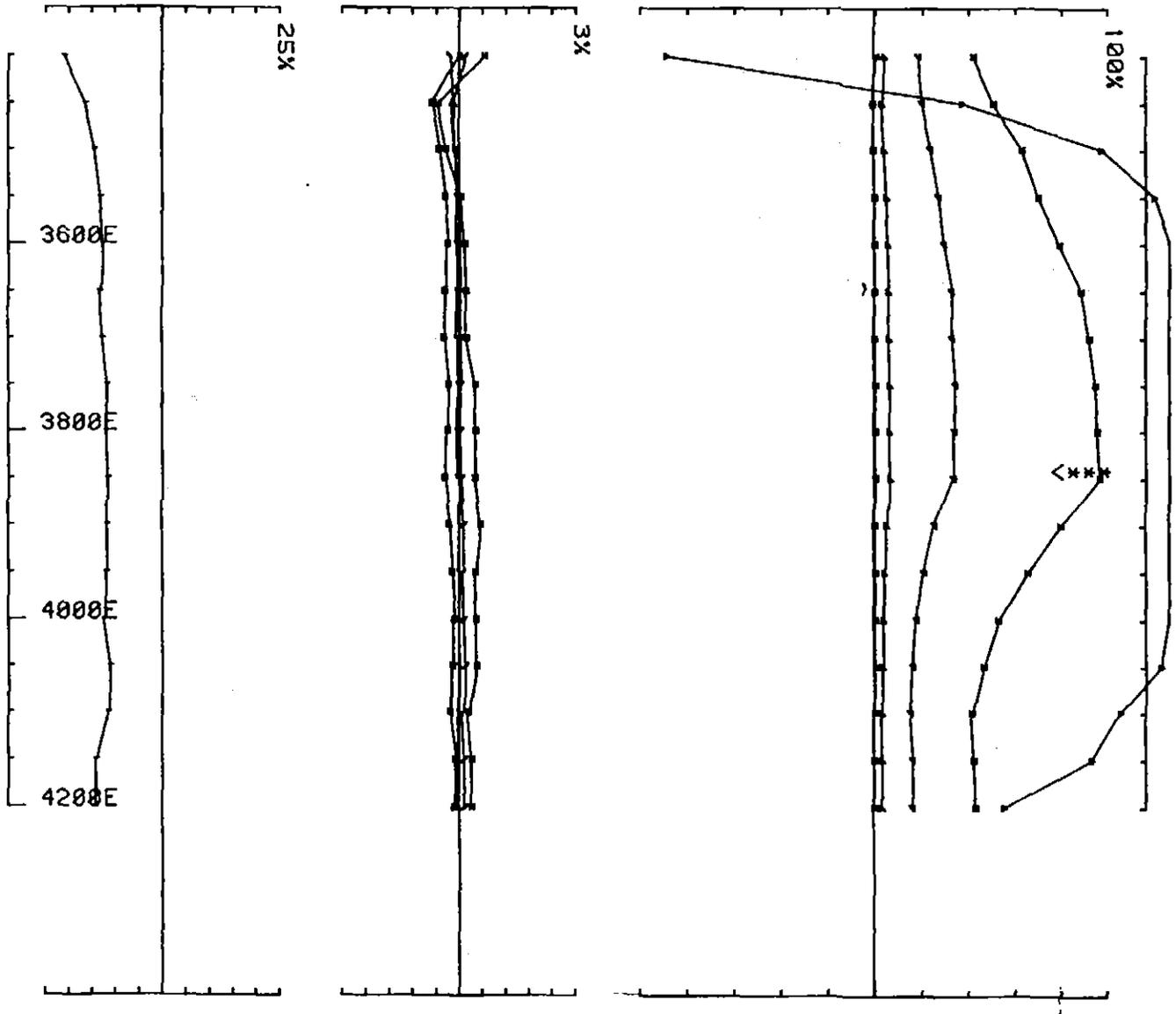
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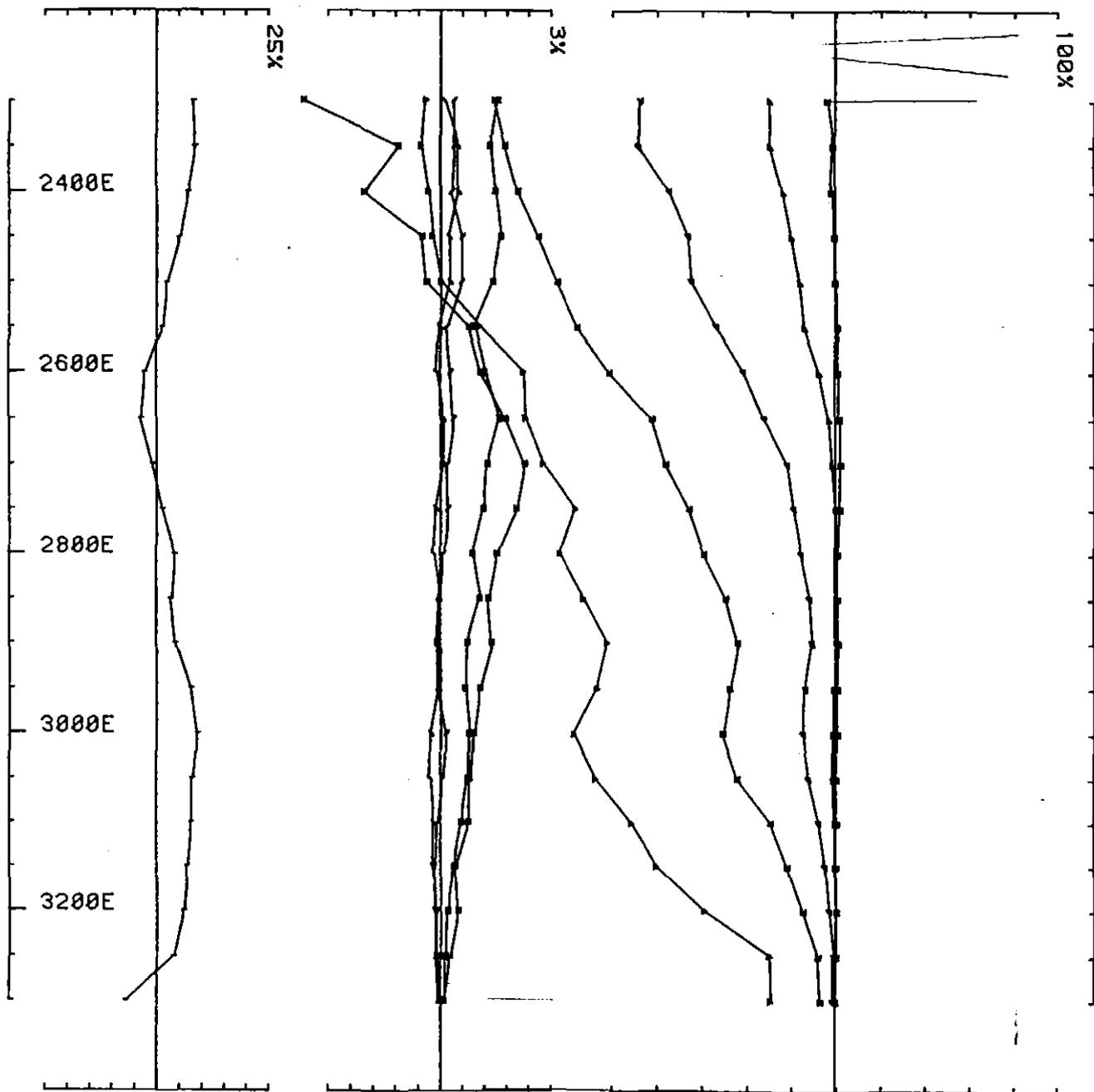
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loop no 0004 line 3400N component Hz secondary field Ch 1 point norm.



UTEM SURVEY at GARFIELD PROJECT for BHP-UTAH MINERALS
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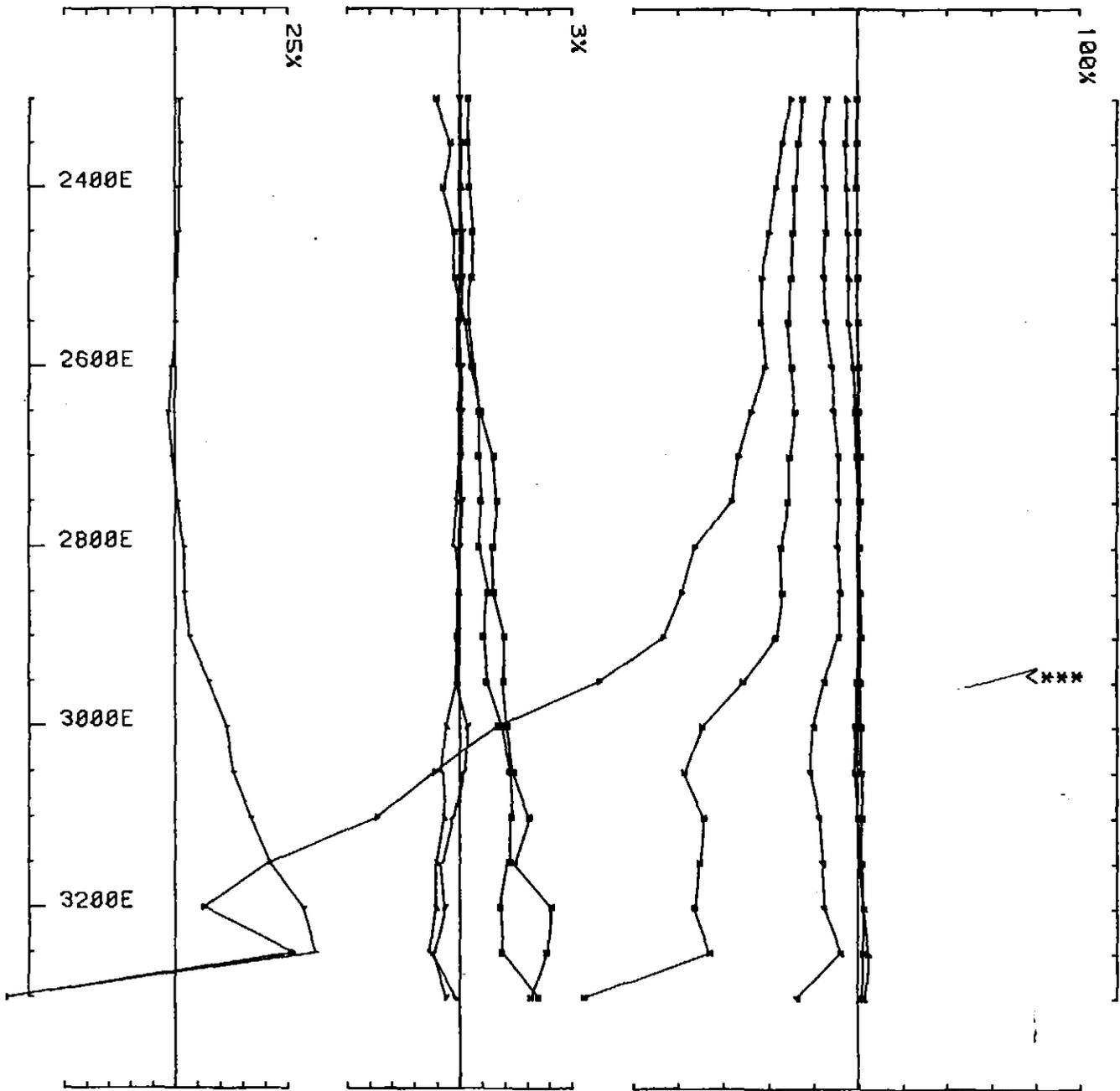
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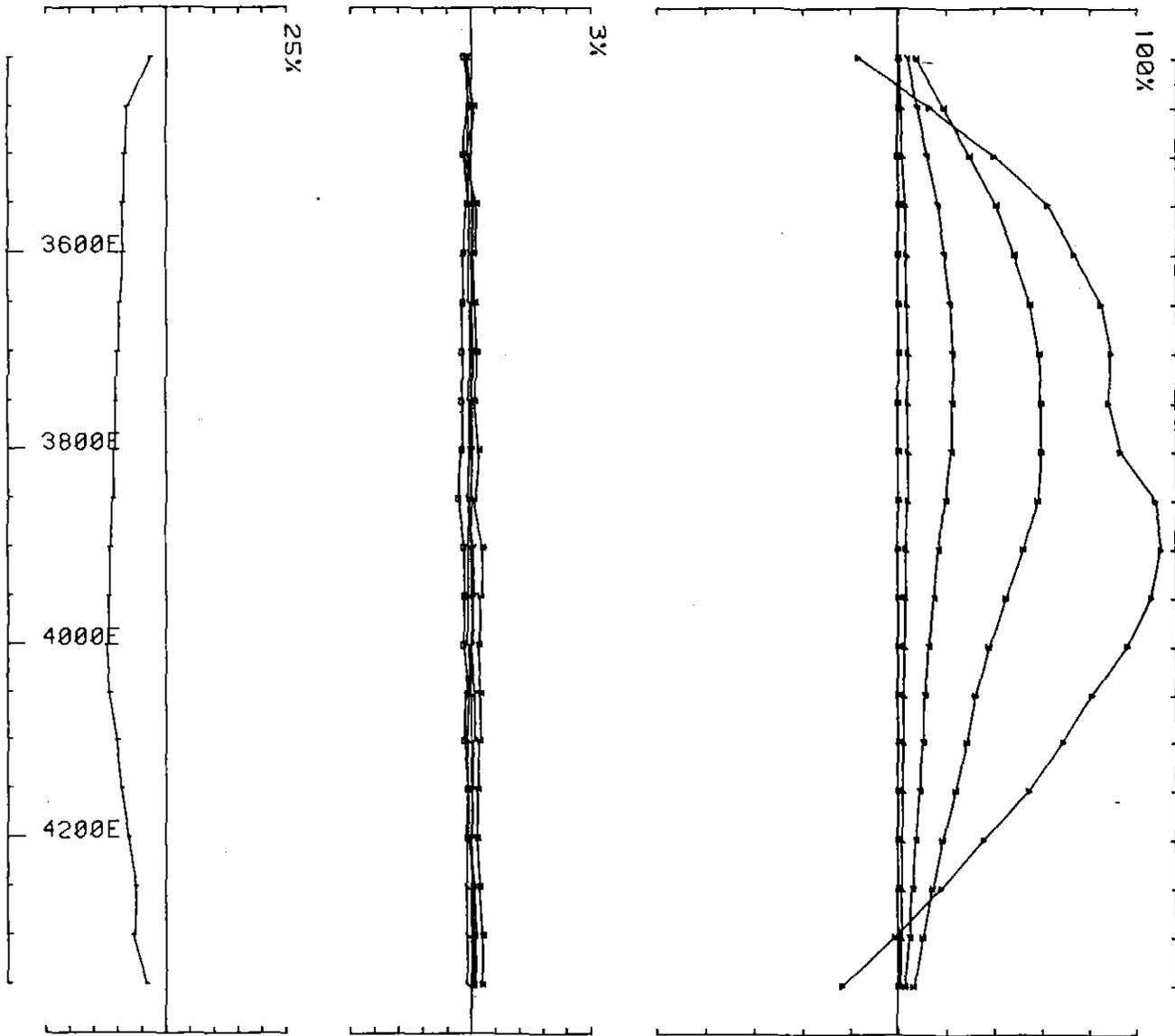
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conducted by ST RL PL Job 9056 base freq (hz) 26.230 MAR 90

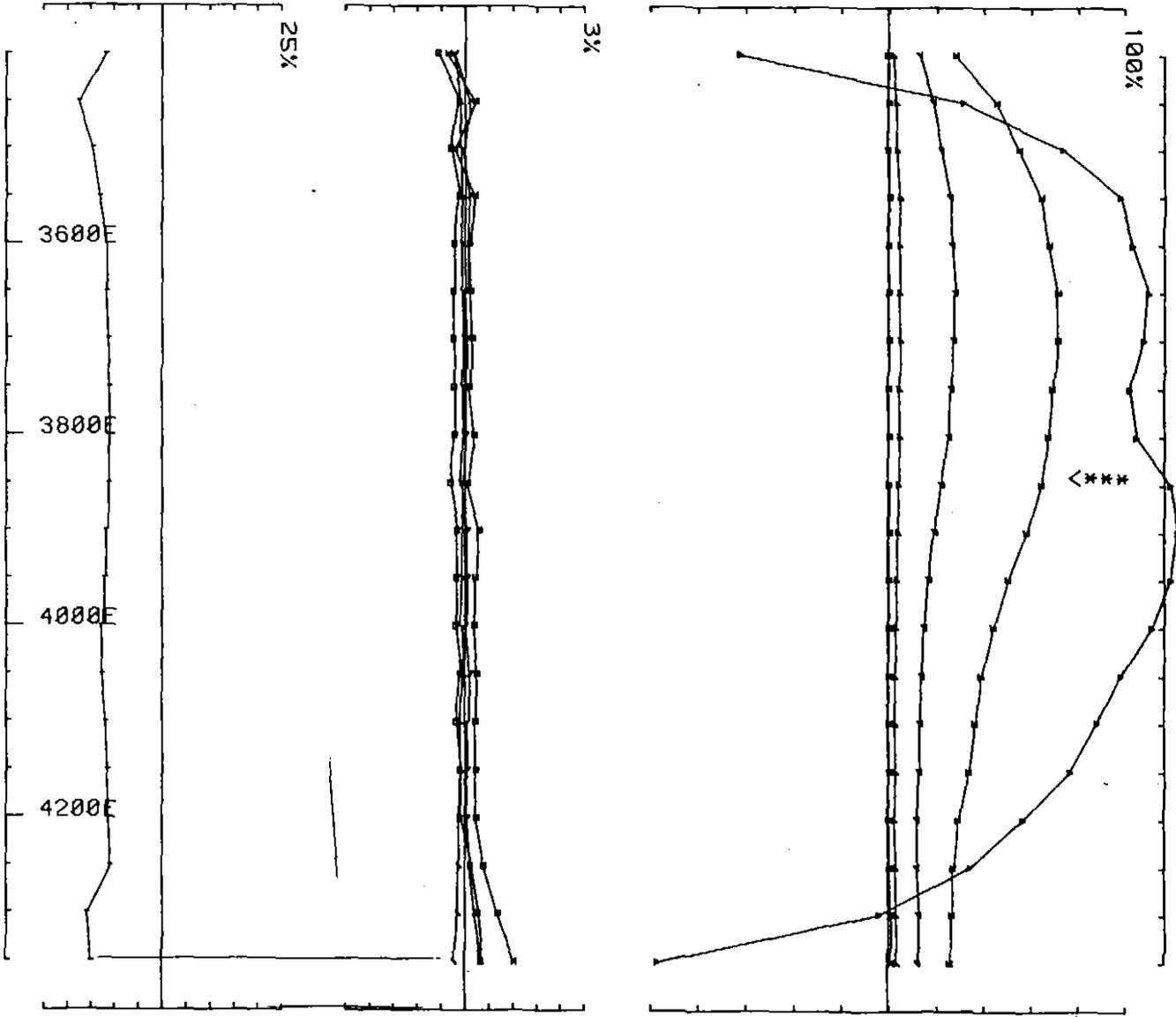
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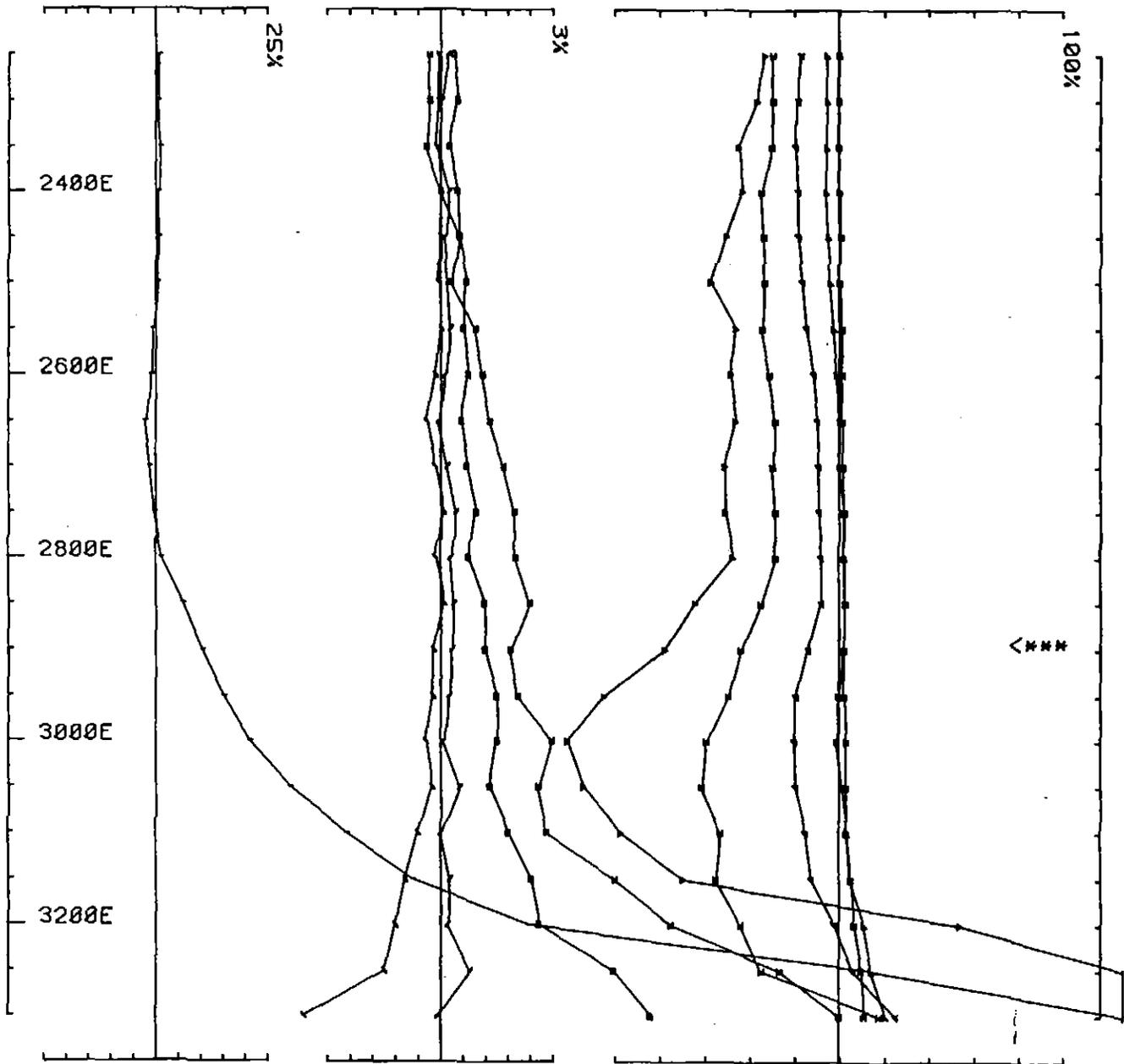
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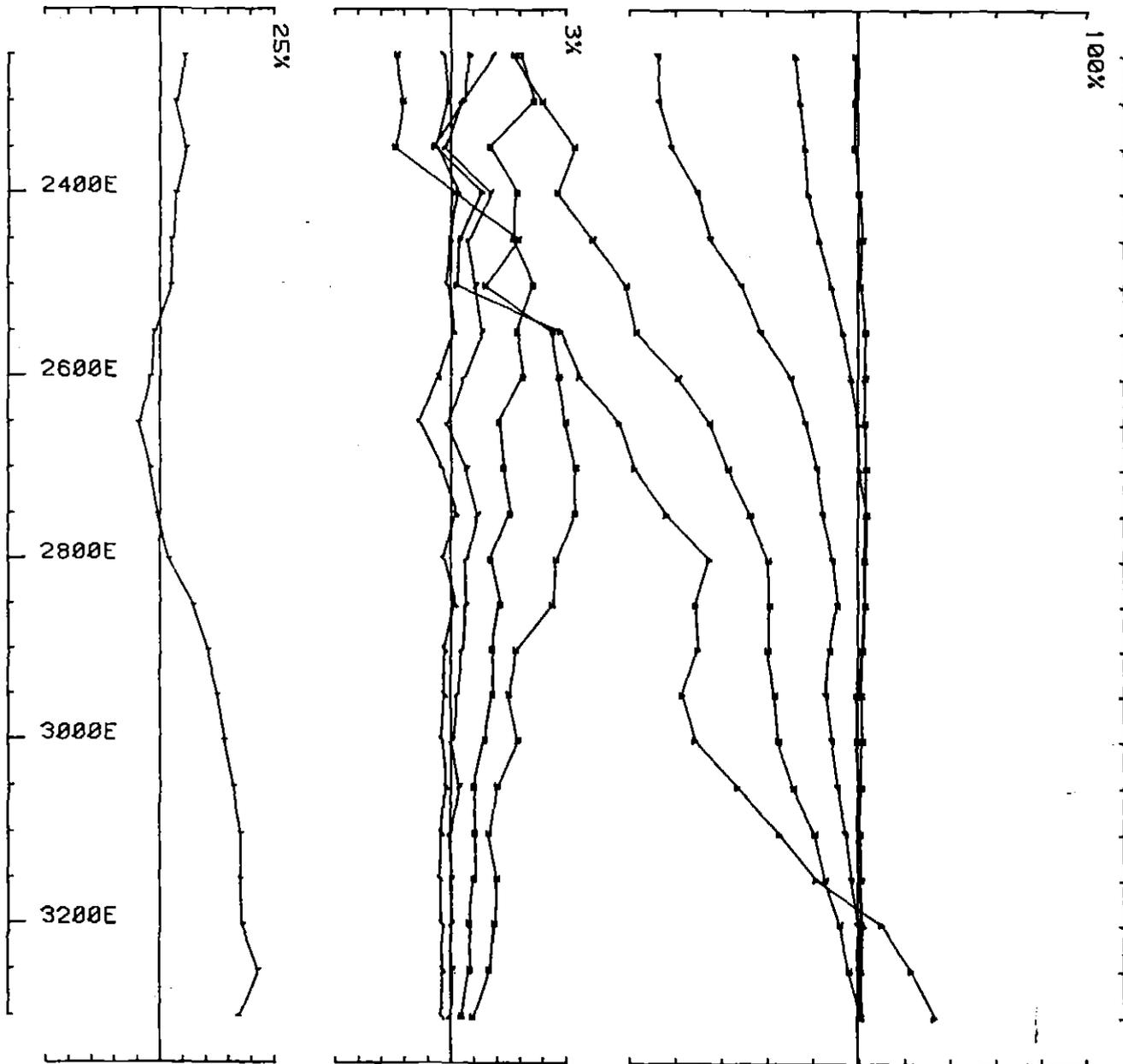
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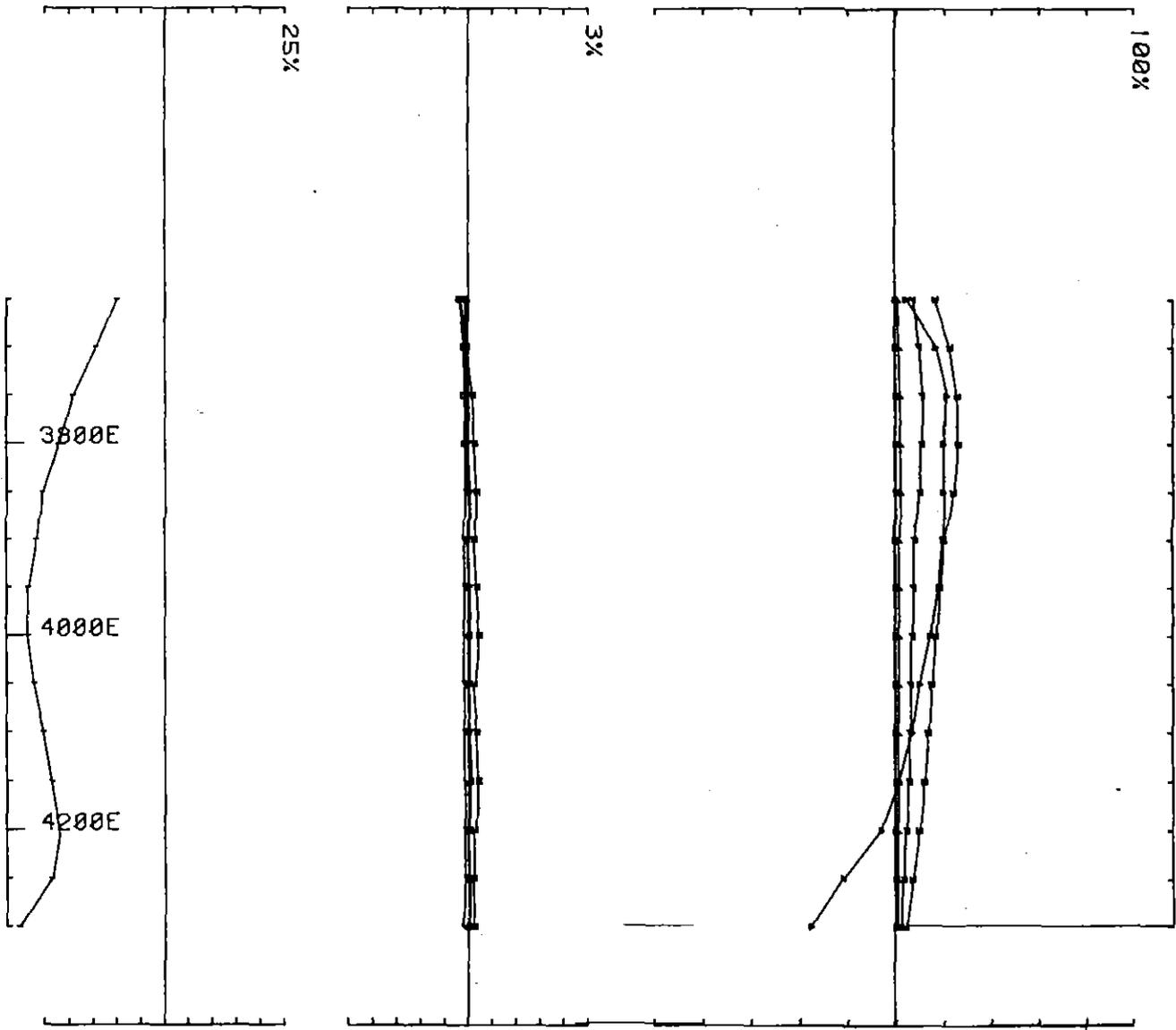
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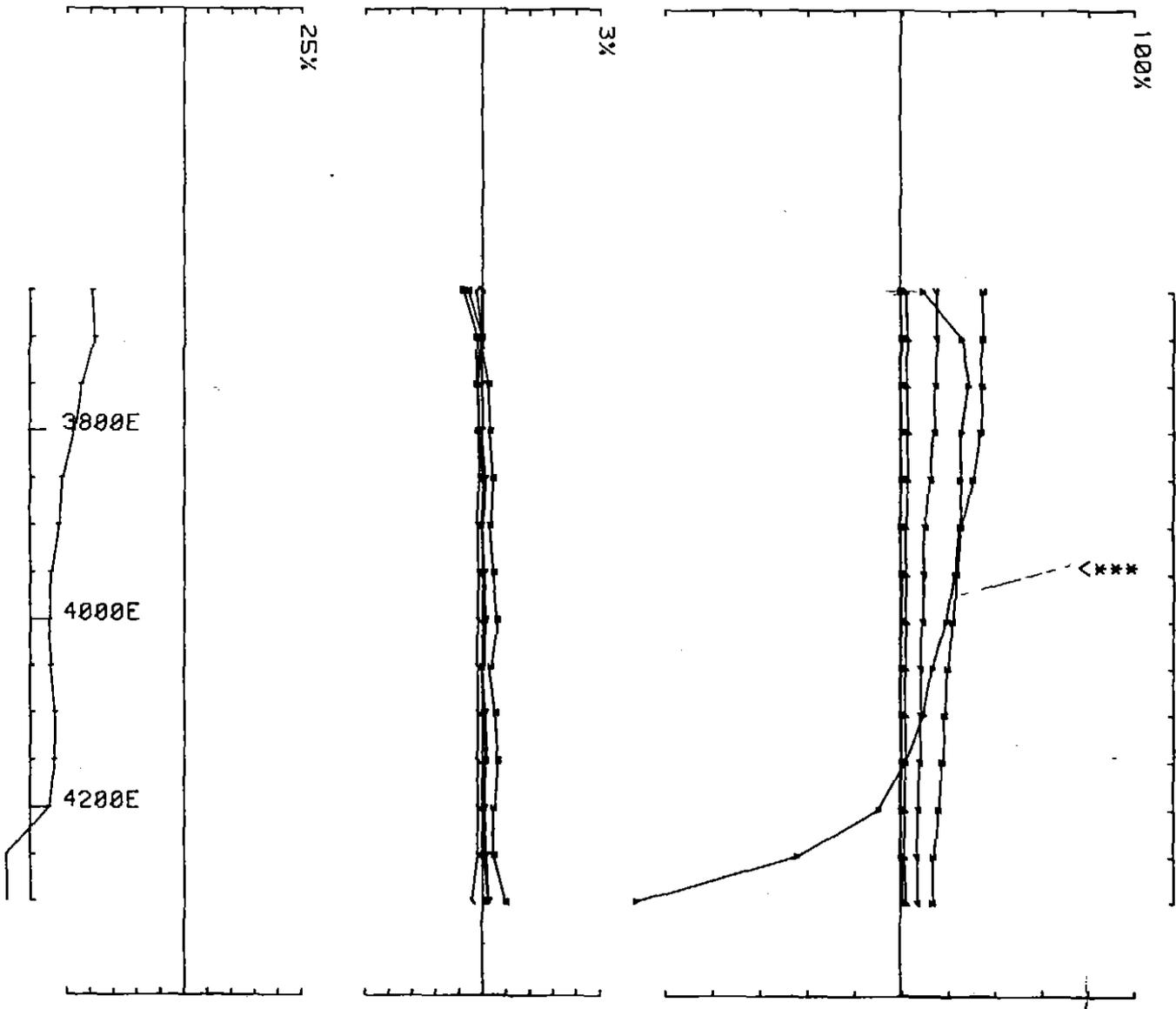
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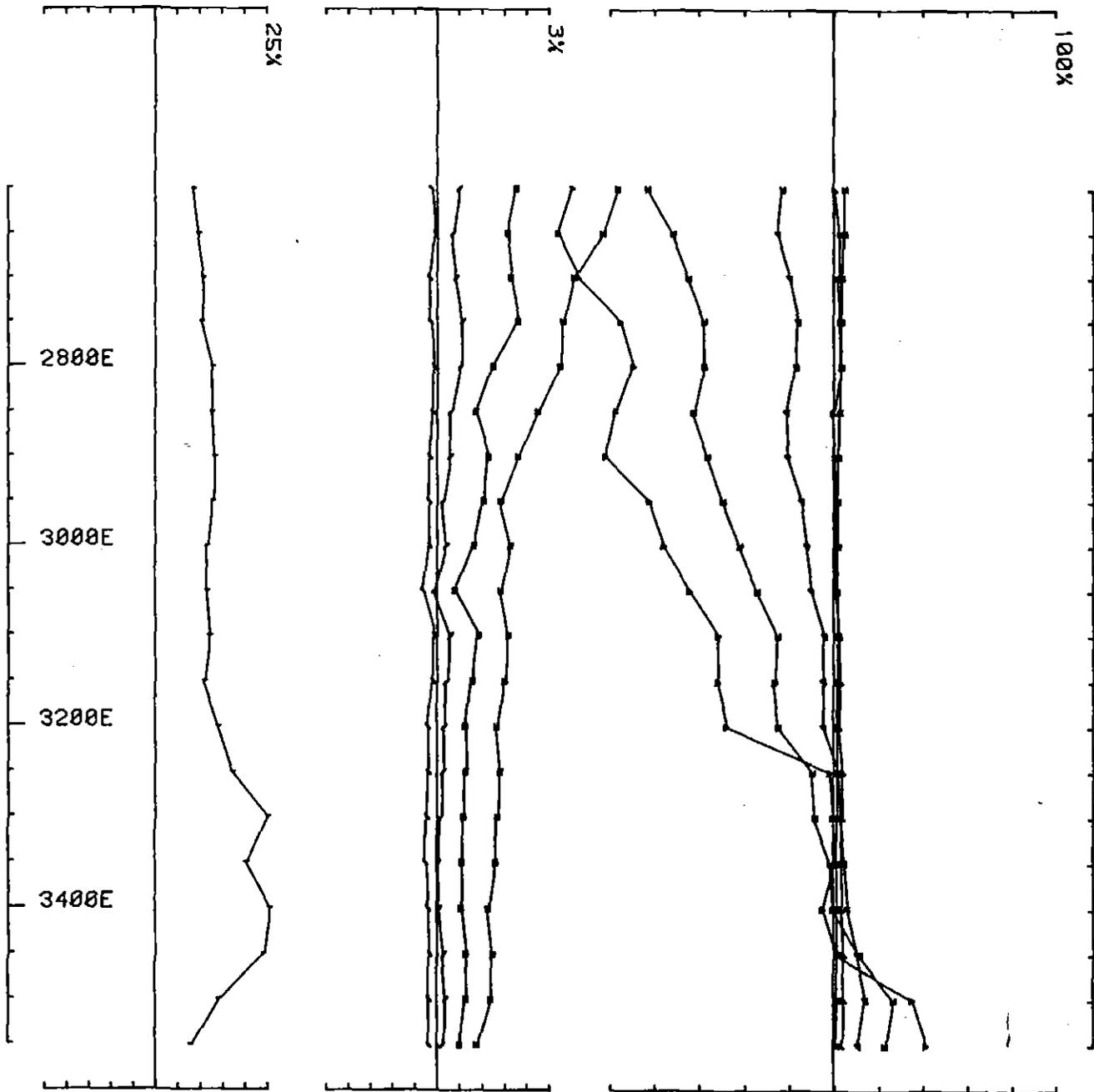
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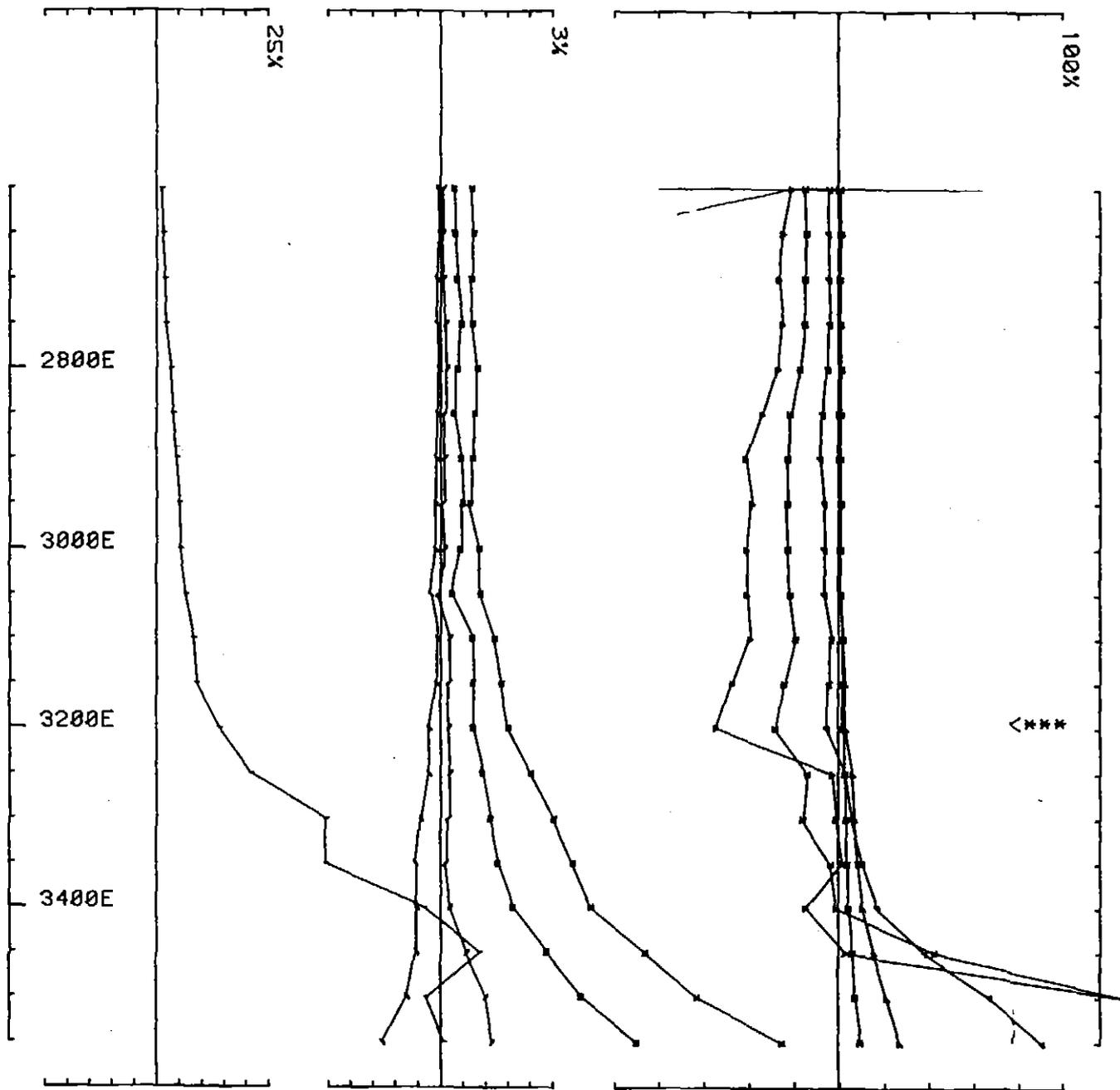
UTEM SURVEY at GARFIELD PROJECT for ~~BHP~~ UTAH MINERALS
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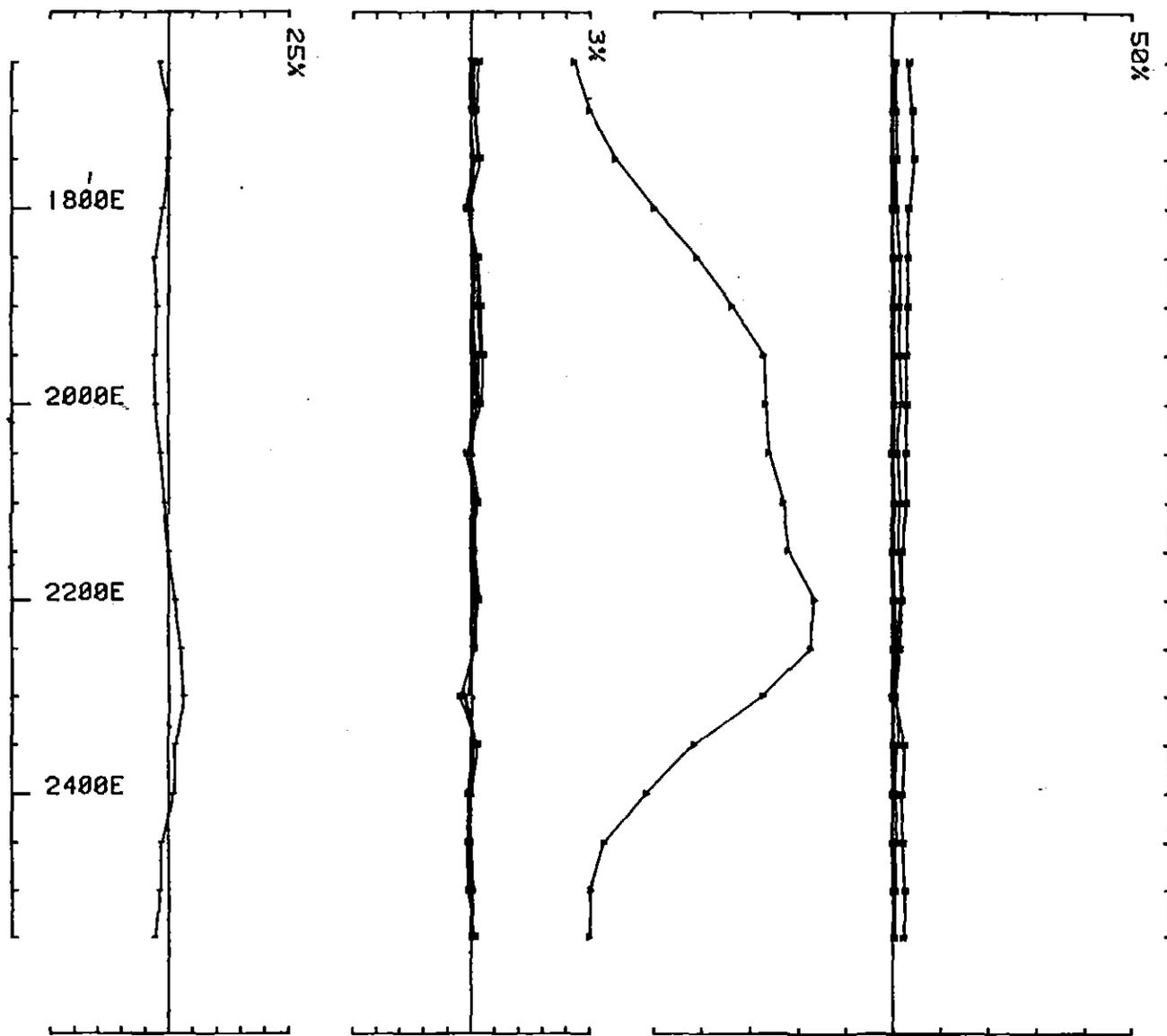
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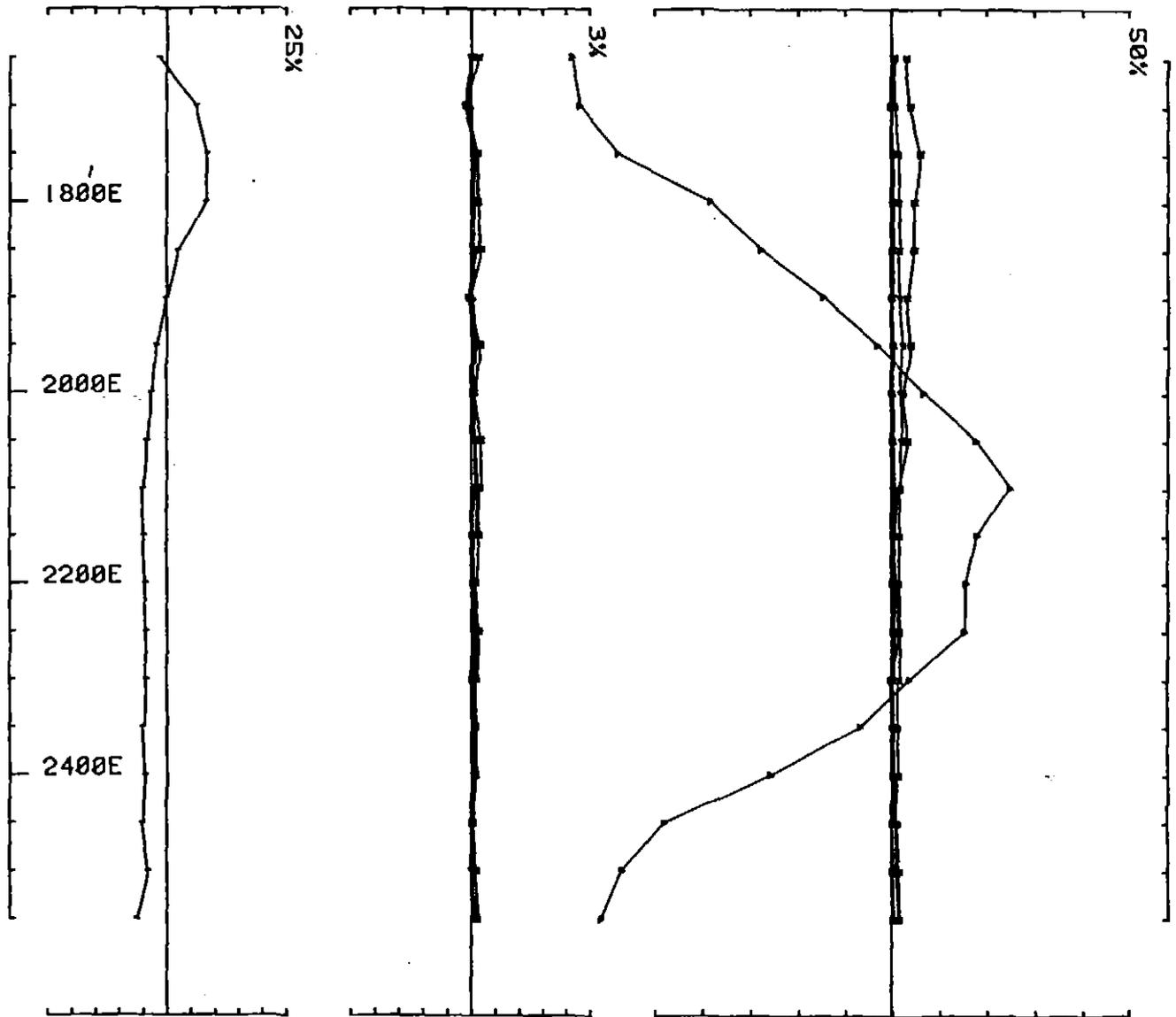
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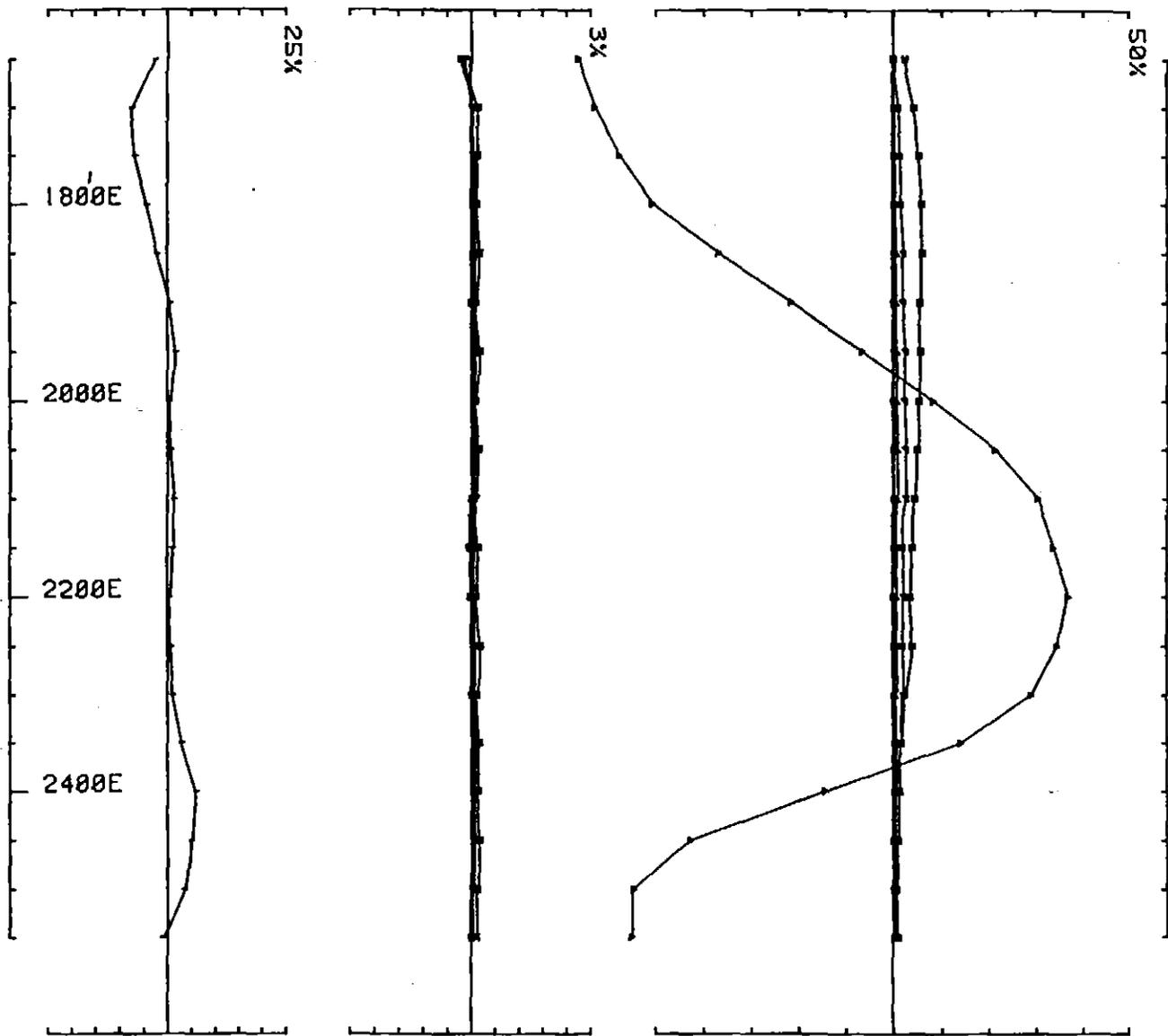
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loop no 0004 line 2800N component Hz secondary field Ch 1 point norm.



UTEM SURVEY at GARFIELD PROJECT for BHP - UTAH MINERALS
conducted by PL RL ST Job 9056 base freq (hz) 26.230
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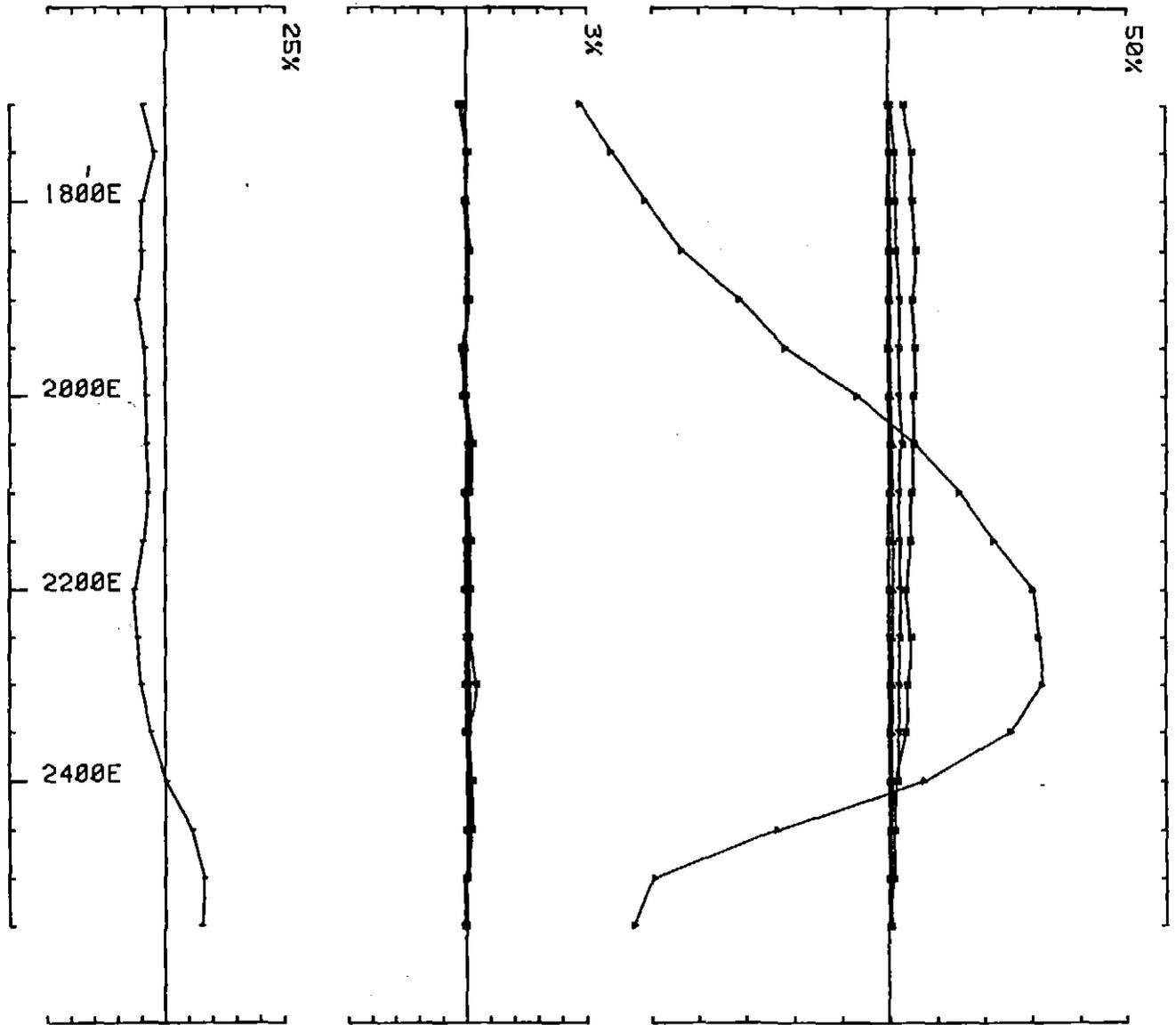
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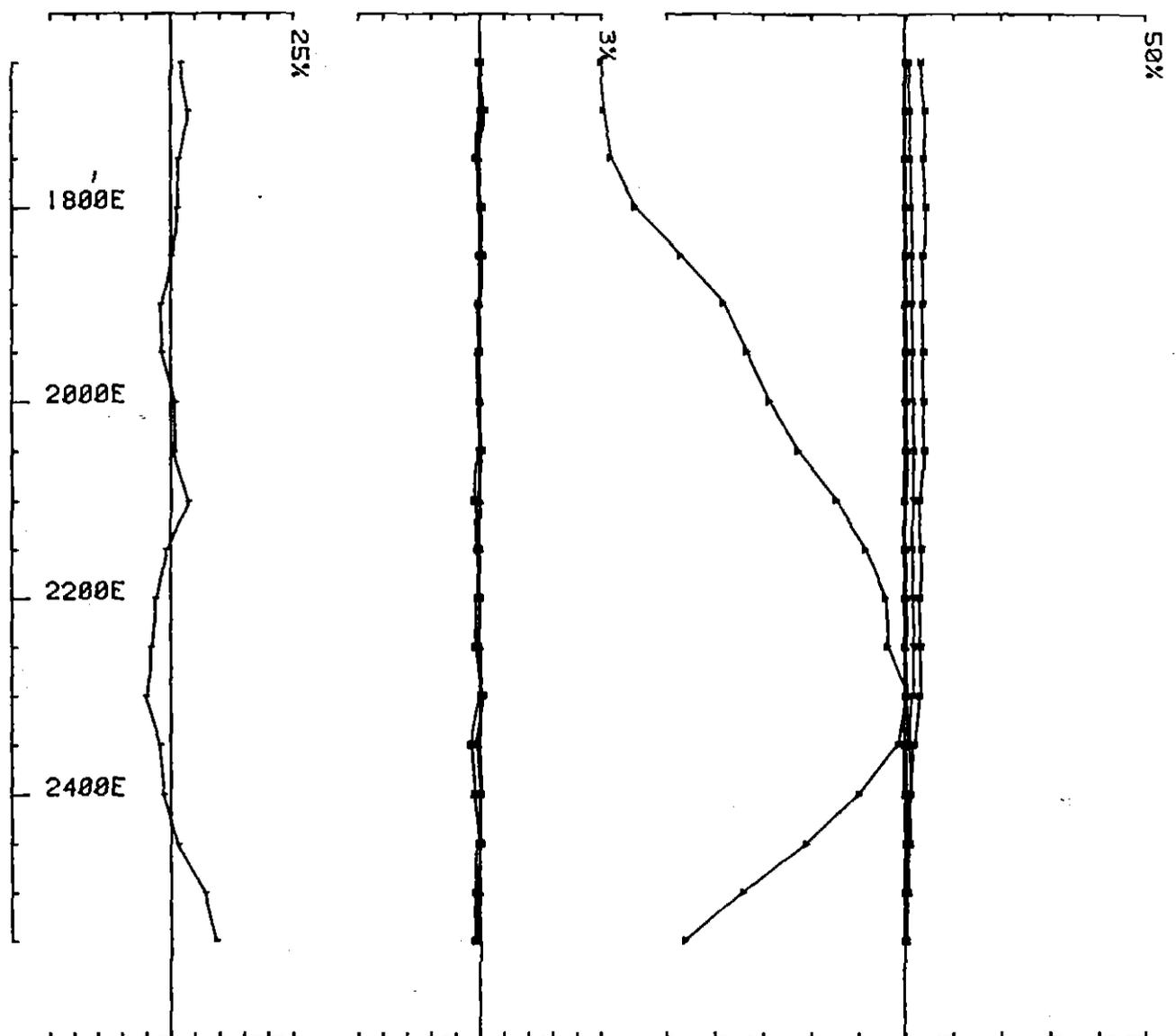
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conducted by PL RL ST Job 9056 base freq (hz) 26.230

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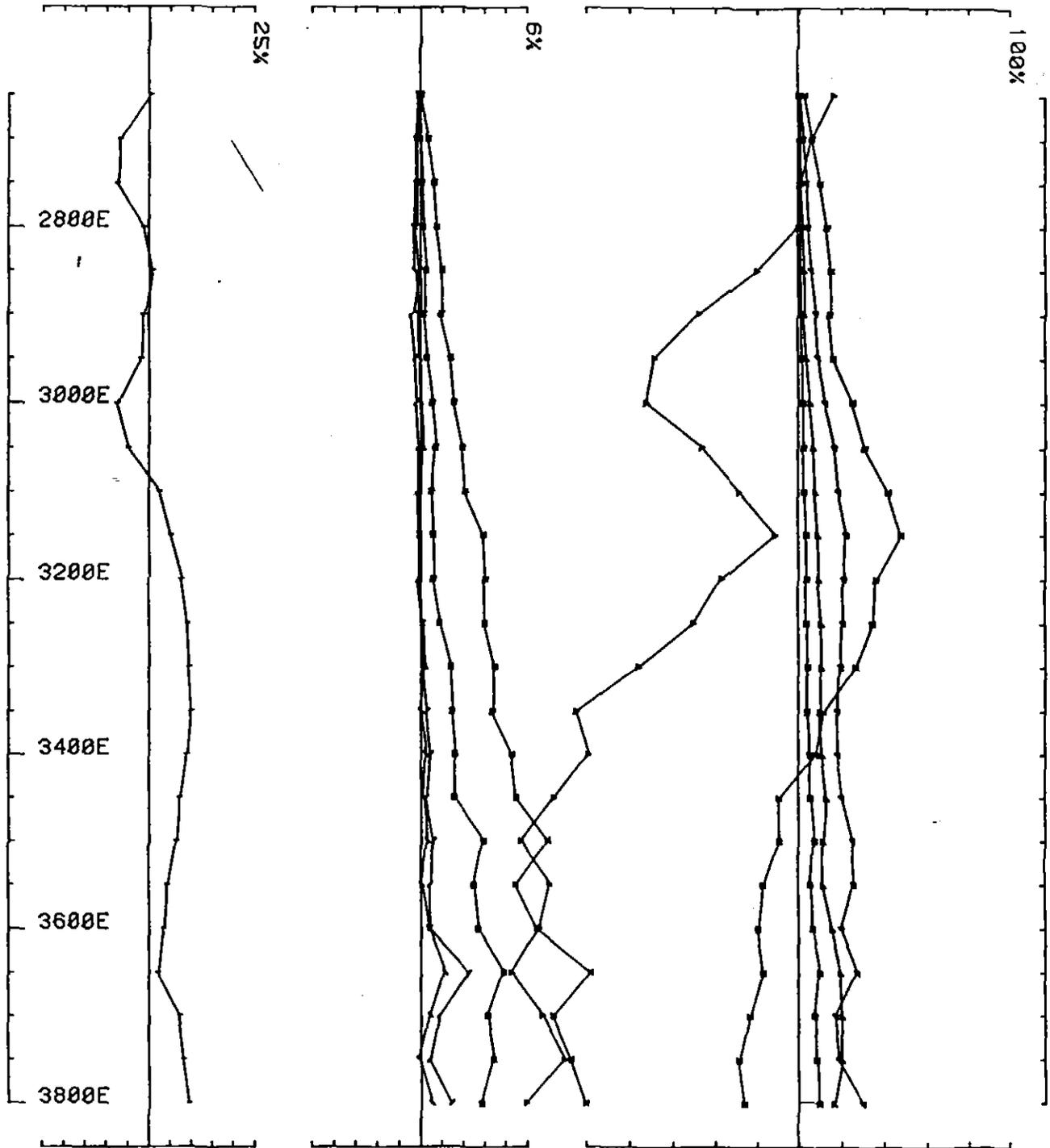
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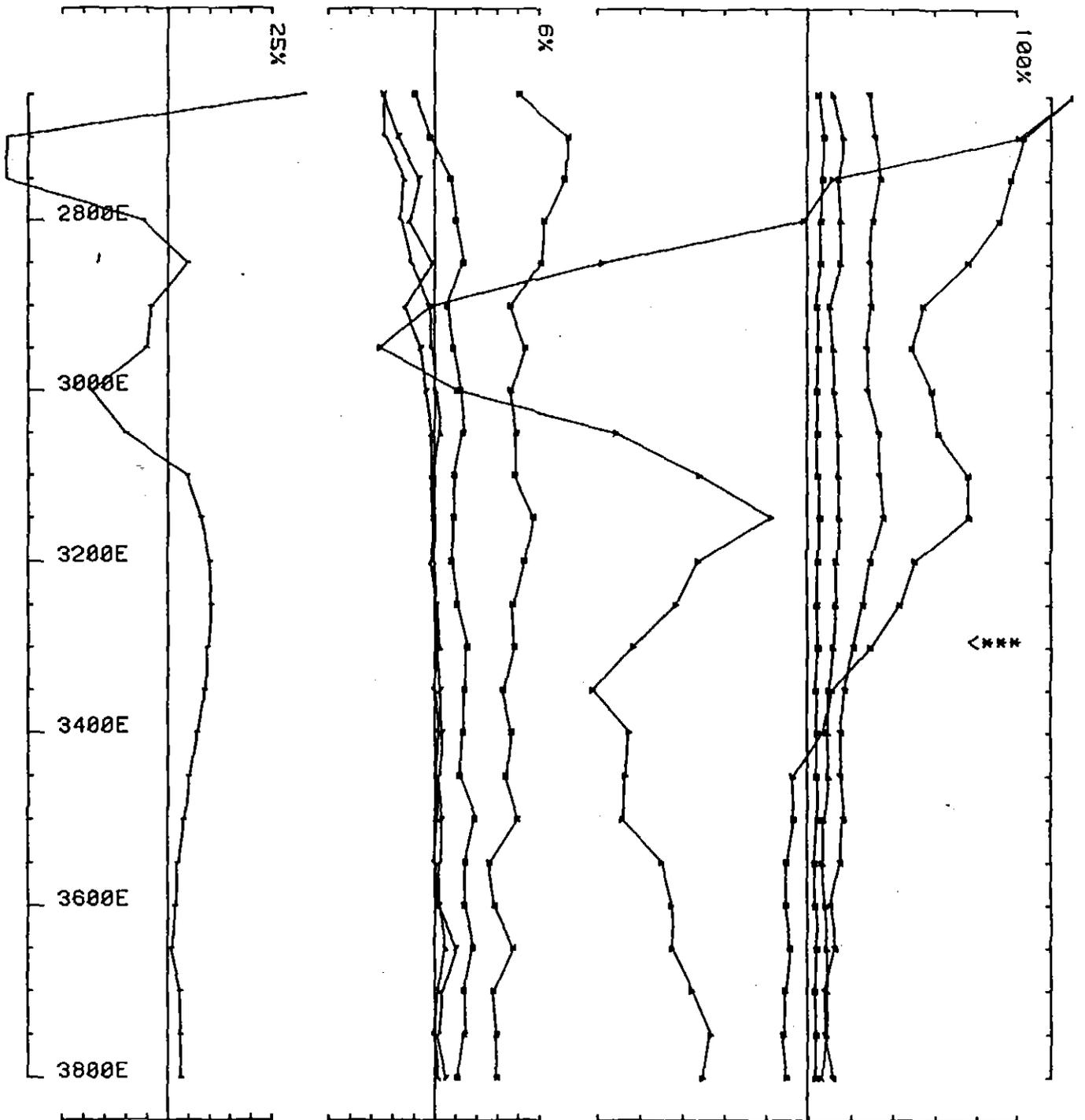
UTEM SURVEY of GARFIELD PROJECT for BHP - UTAH MINERALS

conducted by PL RL ST Job 9056 base freq (hz) 26.230

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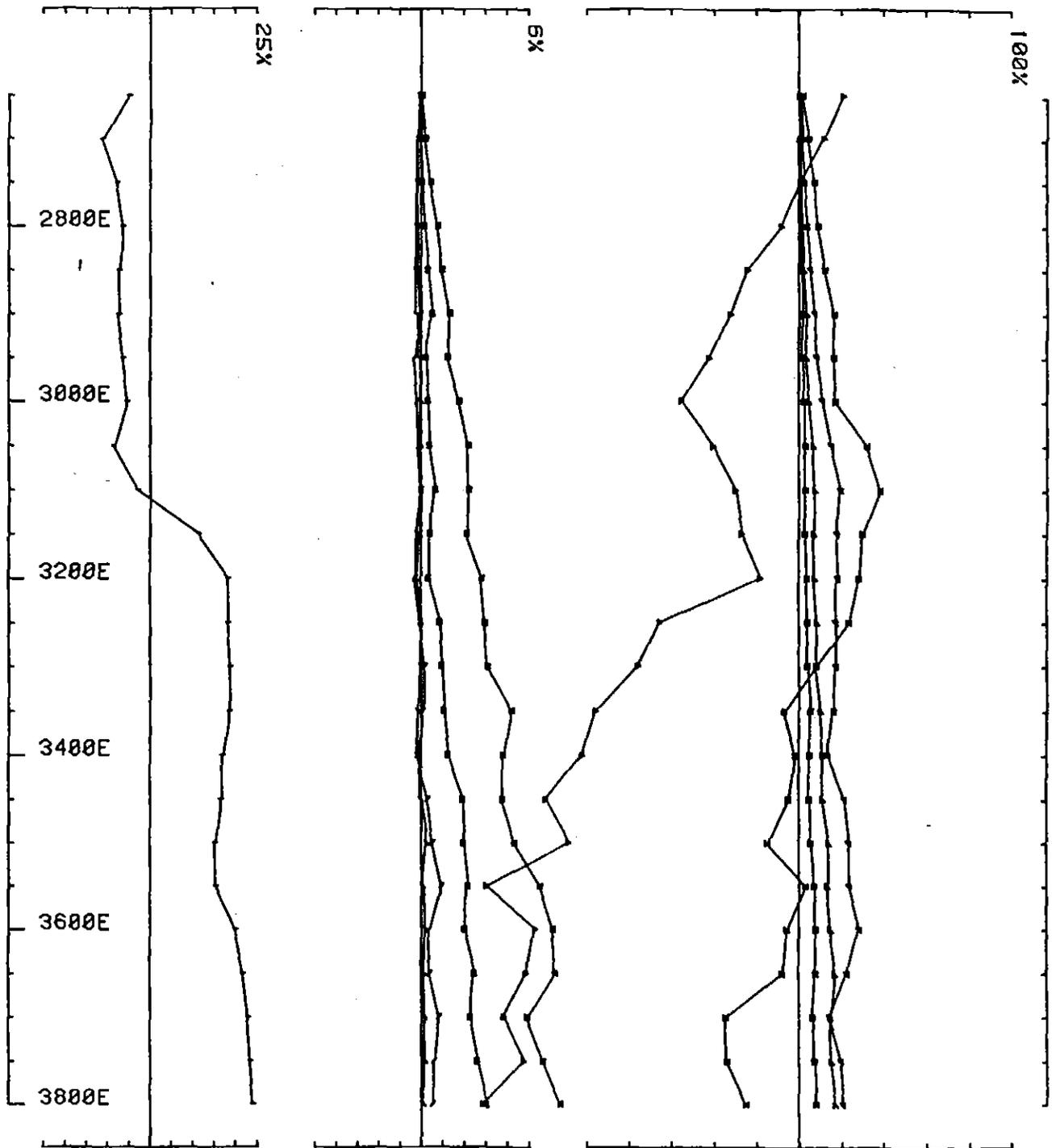
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conducted by PL RL ST Job 9056 base freq (hz) 26.230
loop no 0005 line 1800N component Hz secondary field Ch 1 contin. norm.



UTEM SURVEY of GARFIELD PROJECT for BHP - UTAH MINERALS

conducted by PL RL ST Job 9056 base freq (hz) 26.230

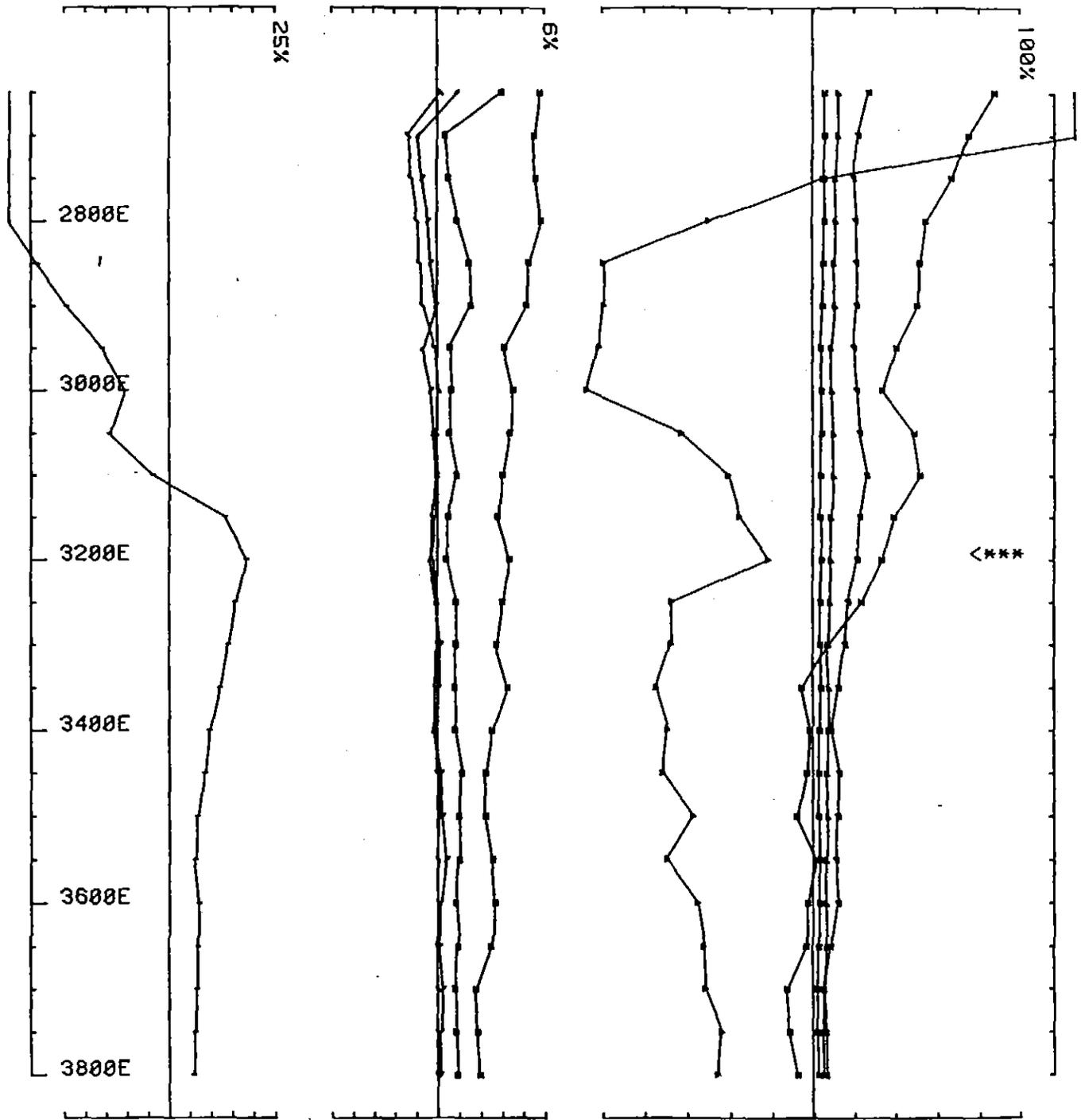
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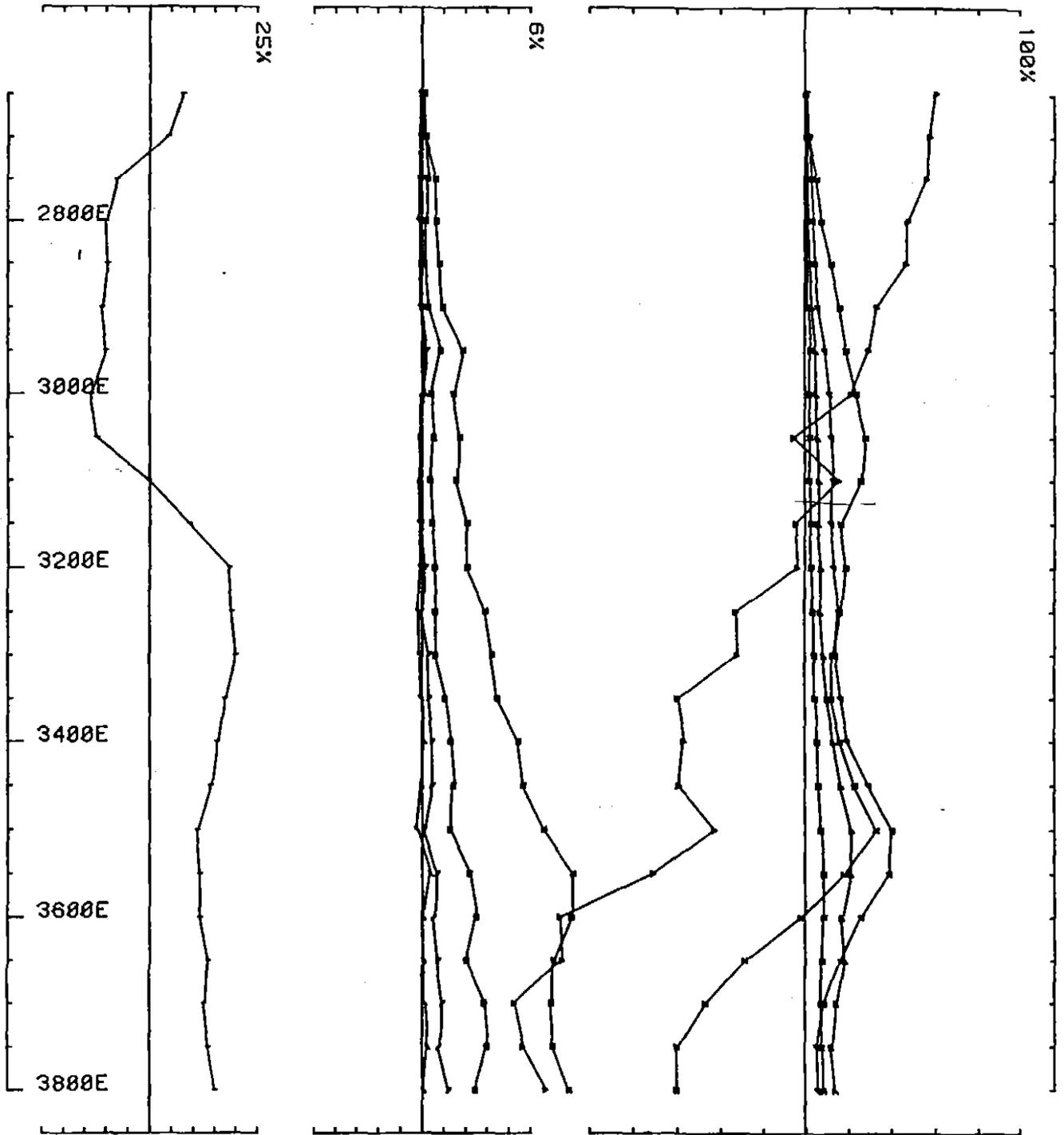
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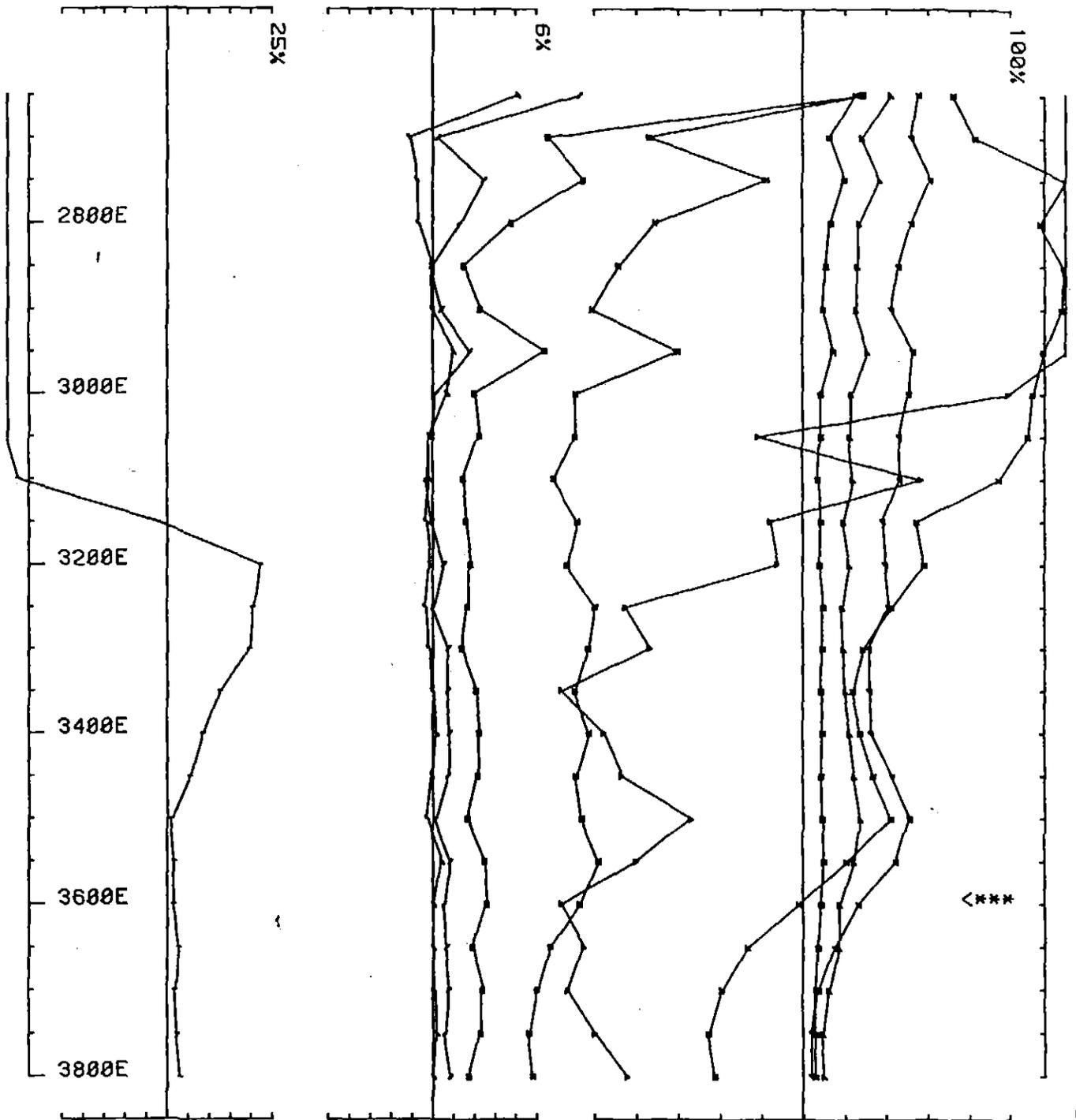
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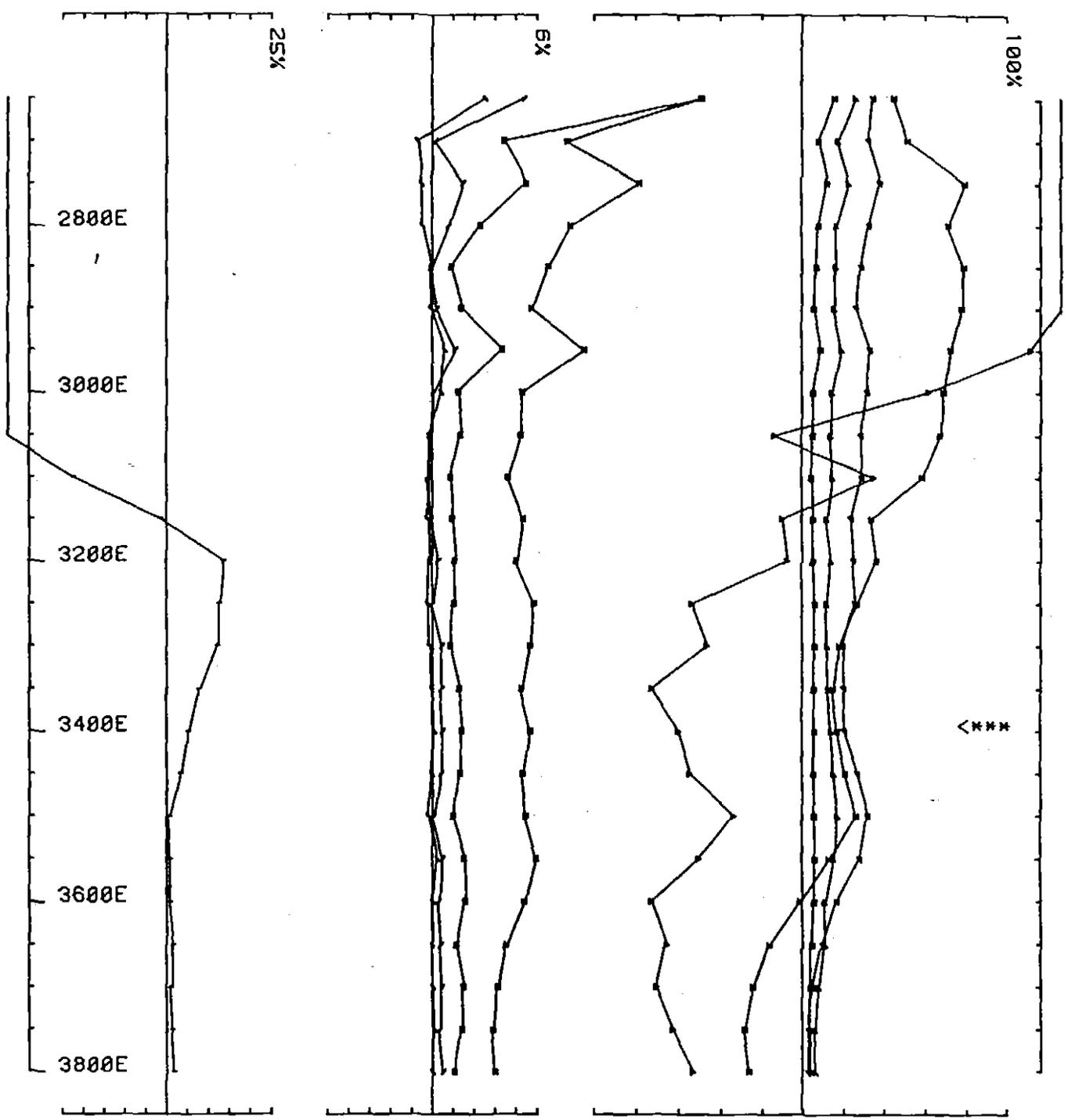
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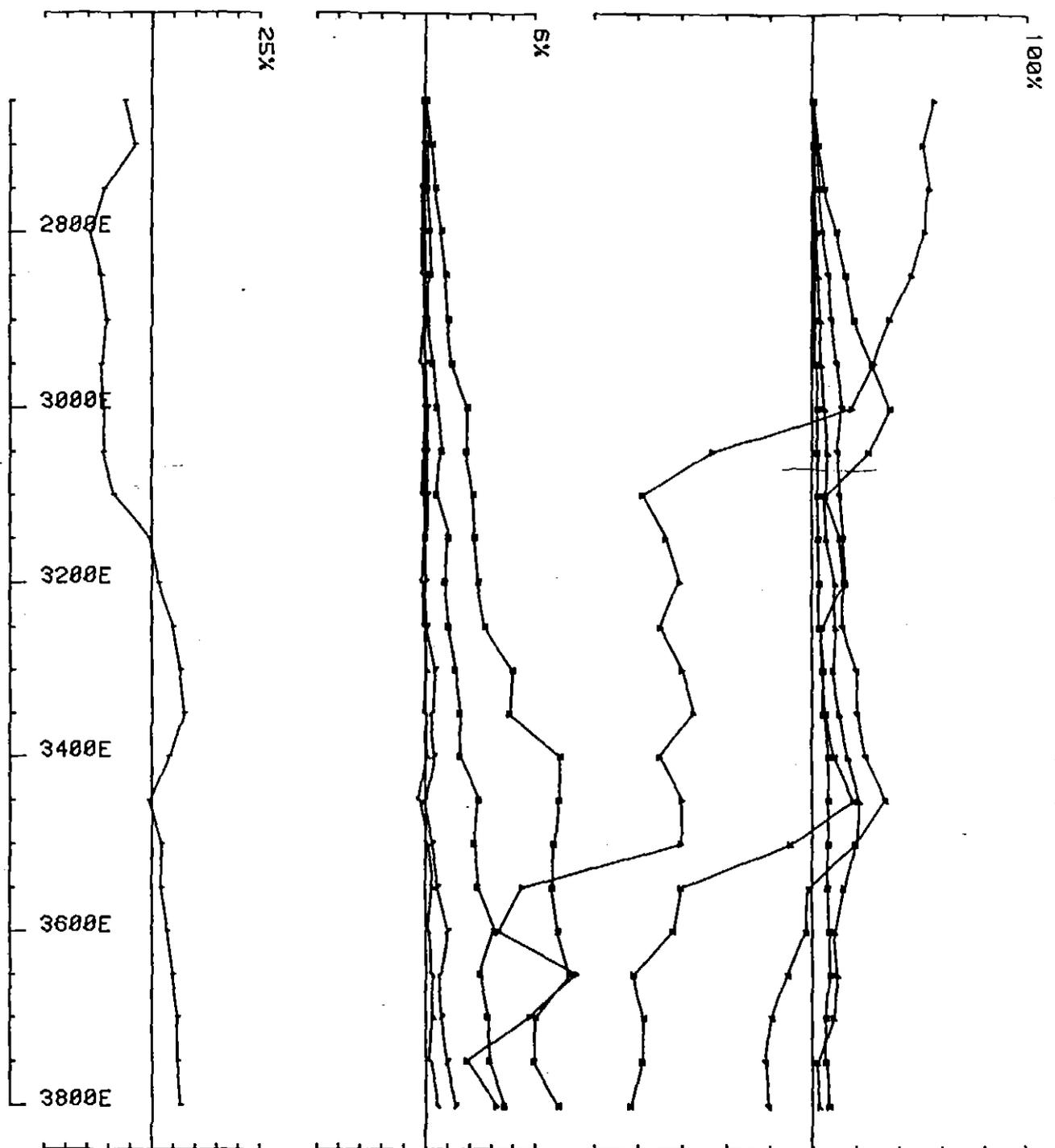
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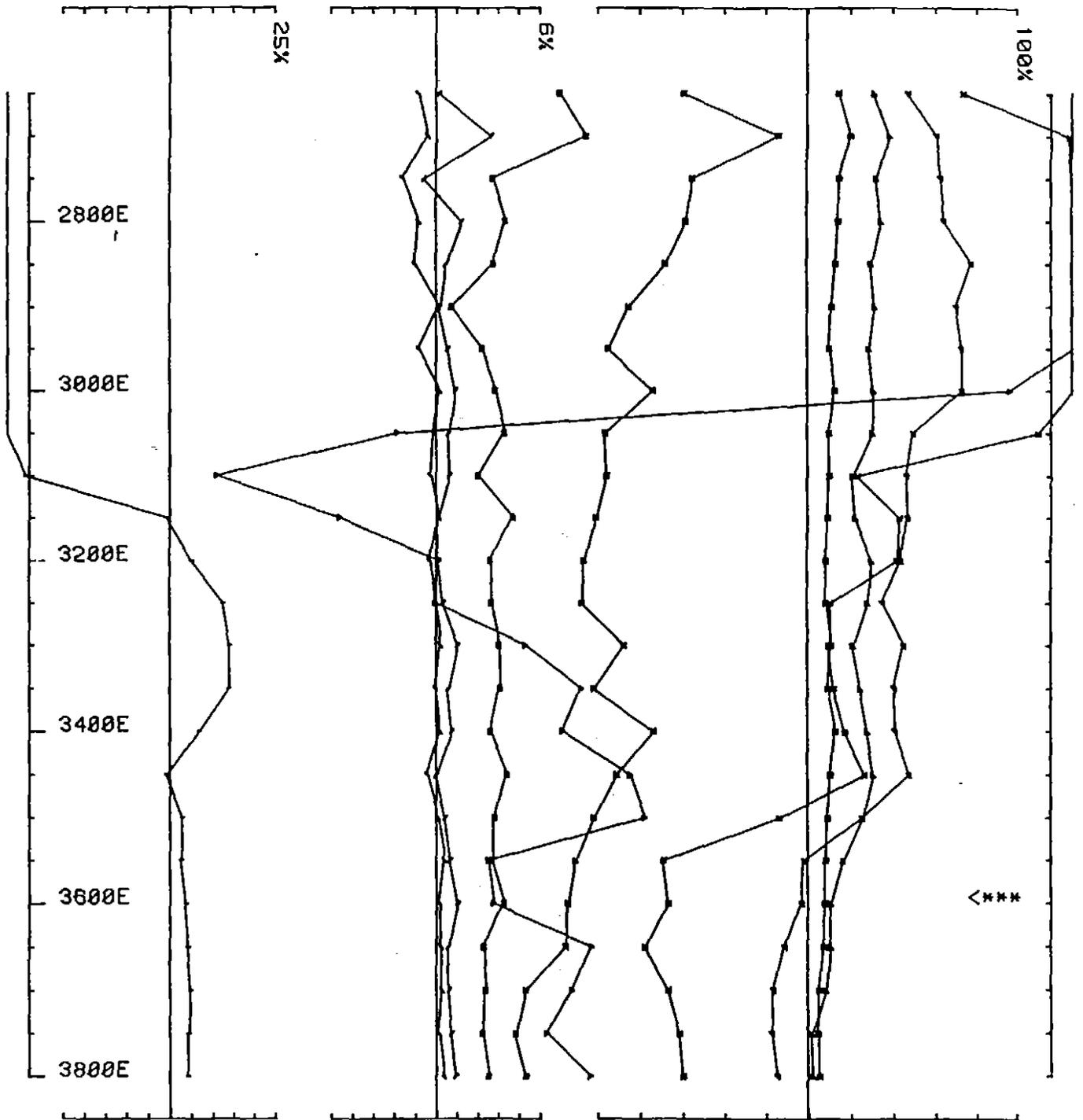
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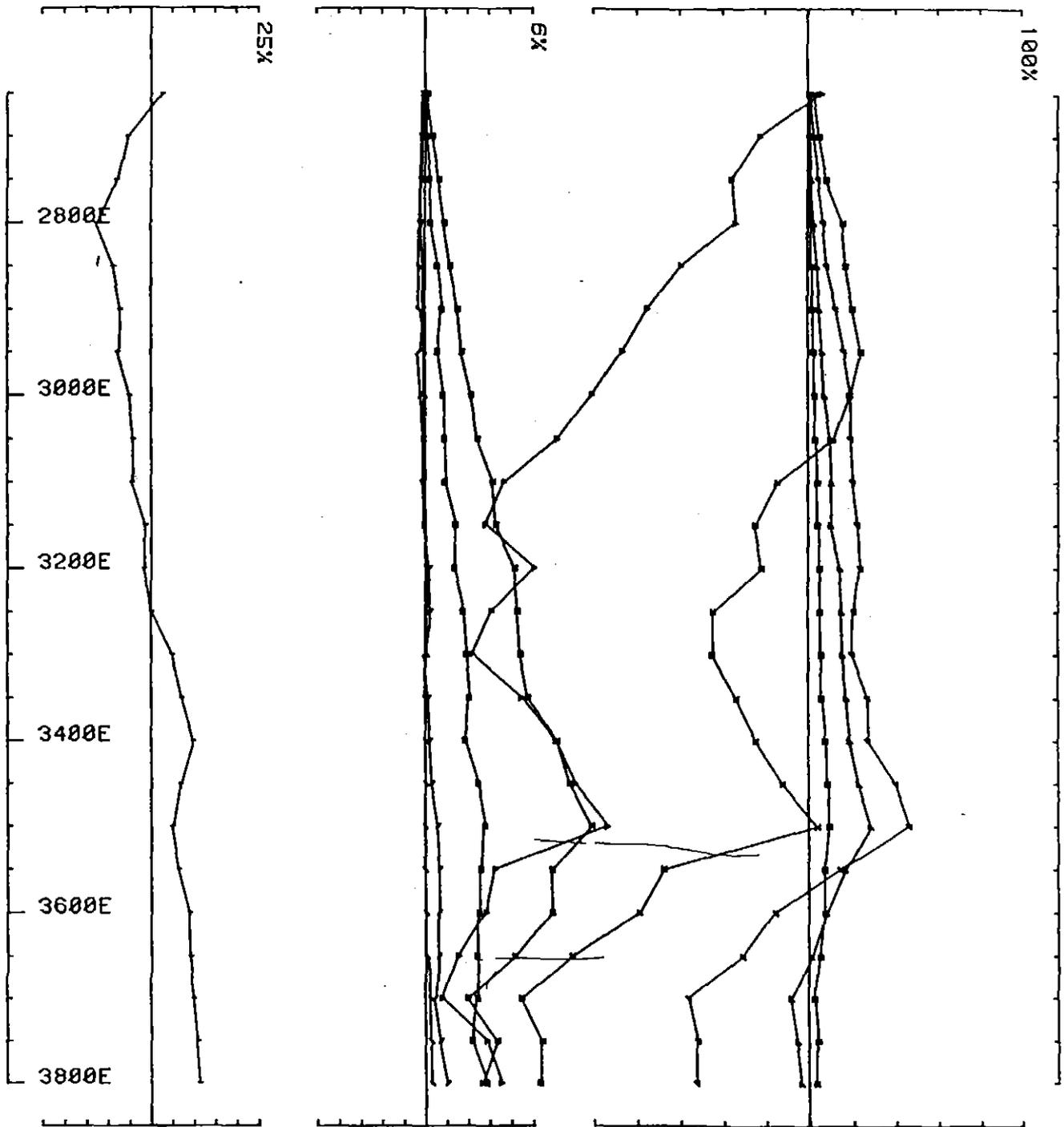
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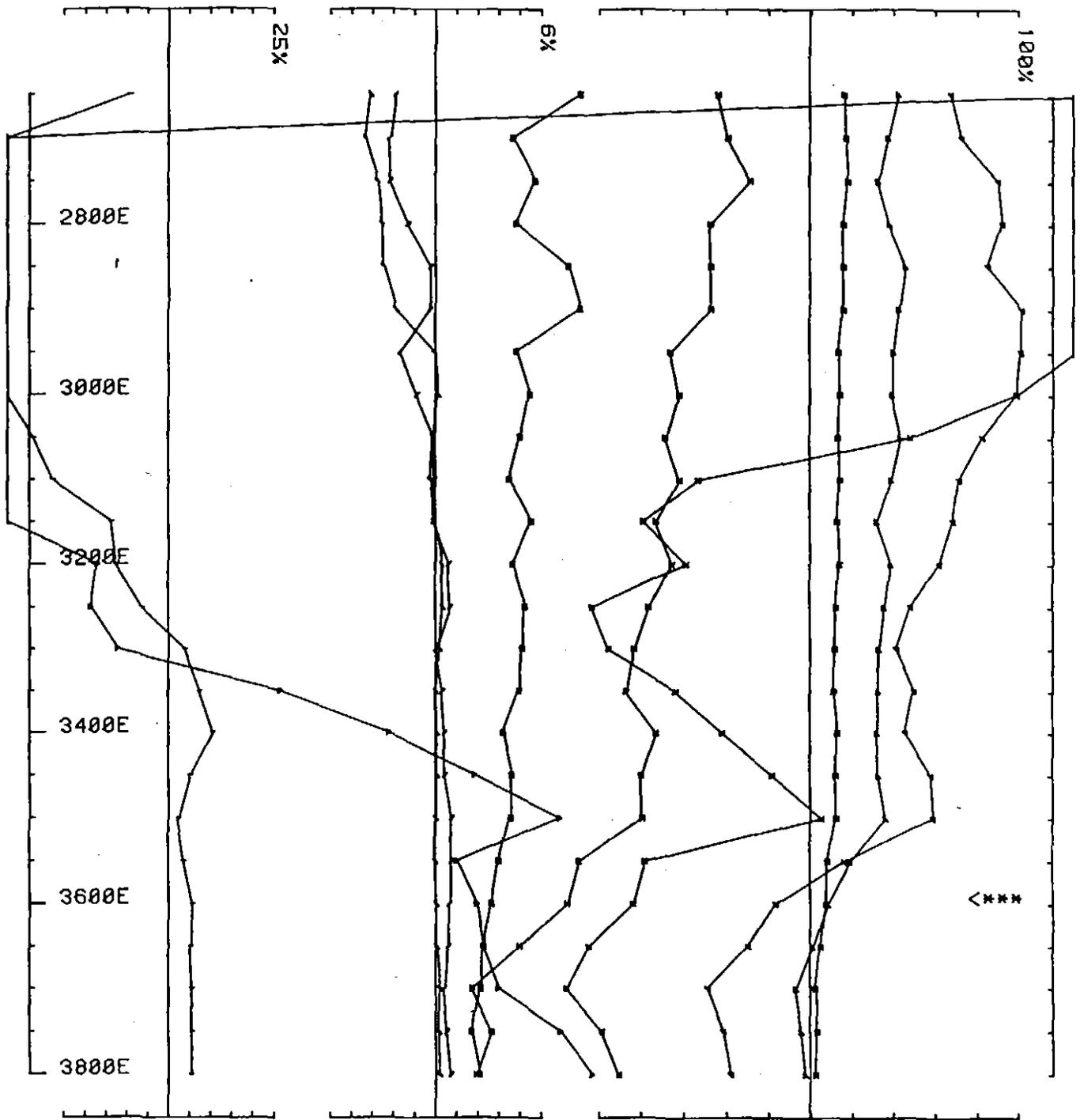
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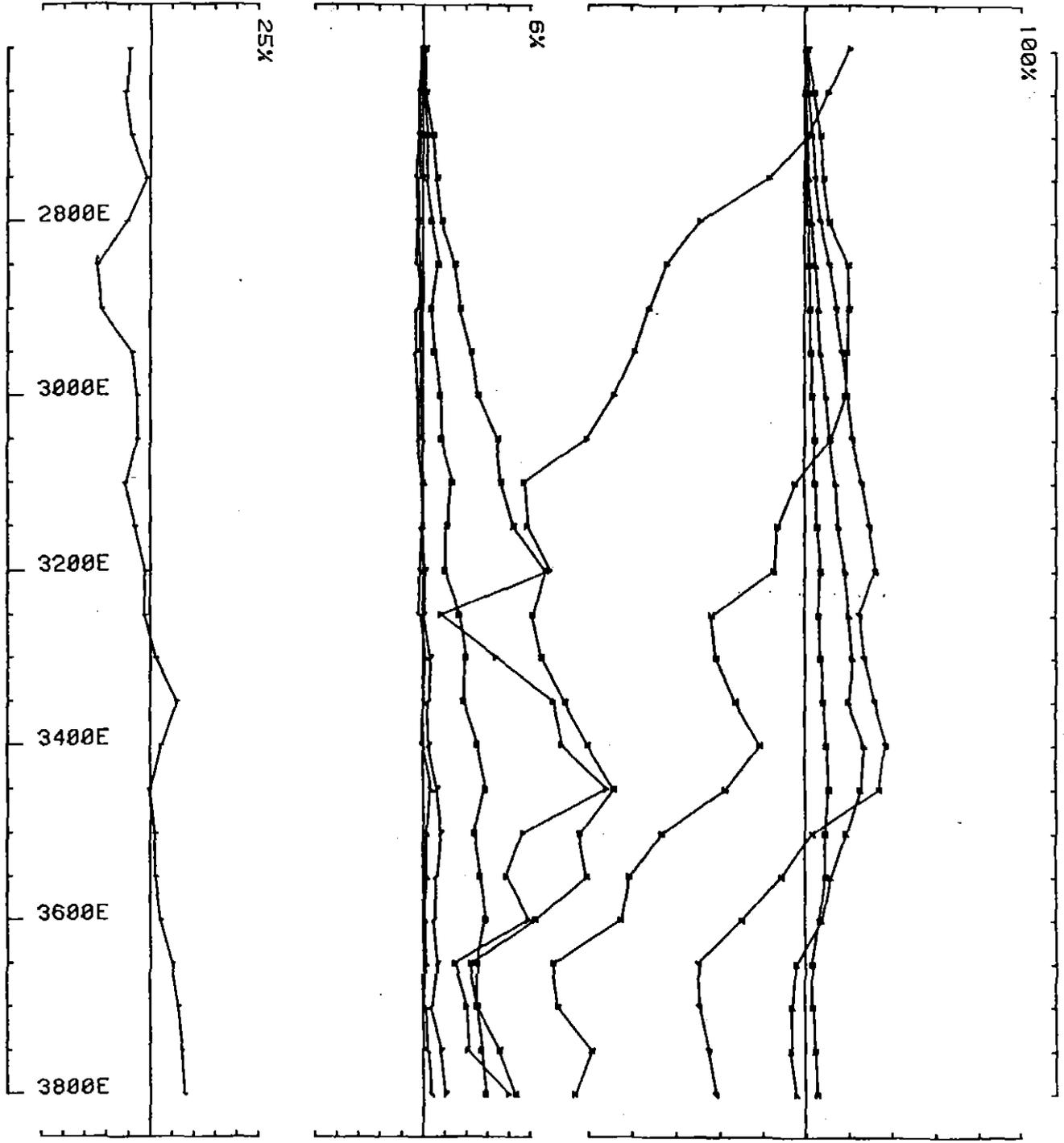
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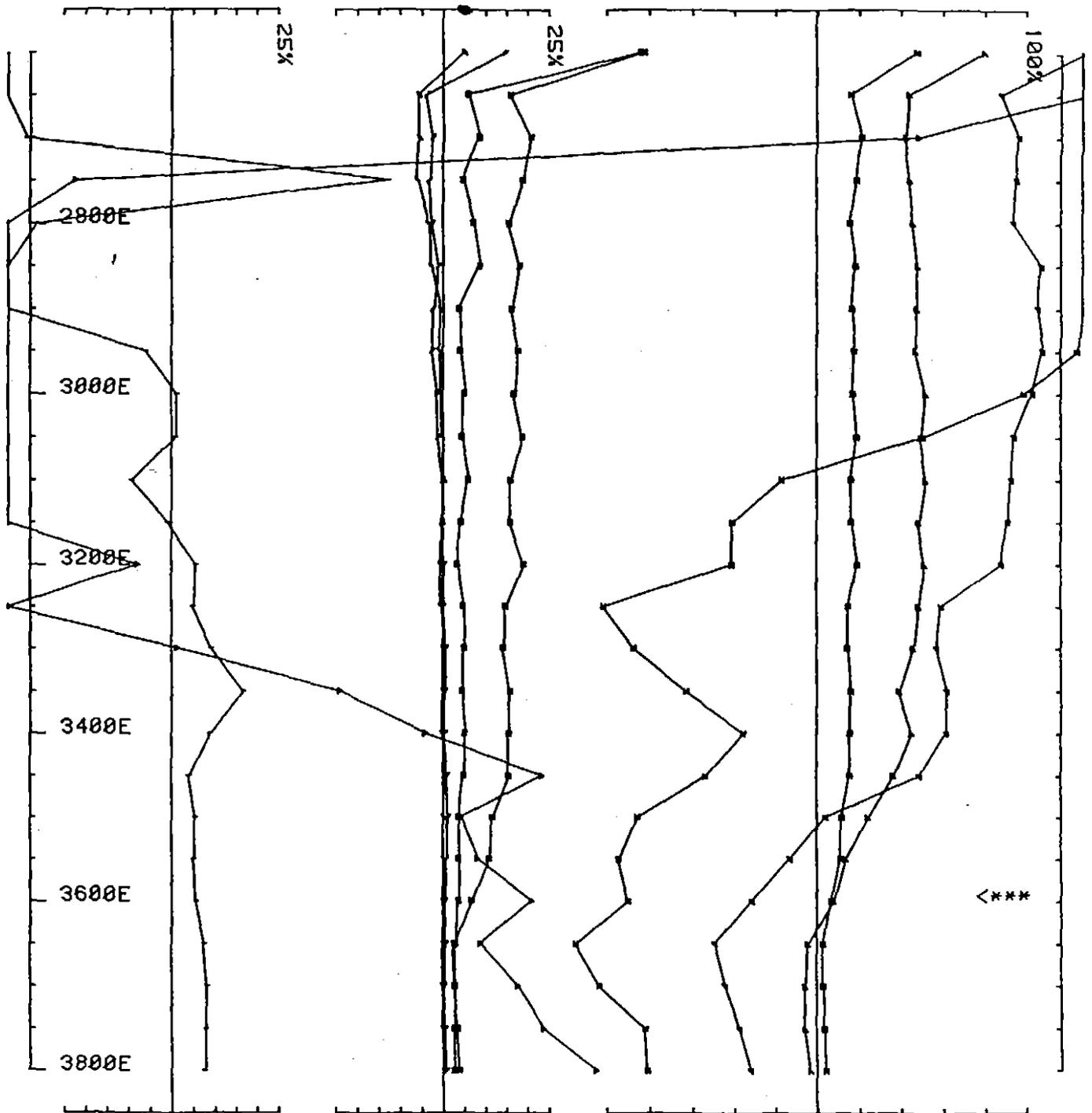
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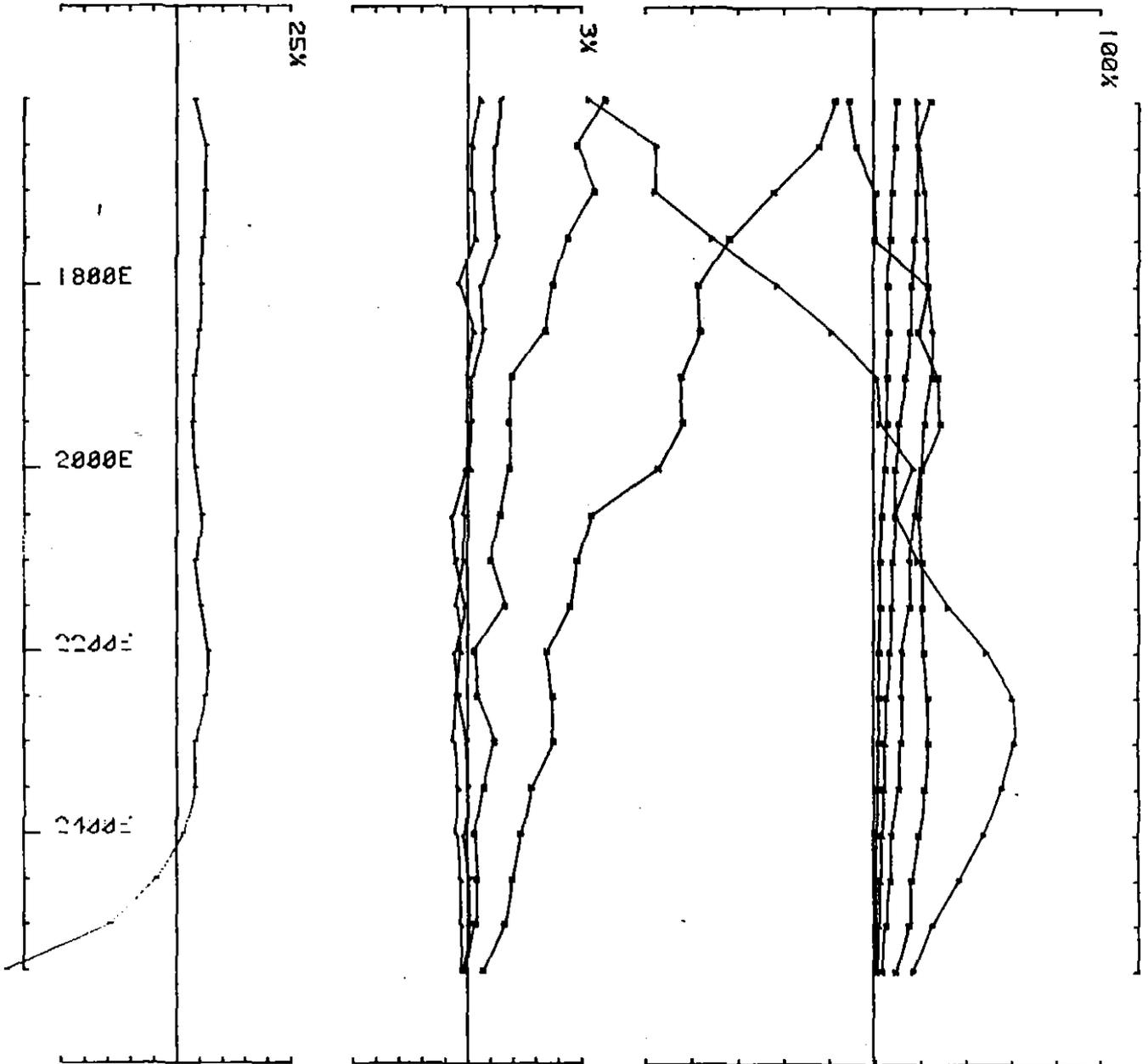
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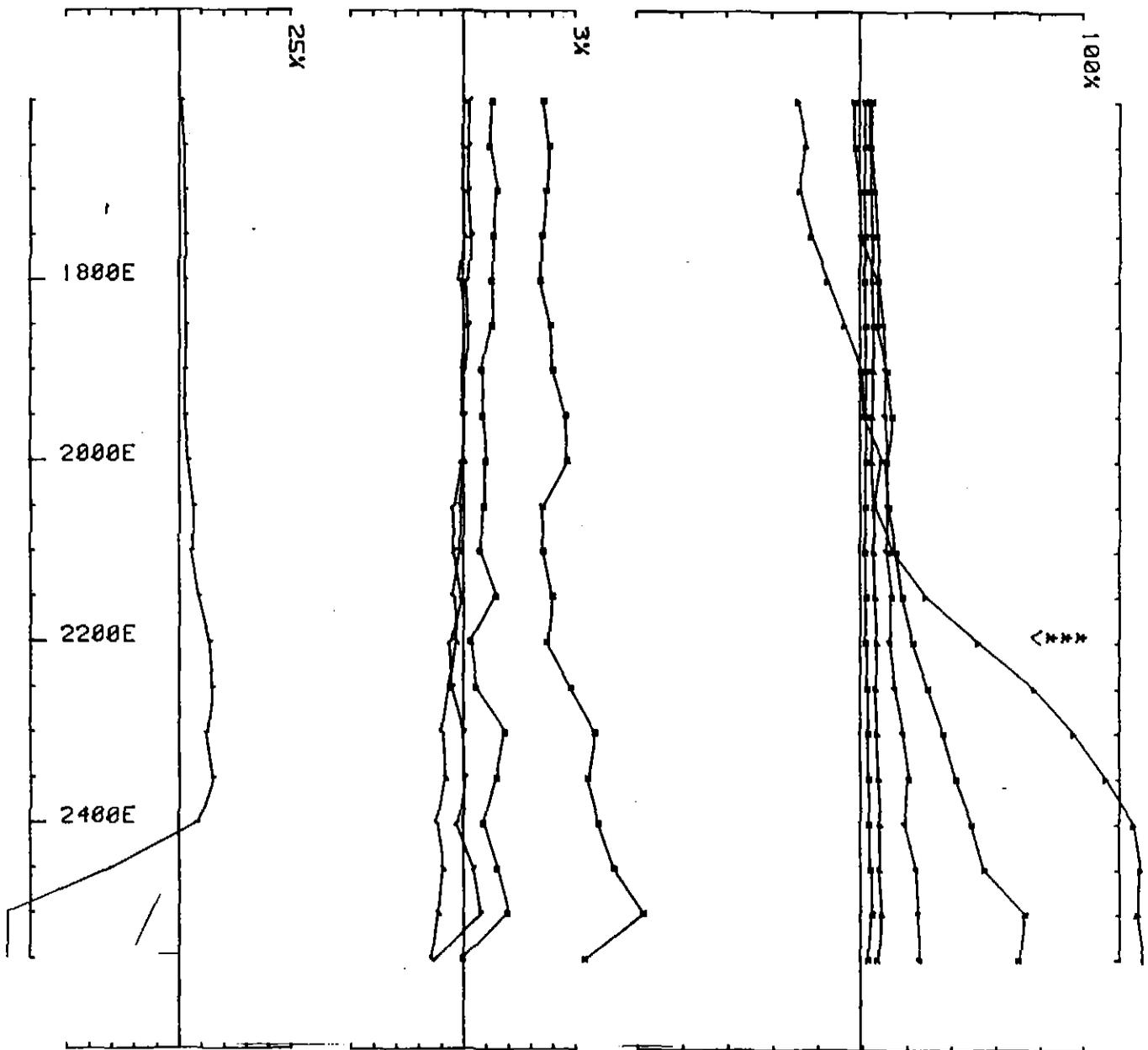
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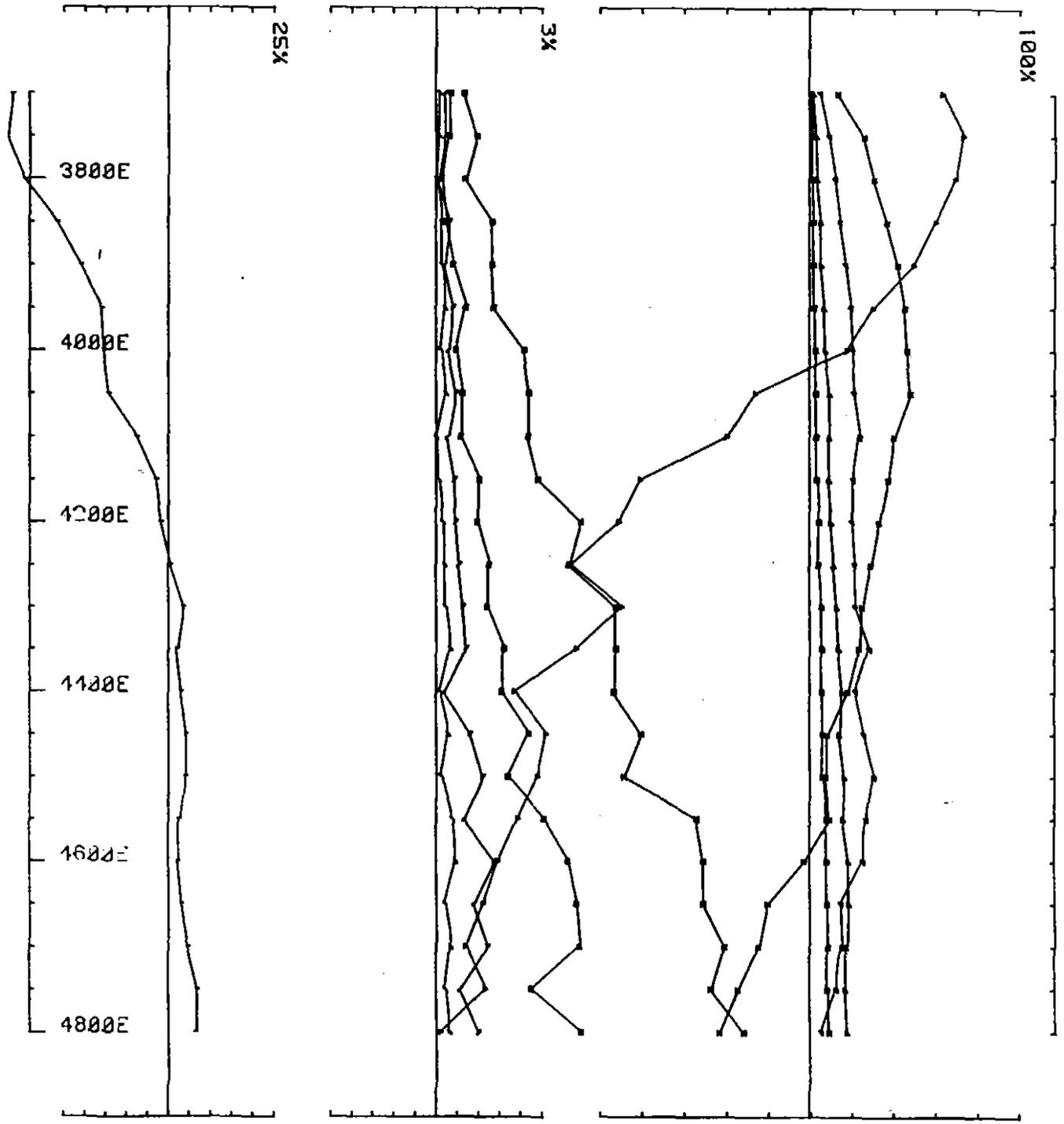
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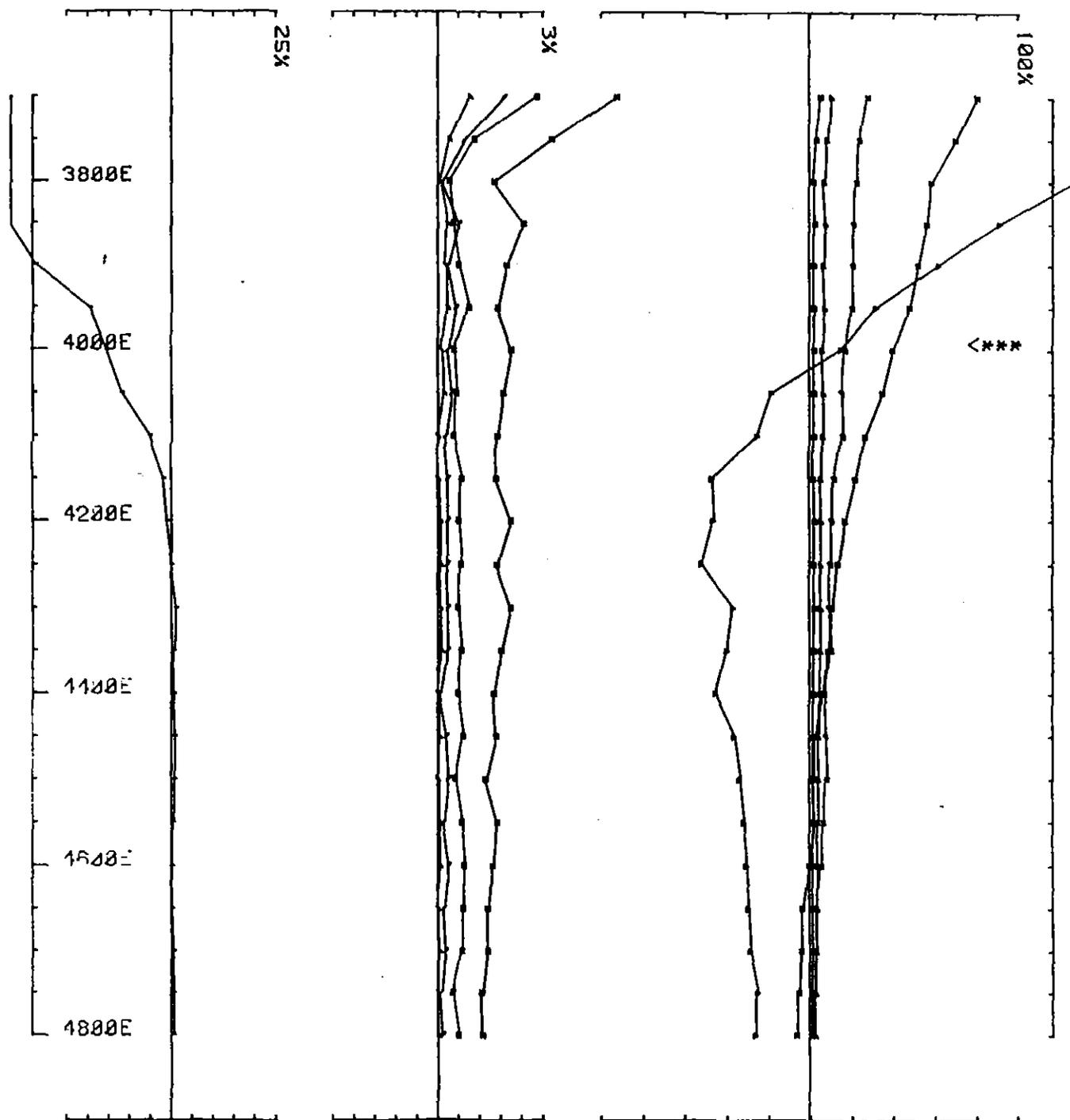
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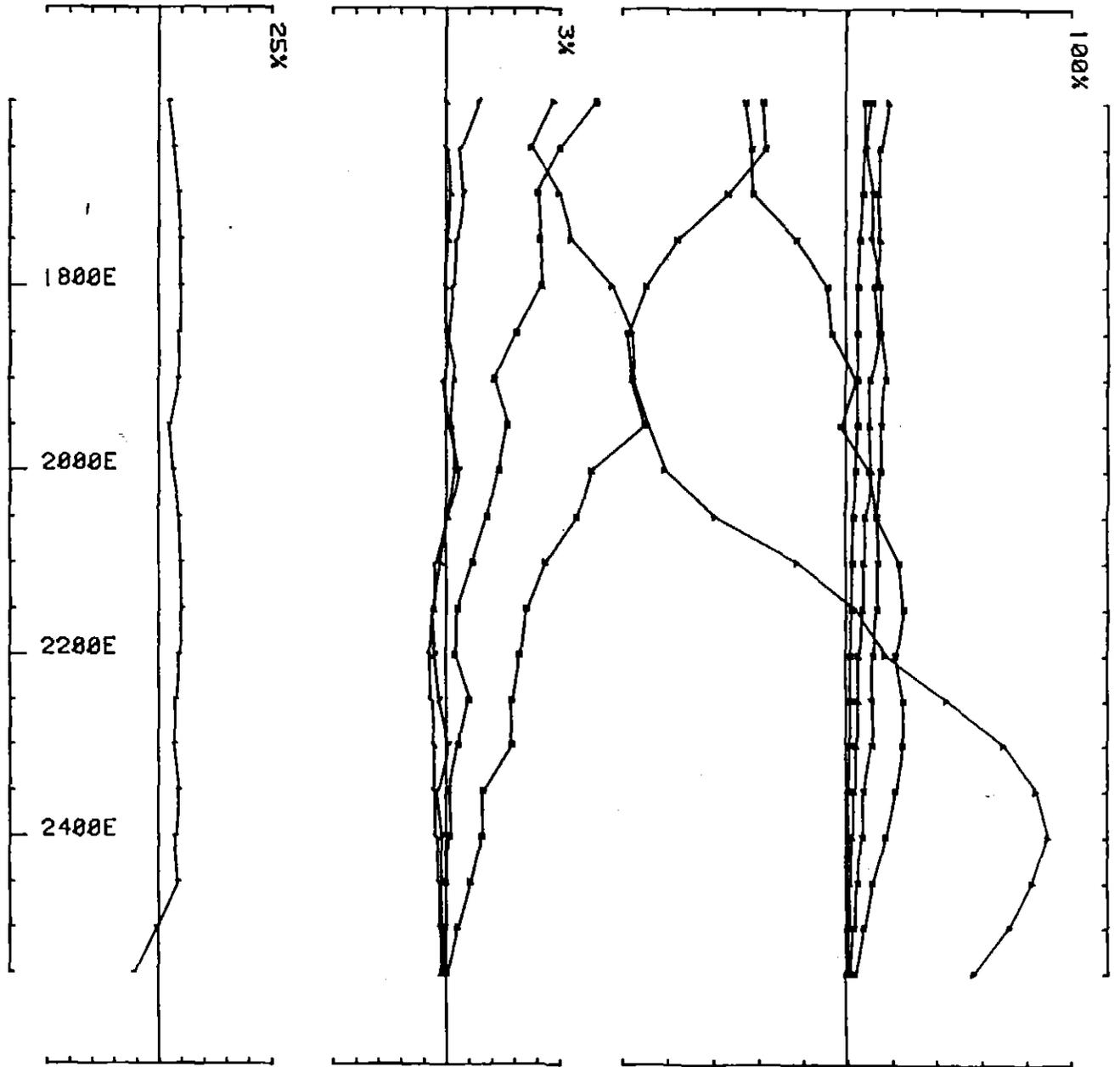
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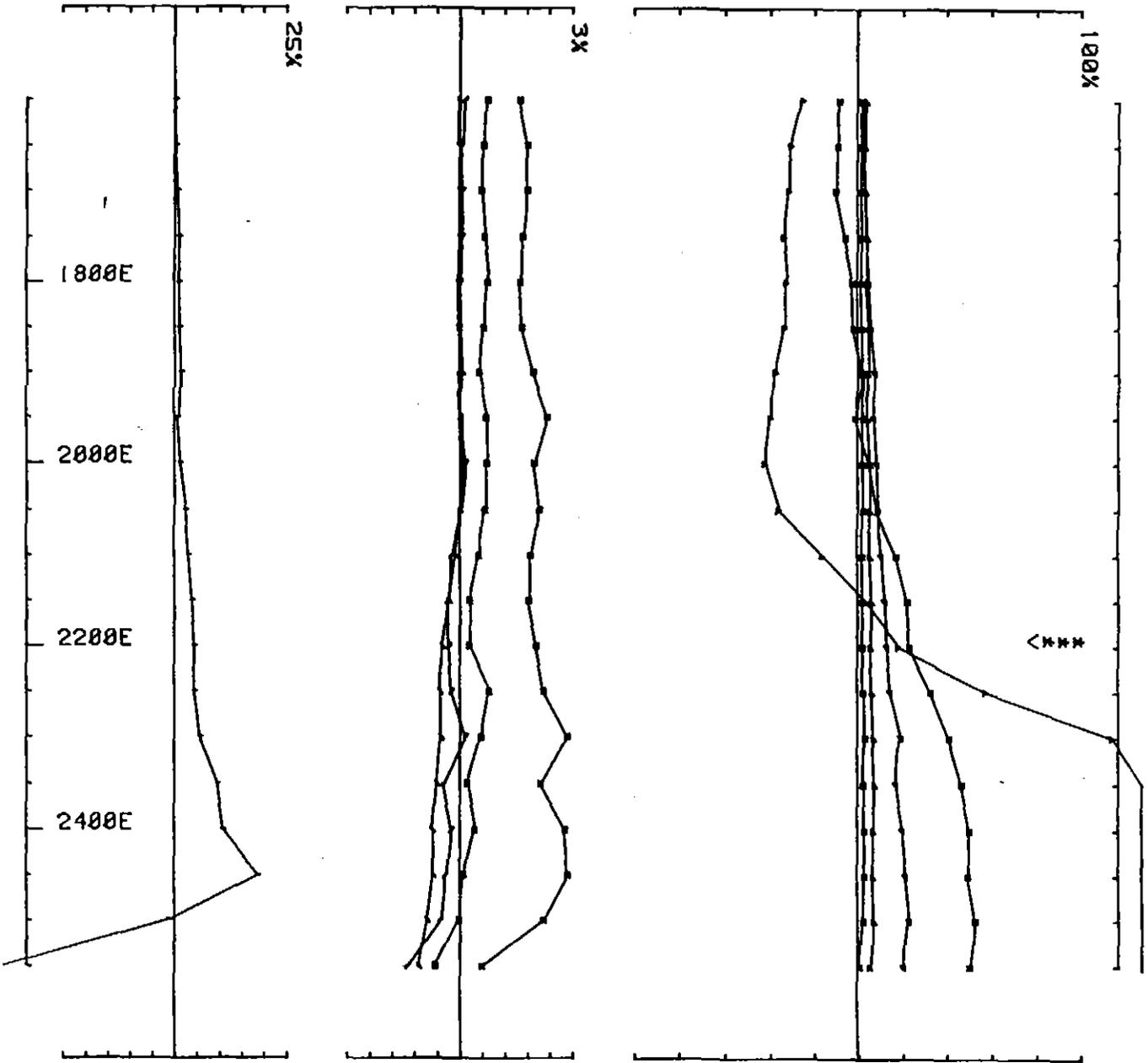
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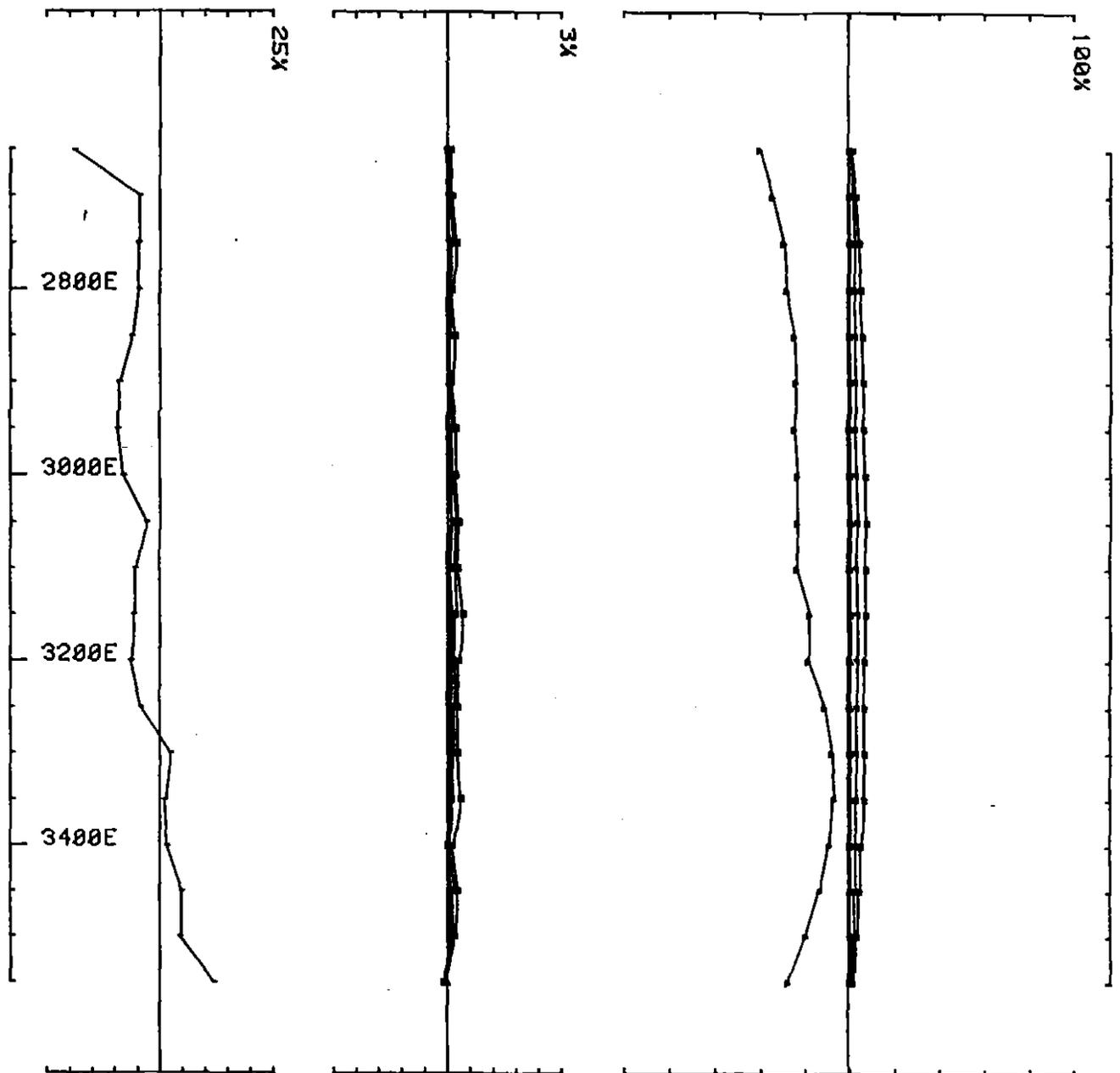
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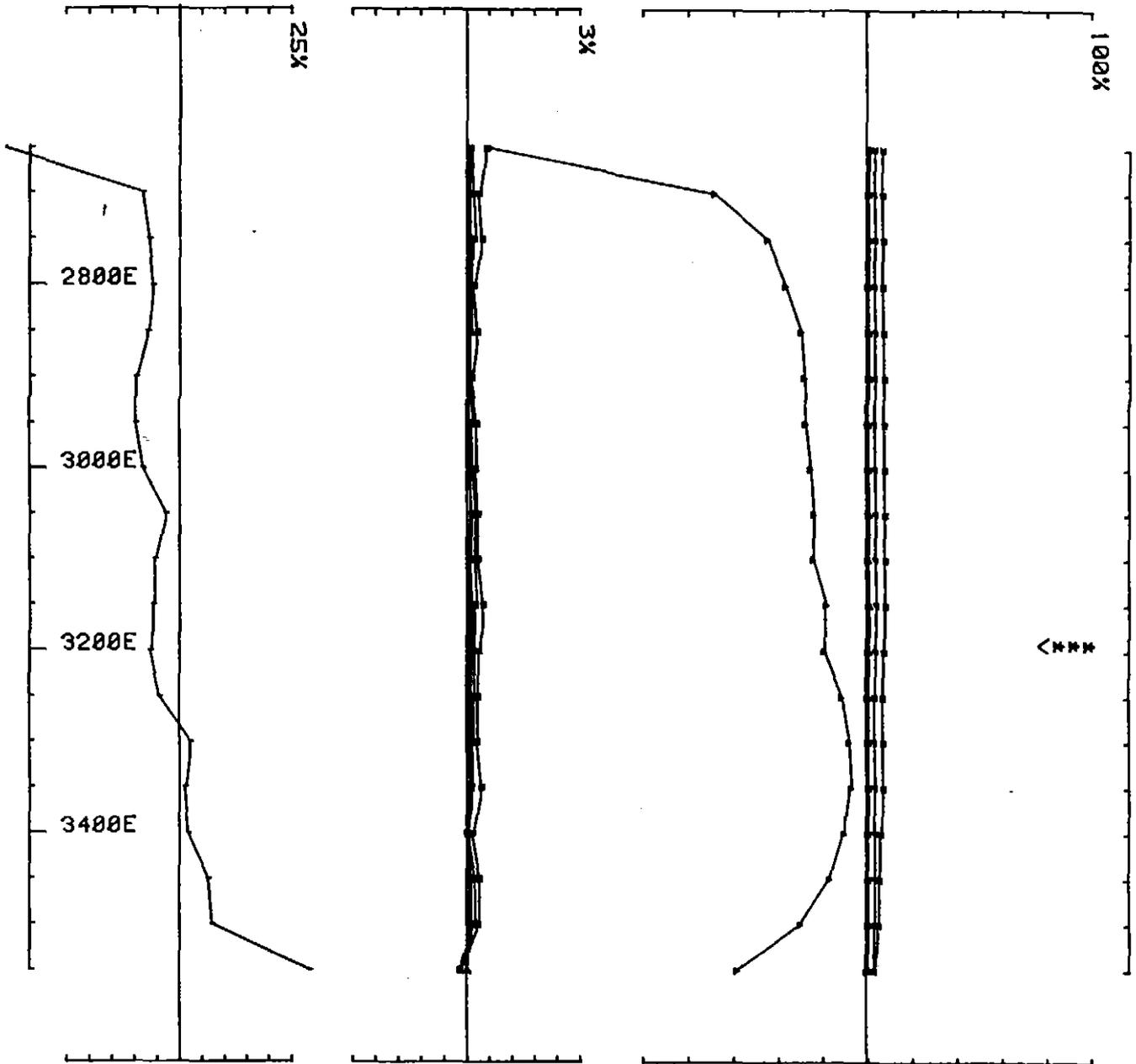
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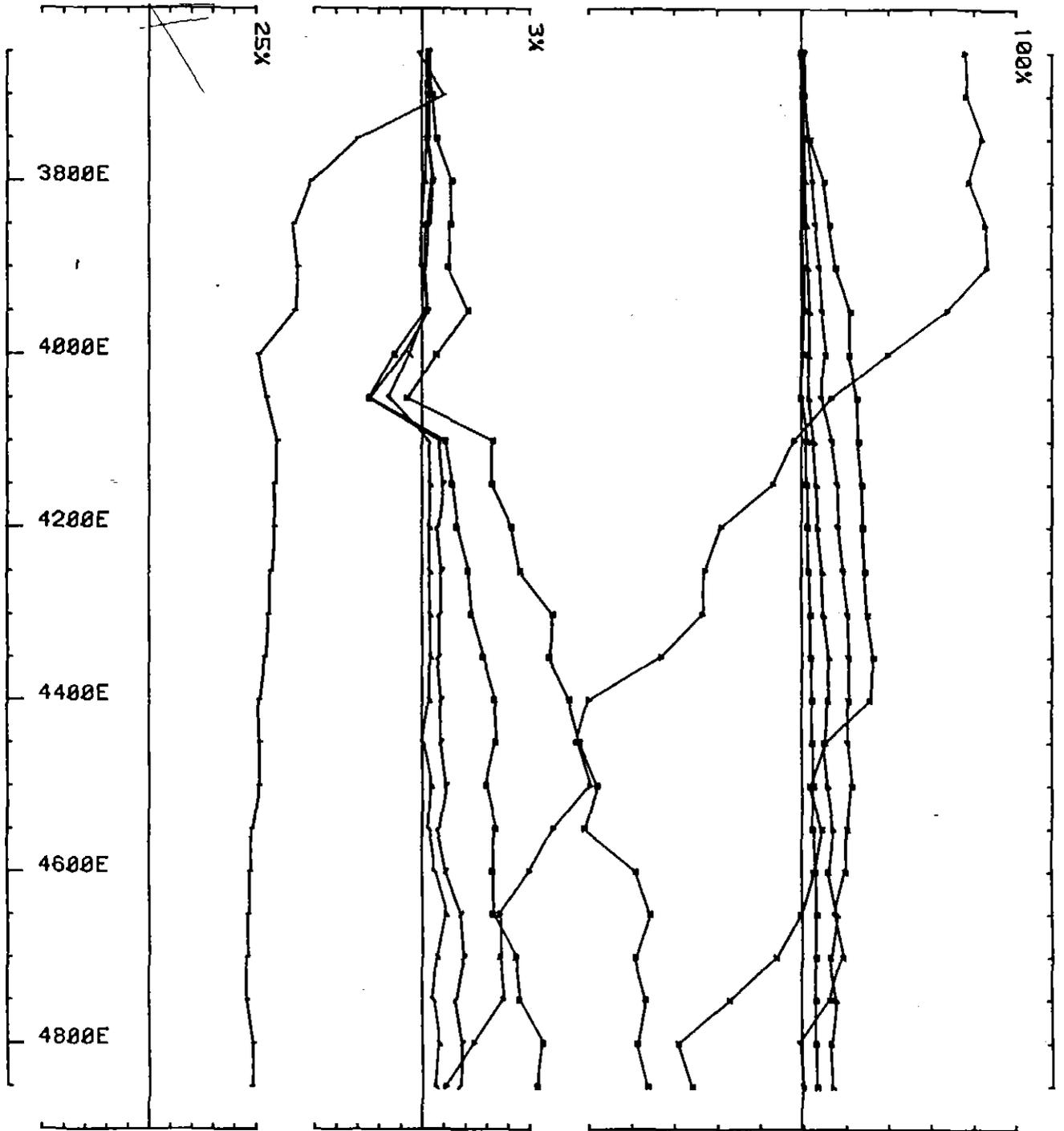
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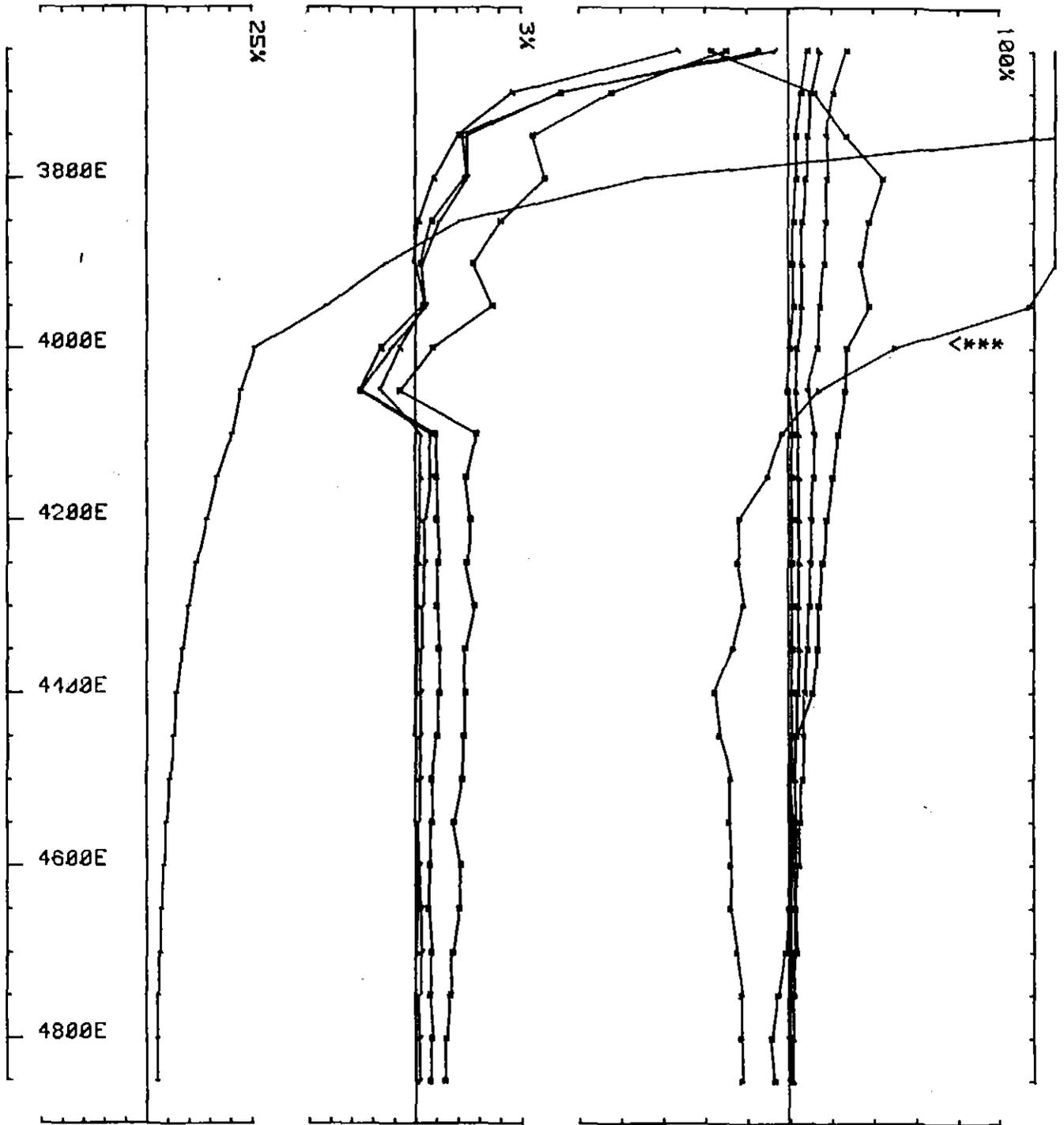
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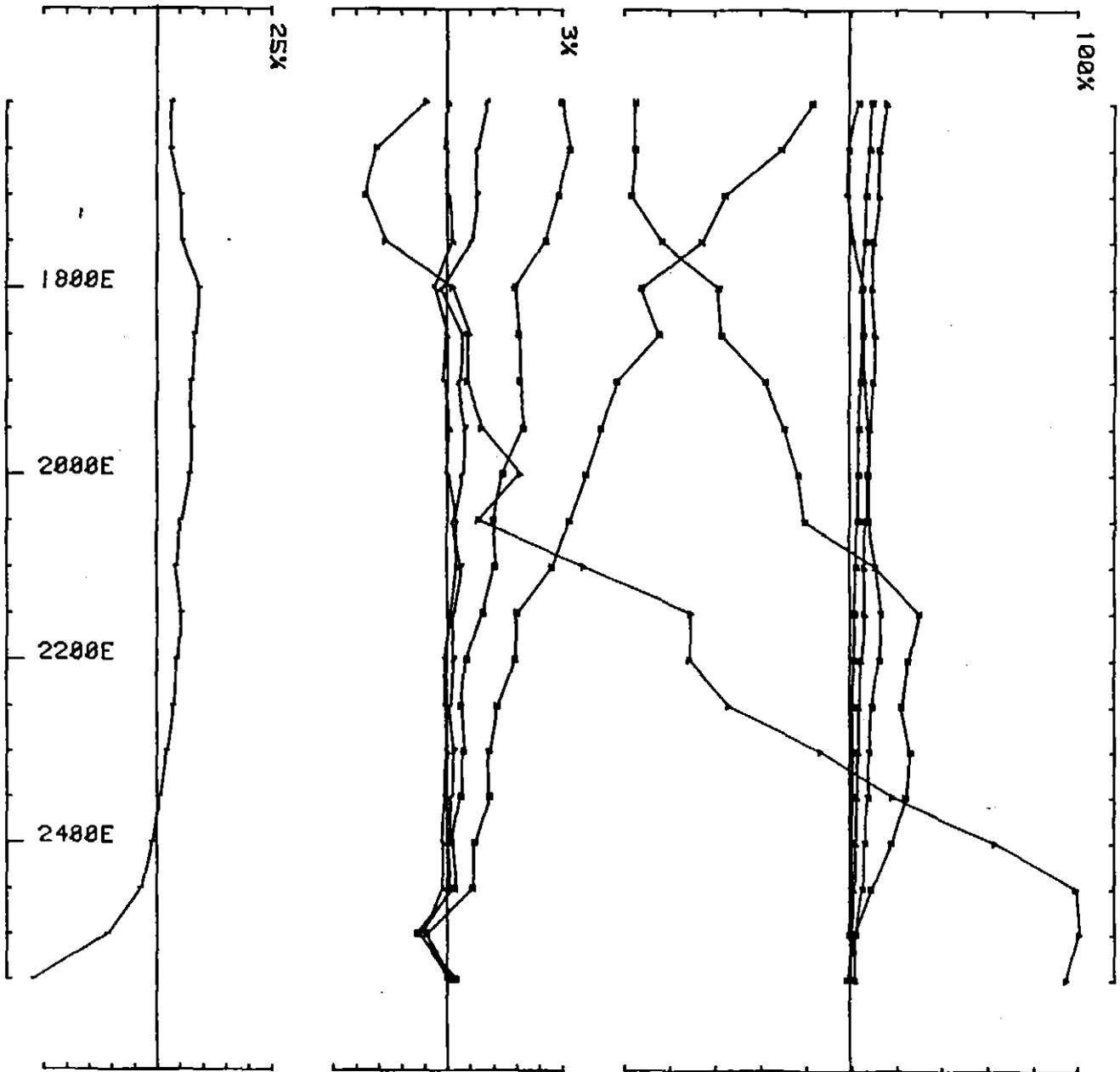
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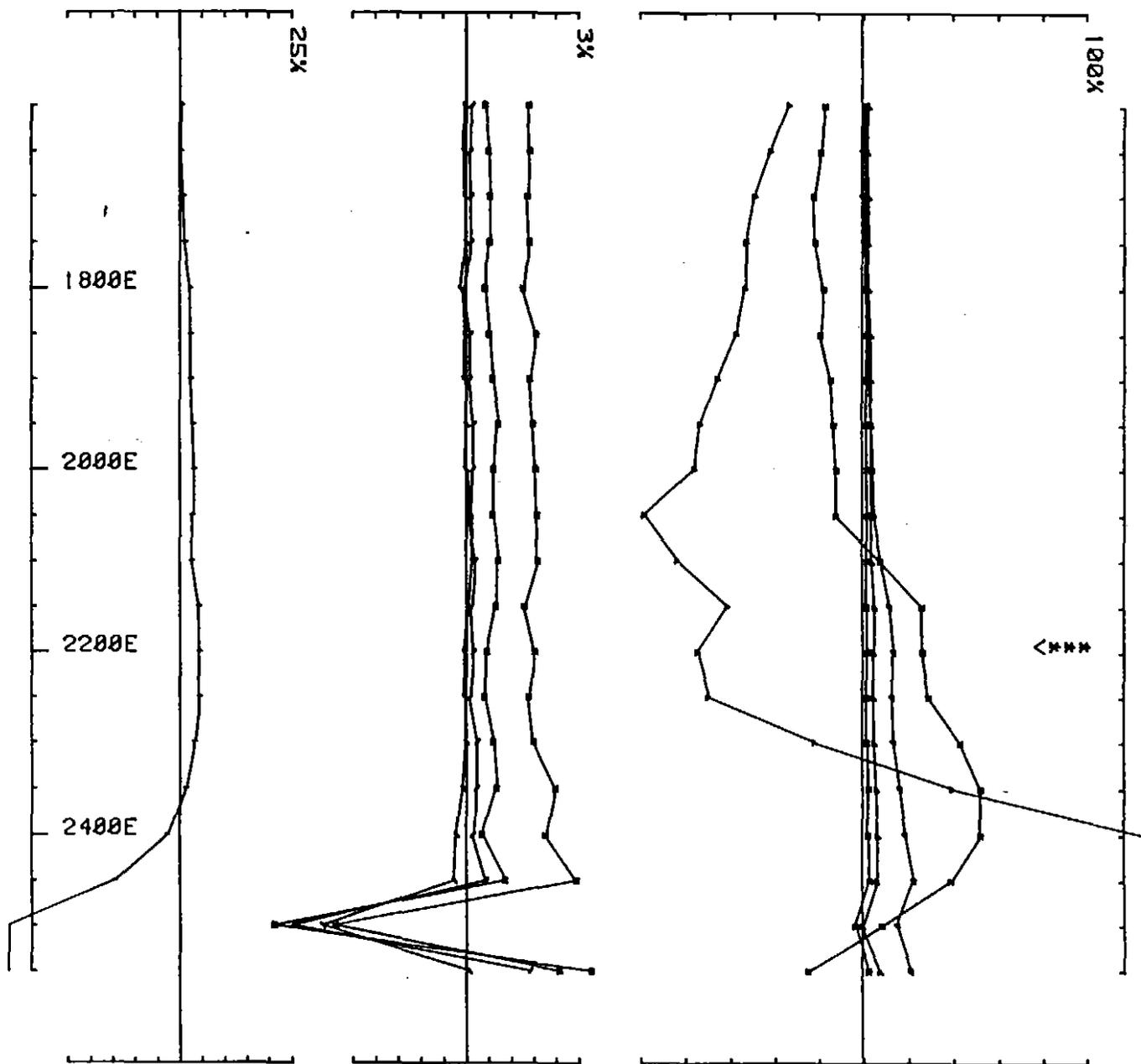
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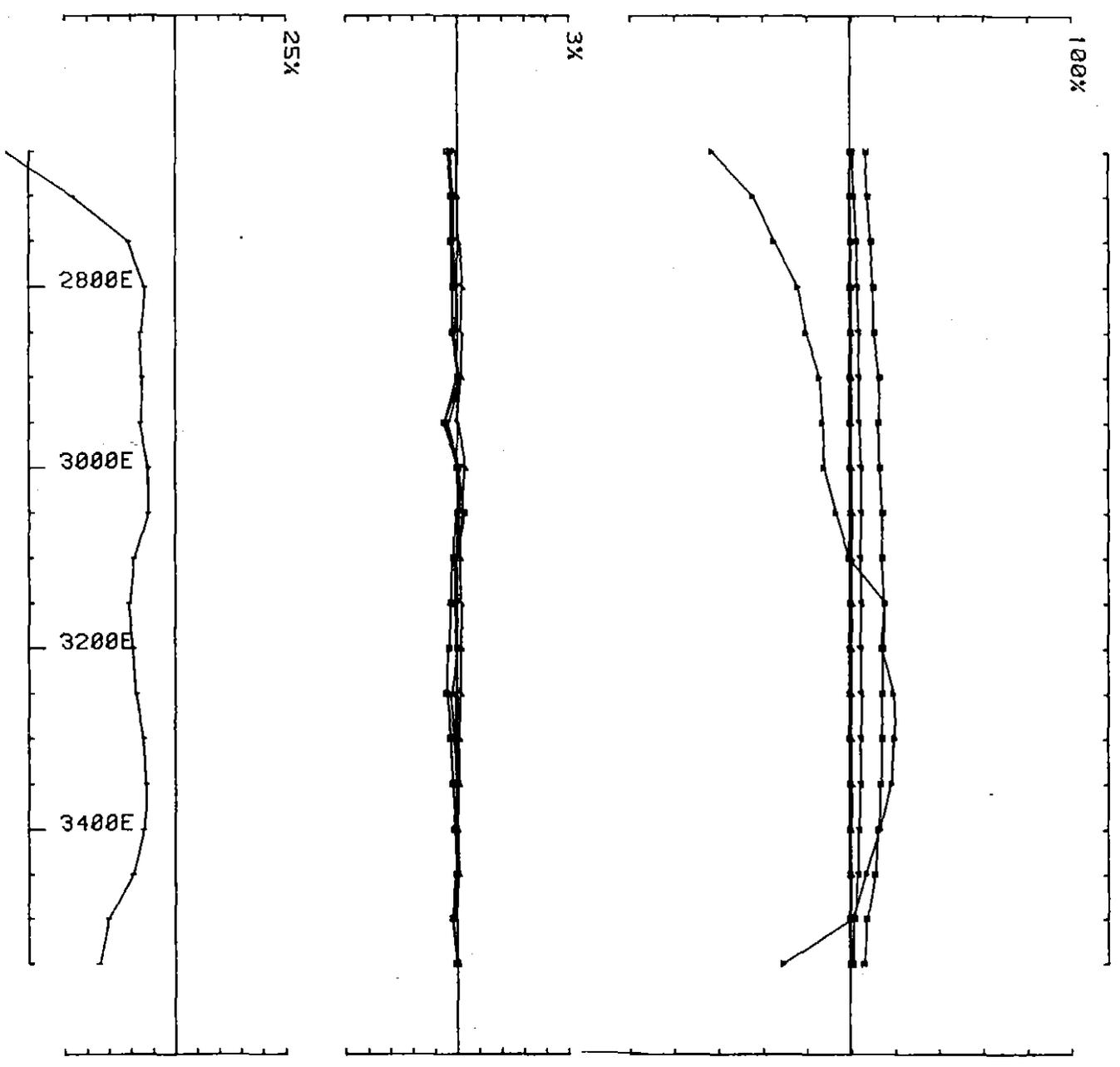
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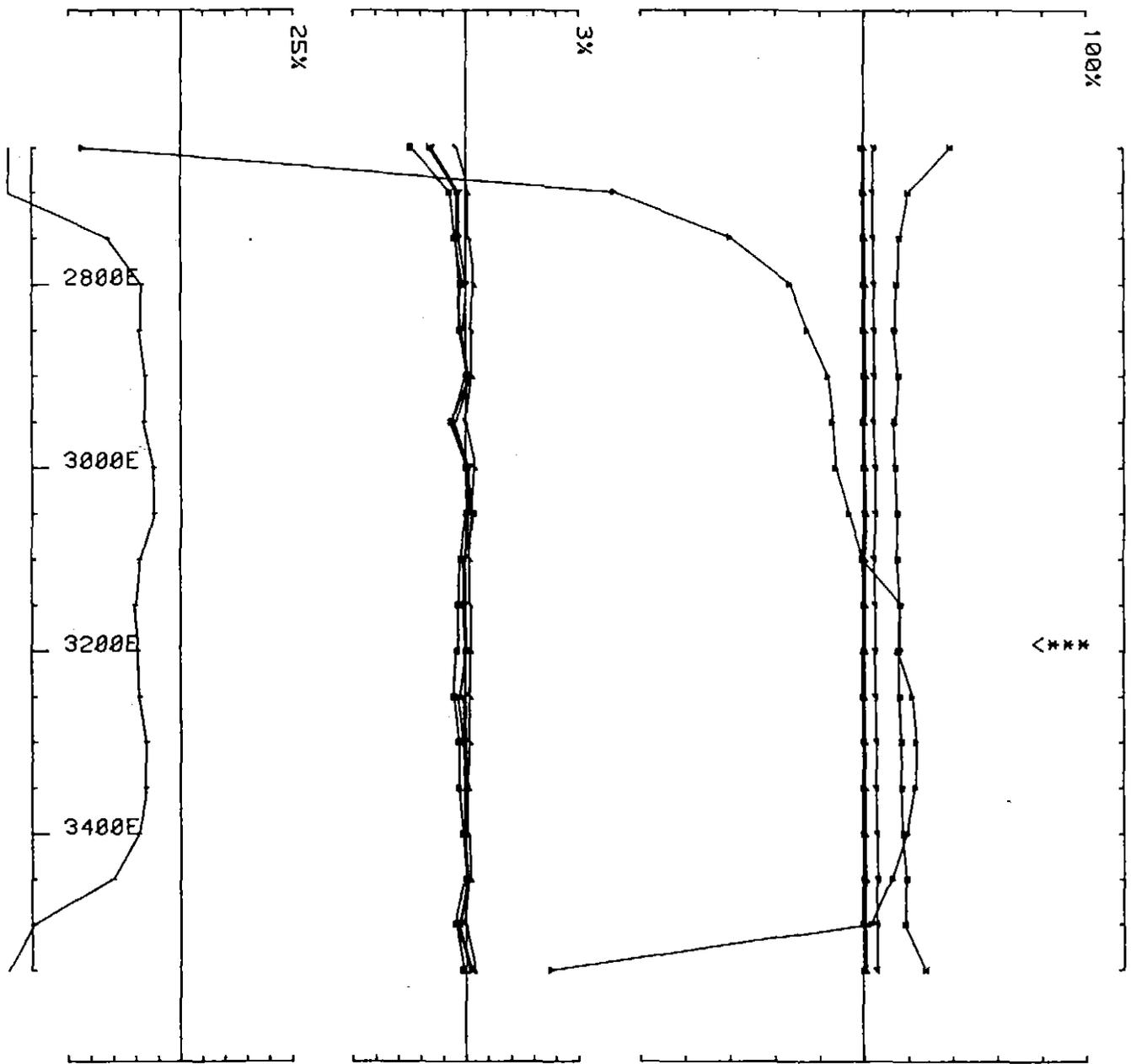
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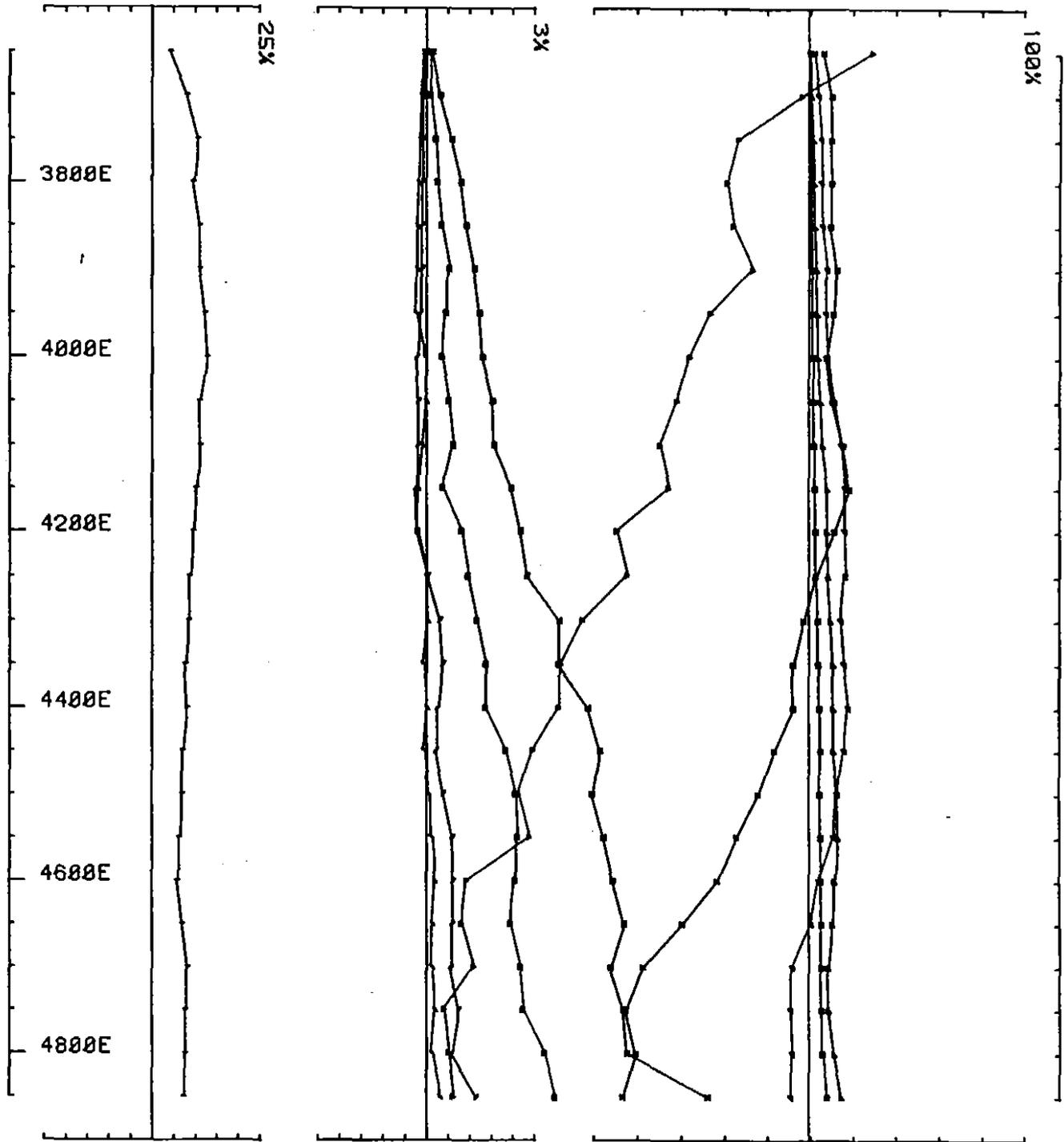
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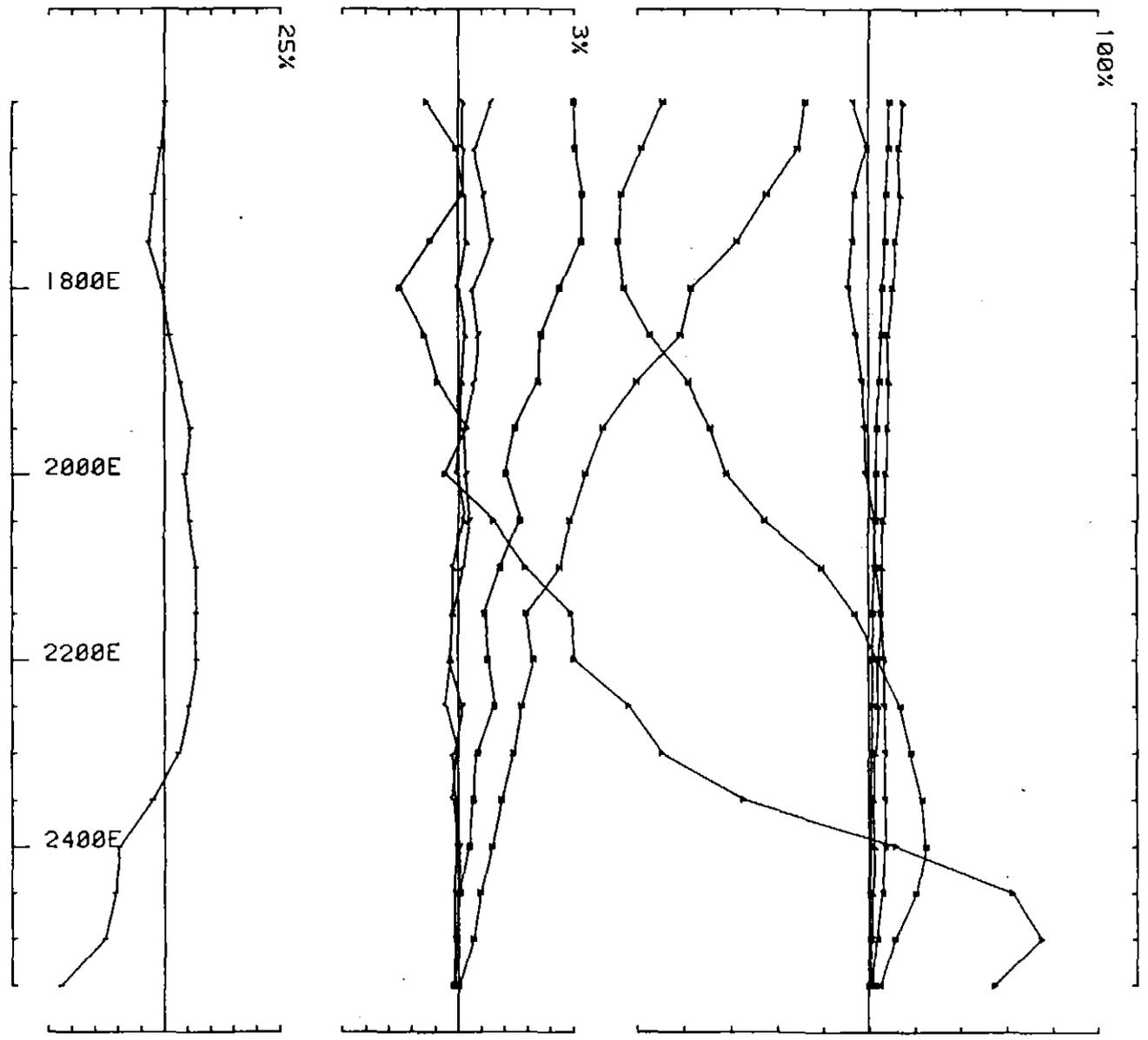
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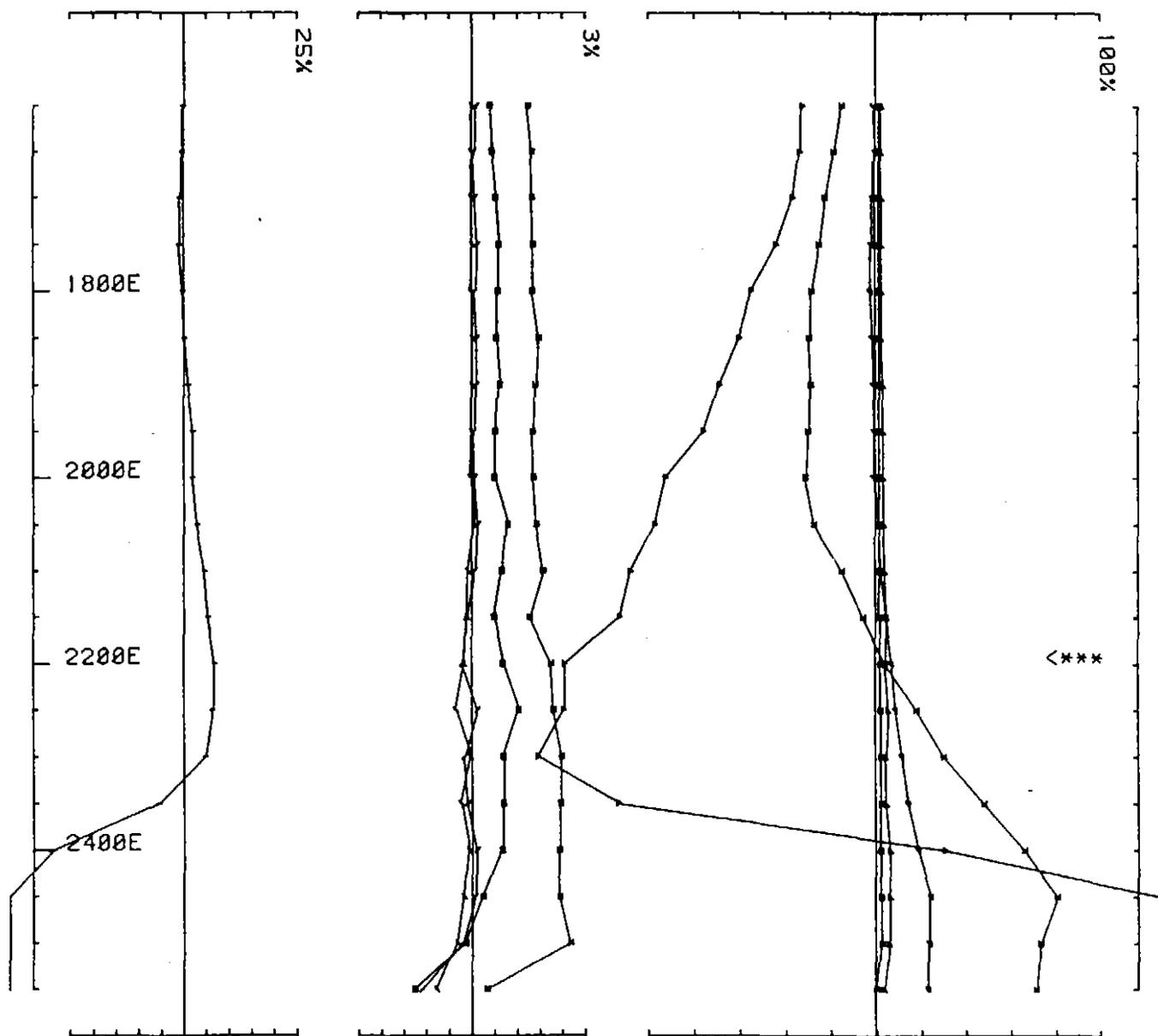
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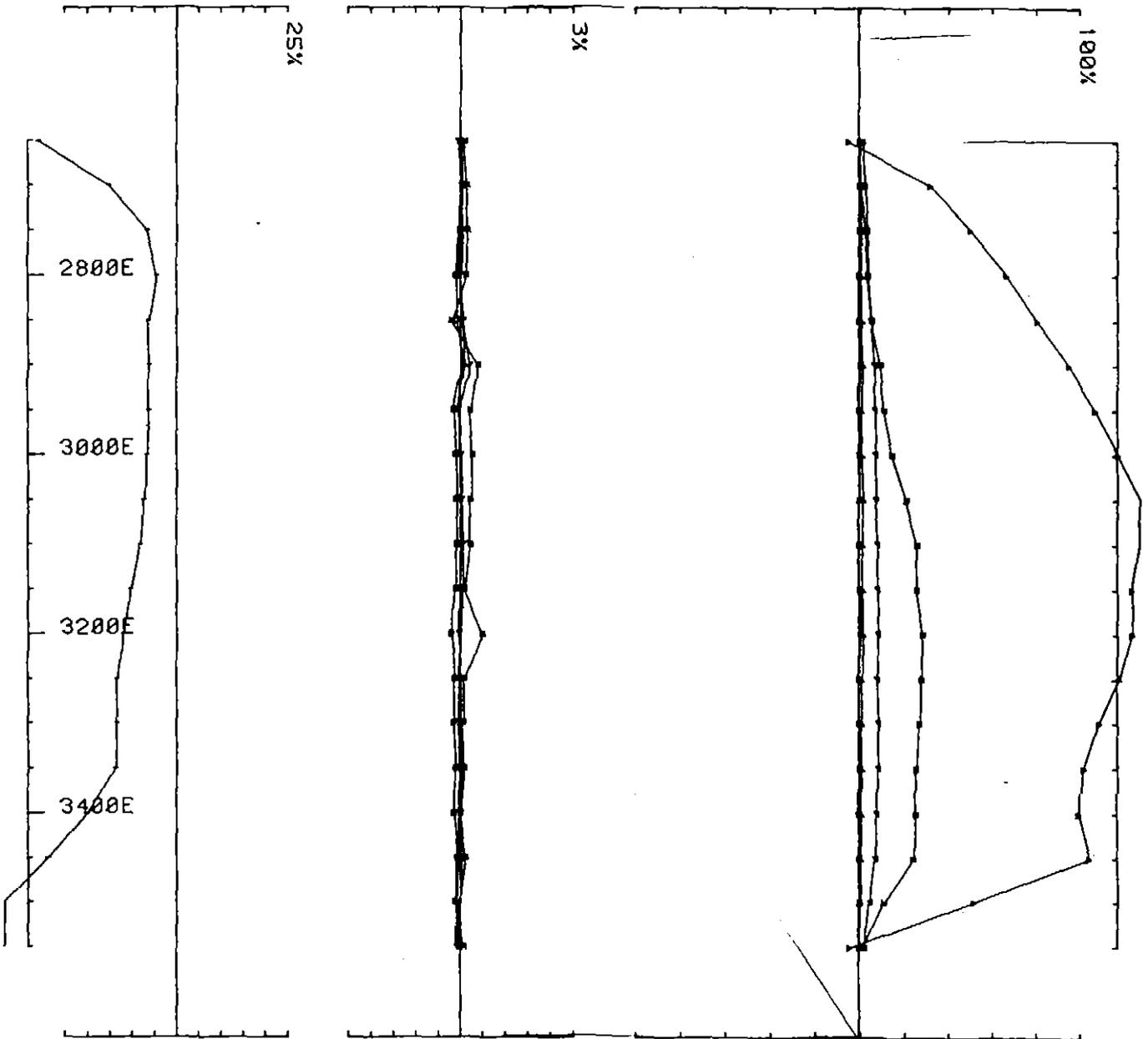
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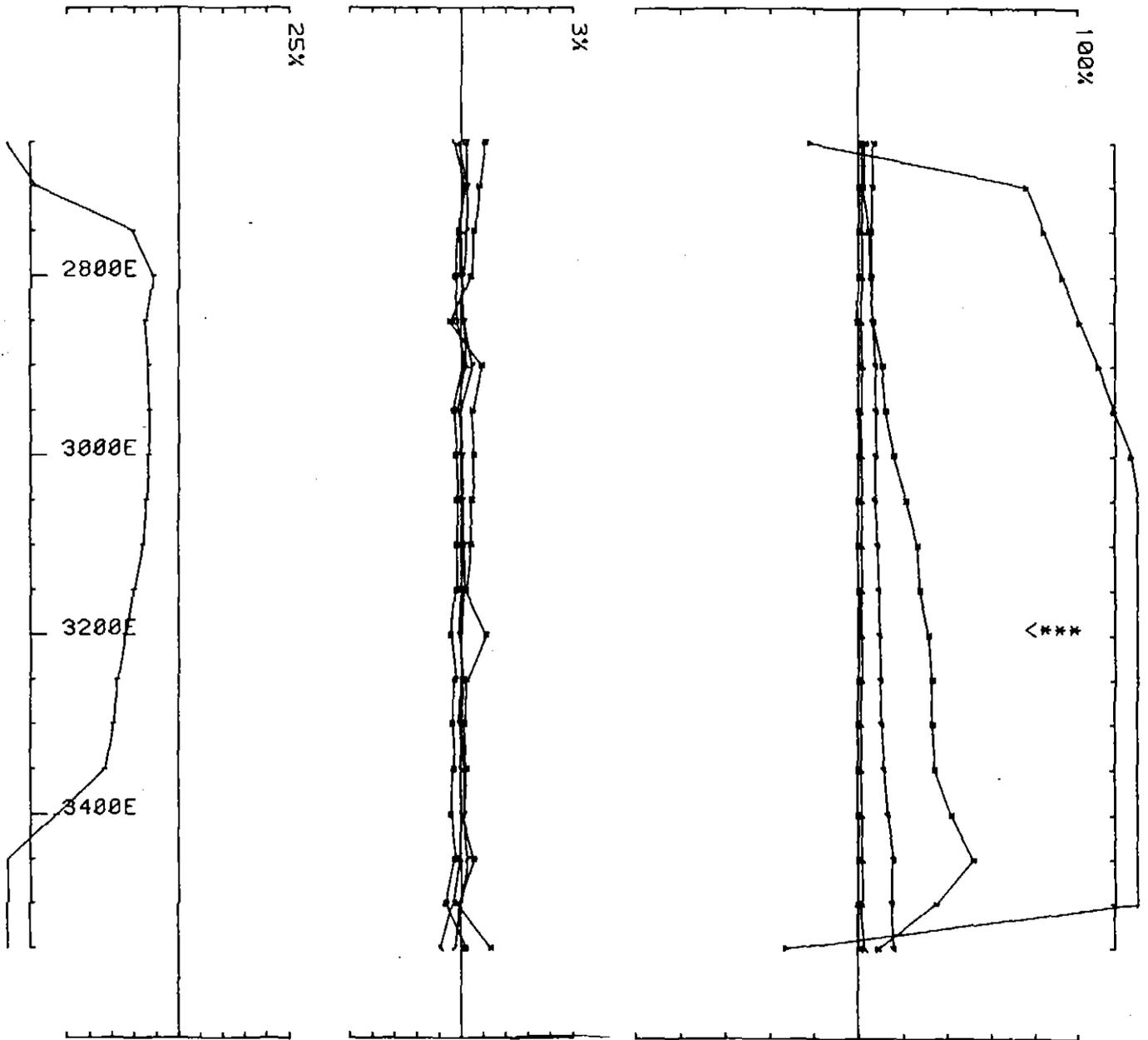
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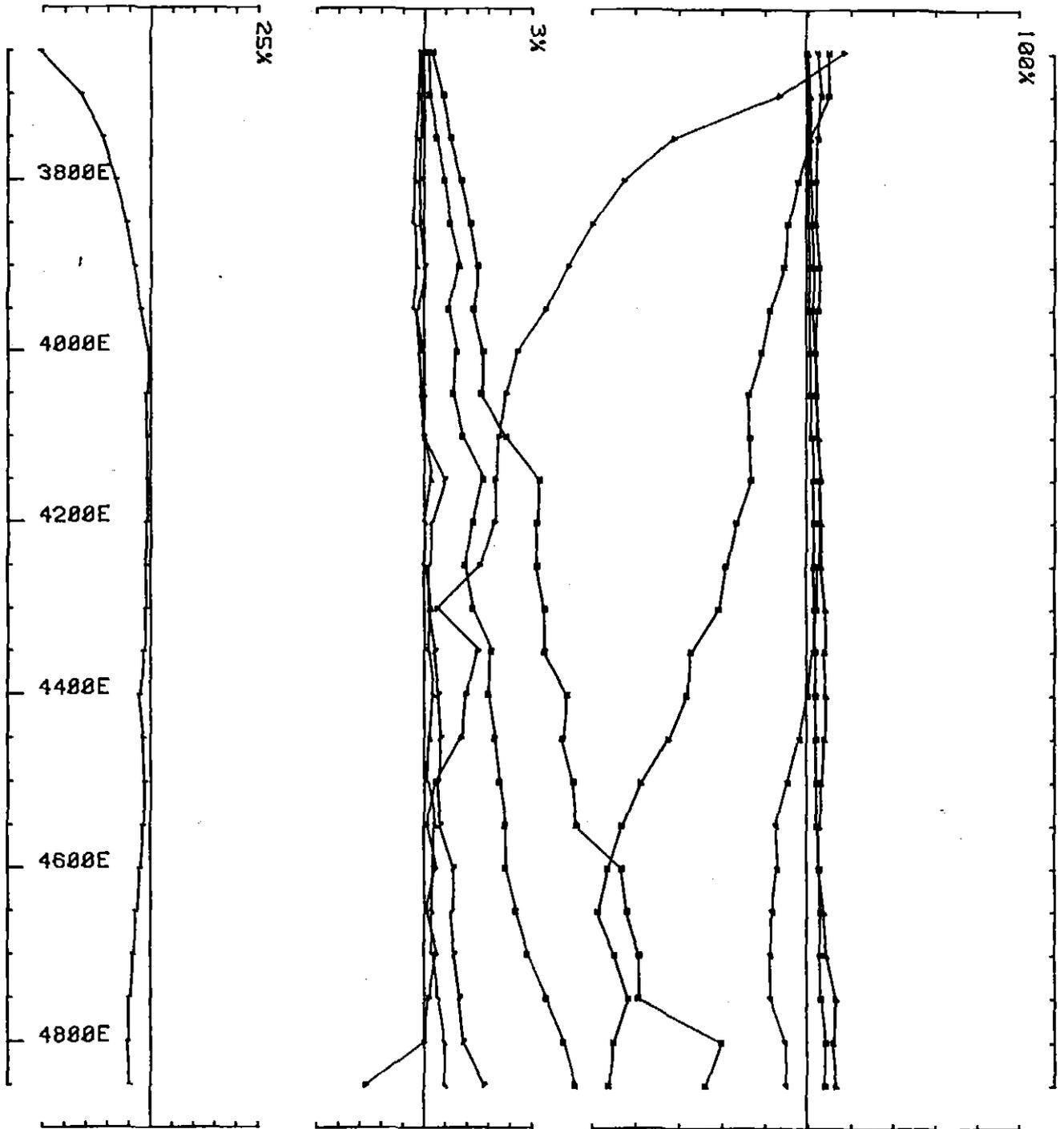
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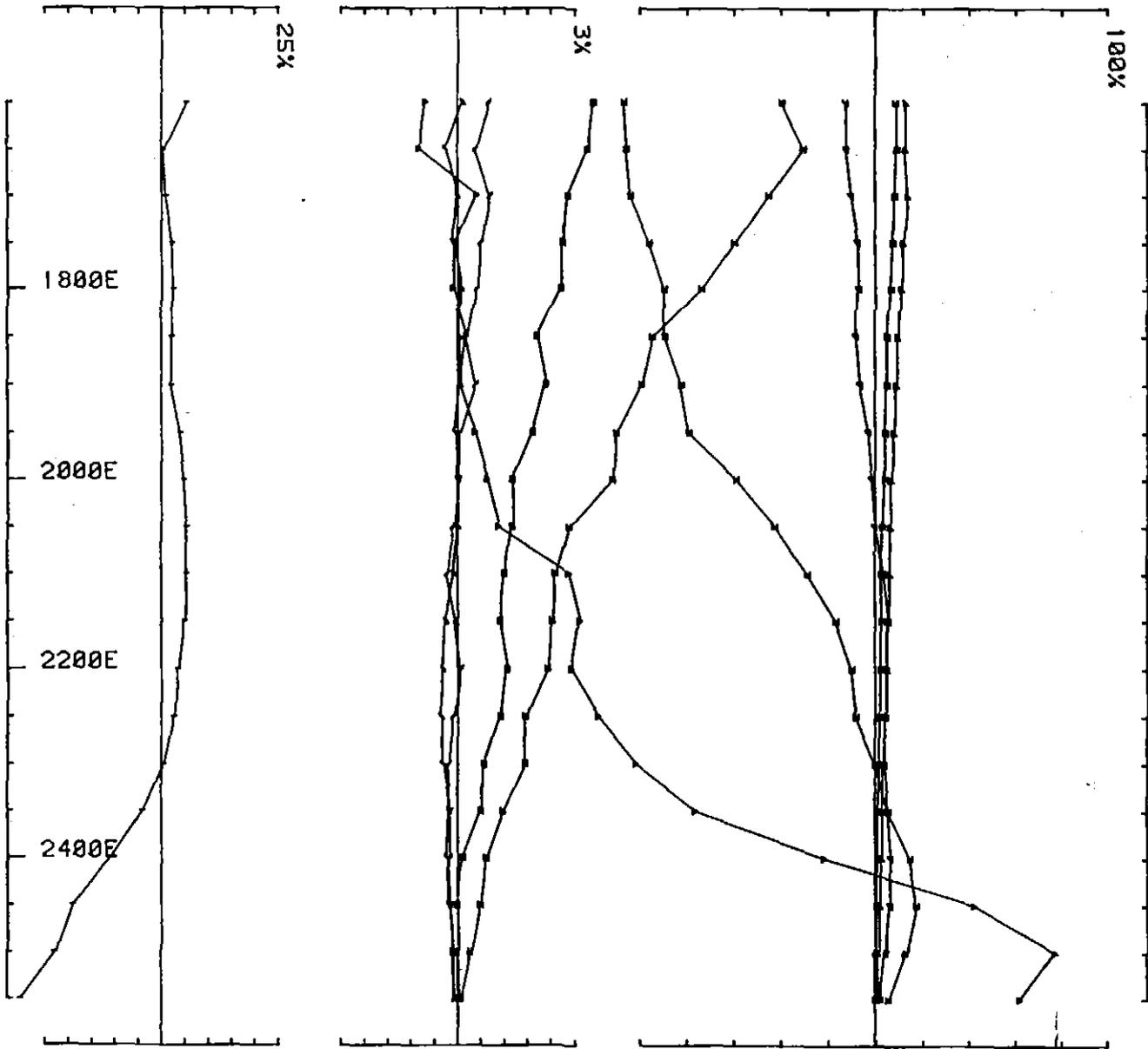
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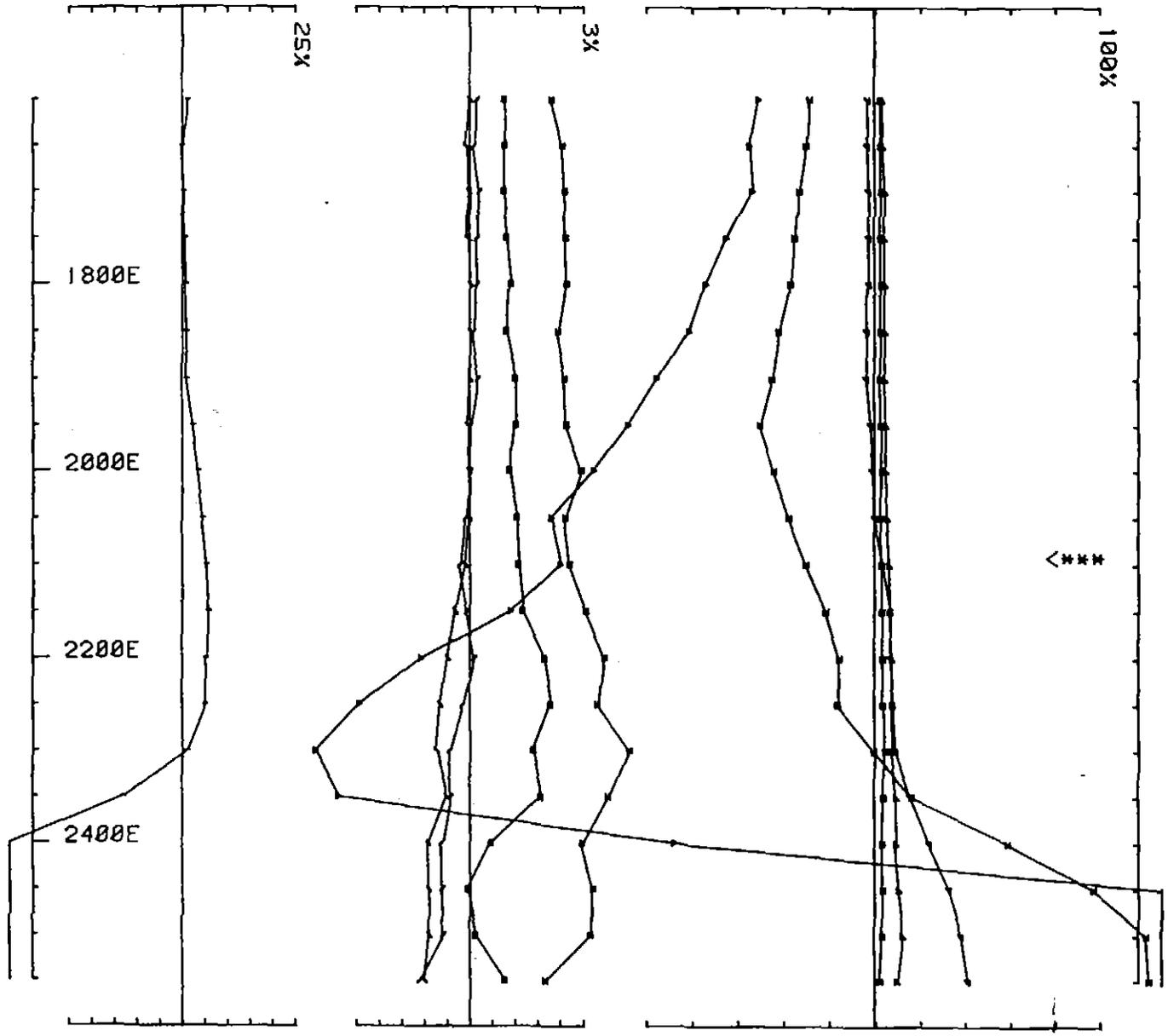
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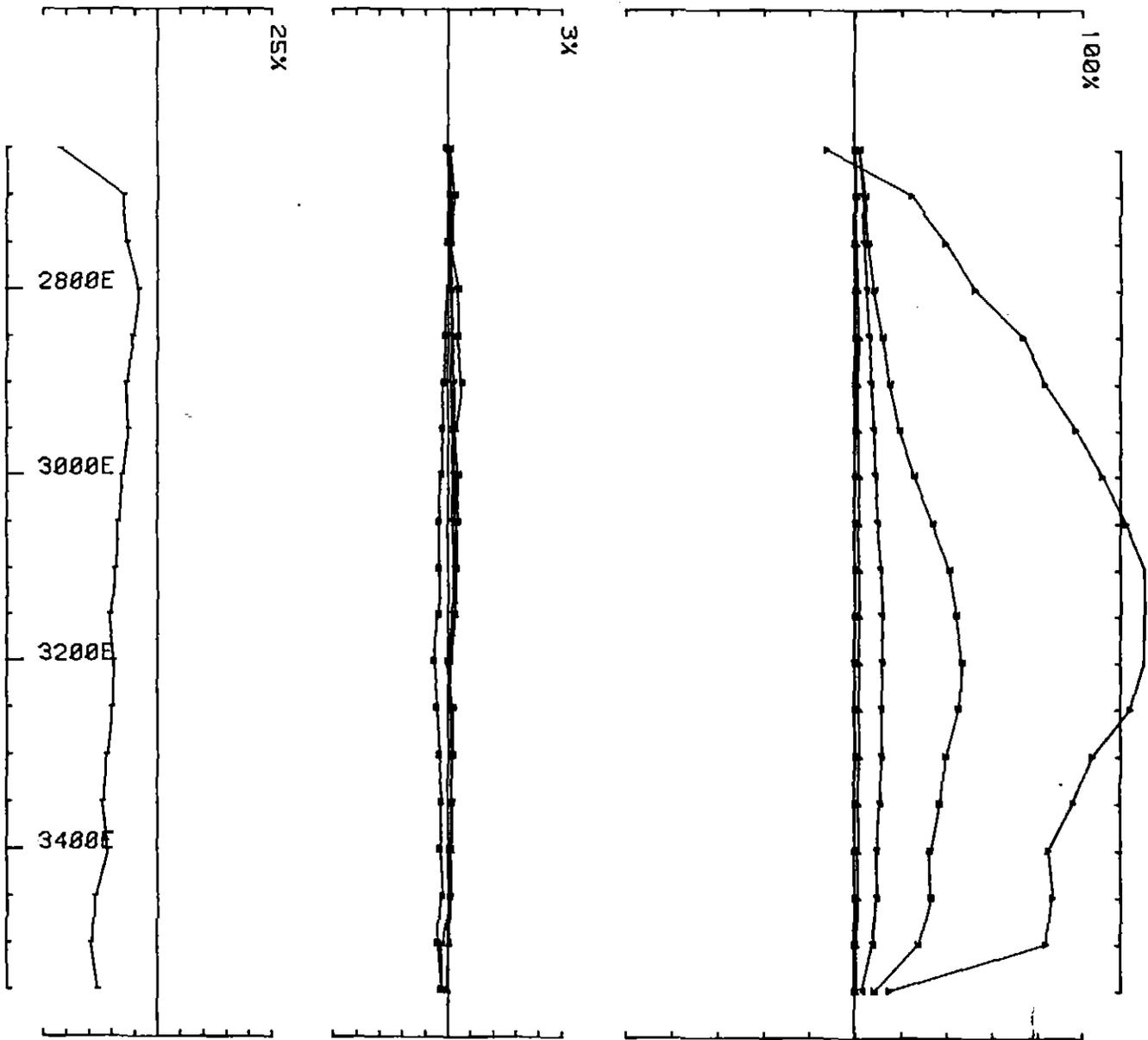
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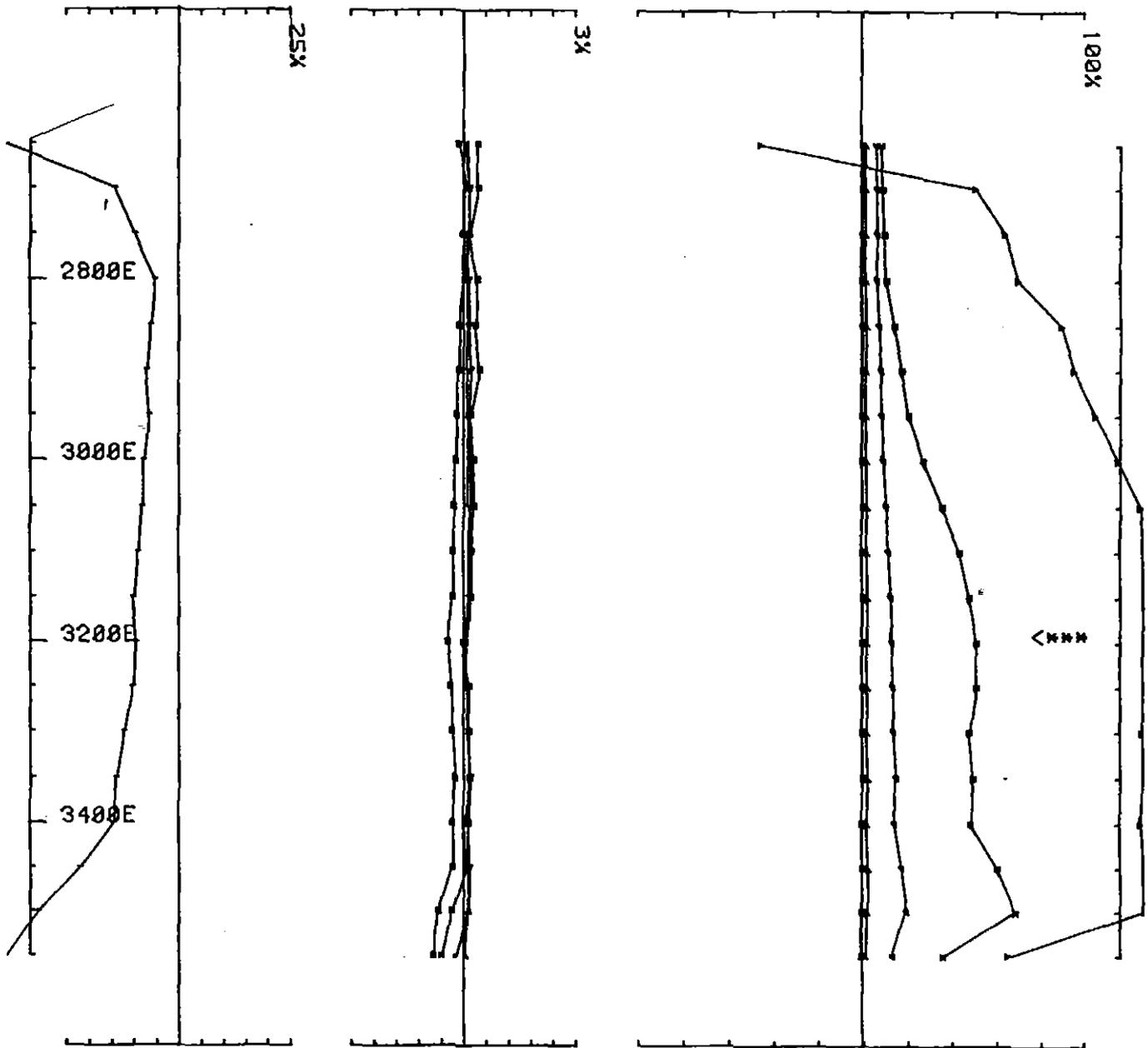
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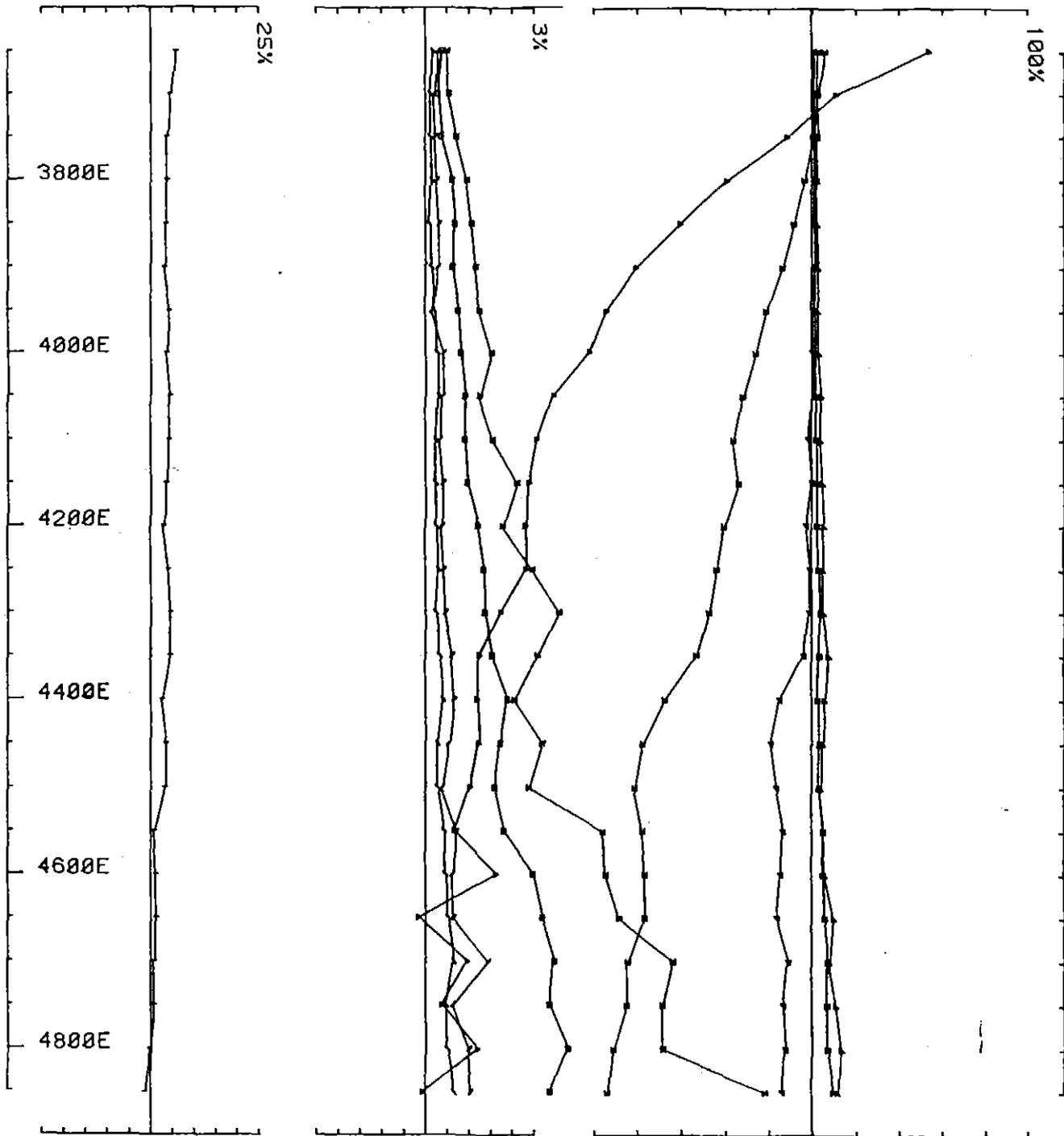
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UTEM SURVEY at GARFIELD PROJECT for BHP-UTAH MINERALS
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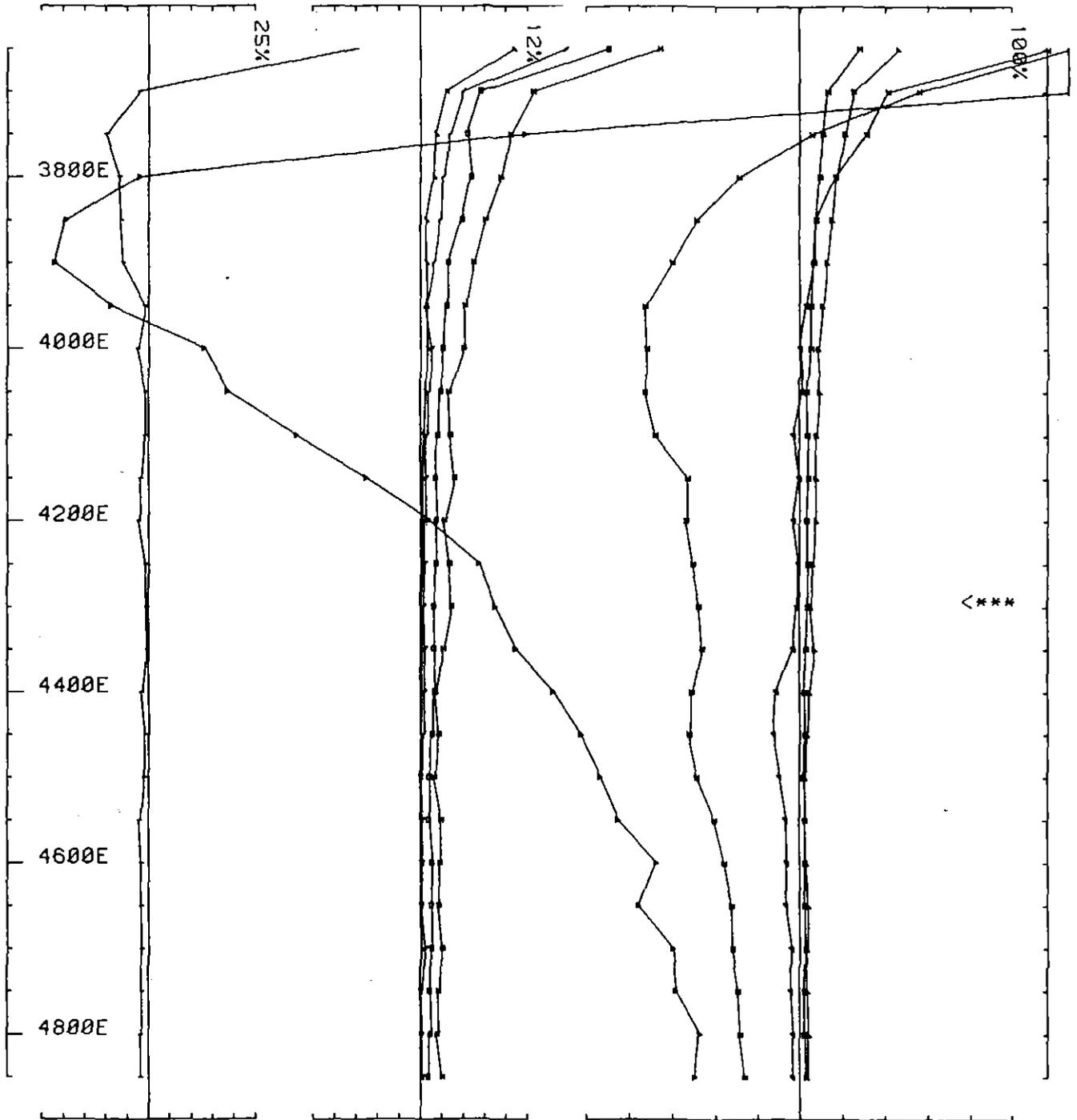
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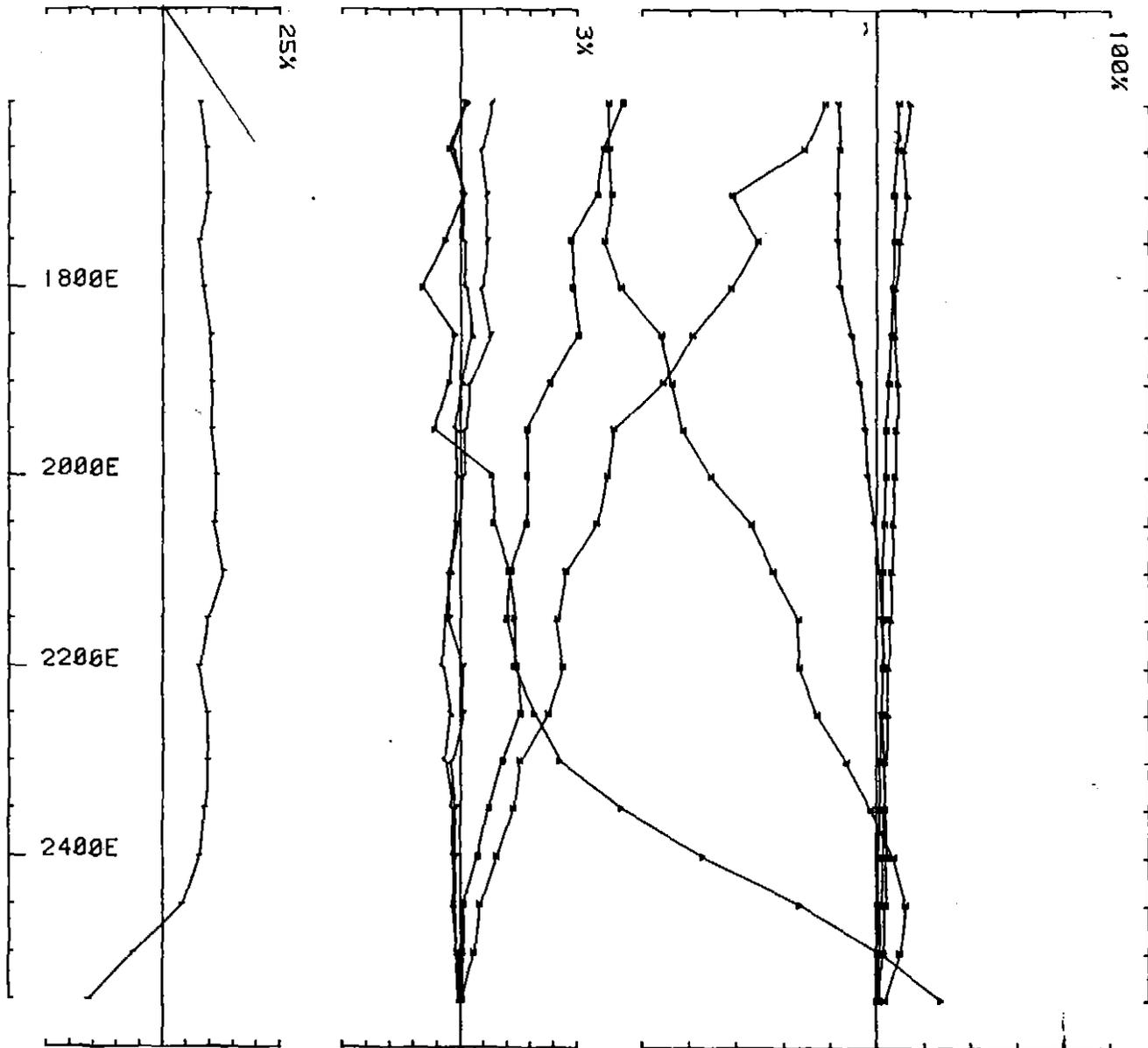
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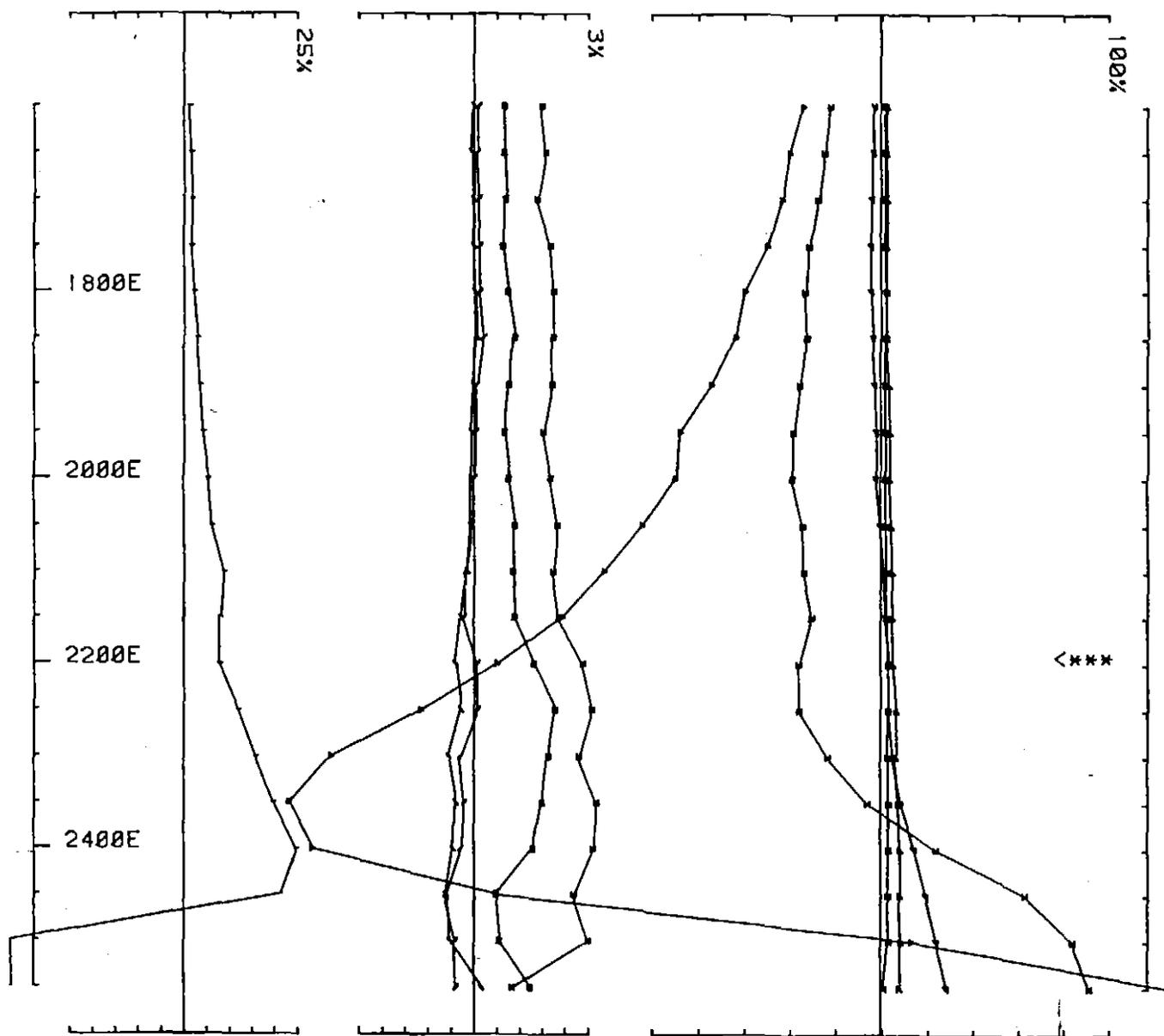
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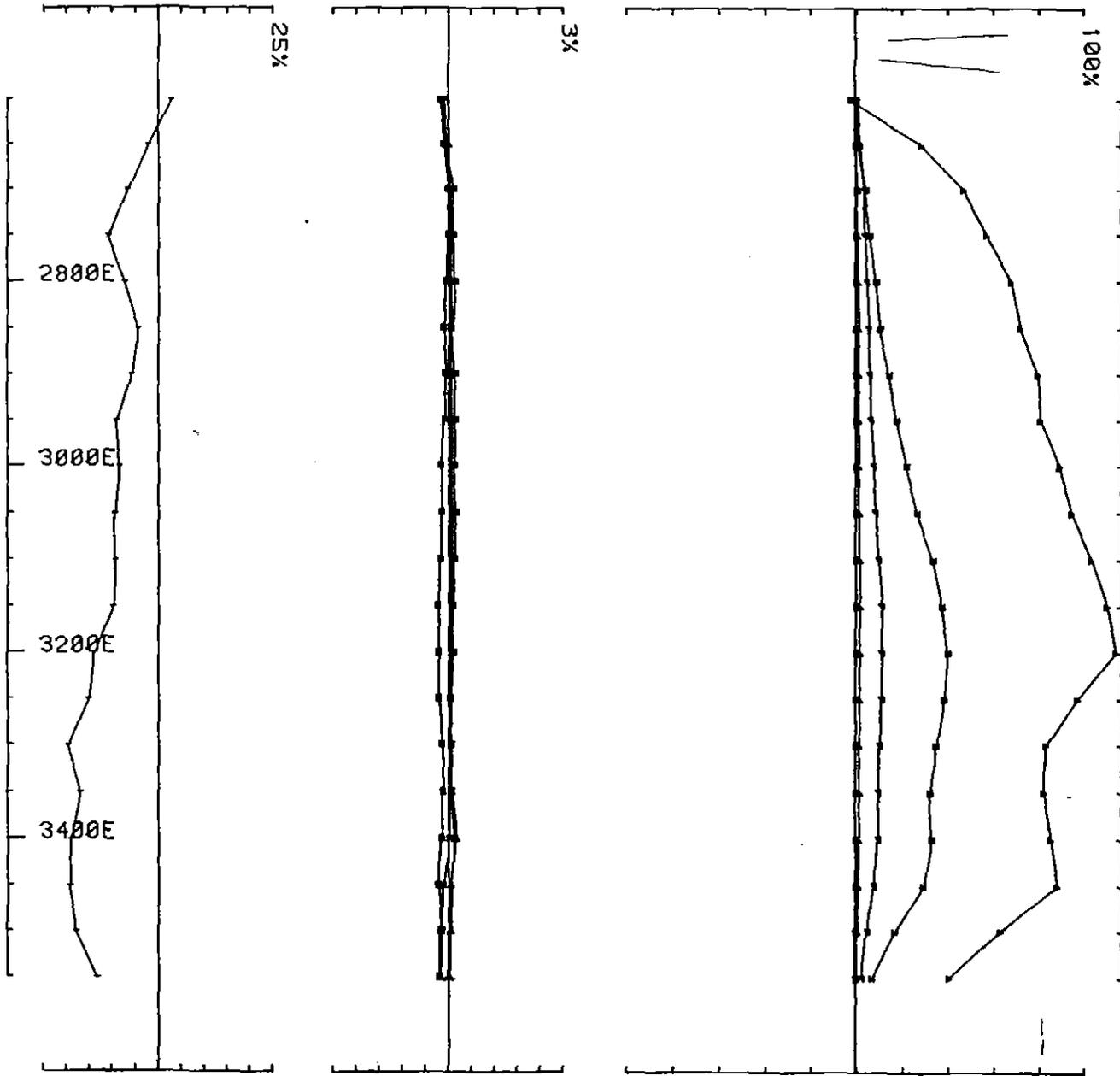
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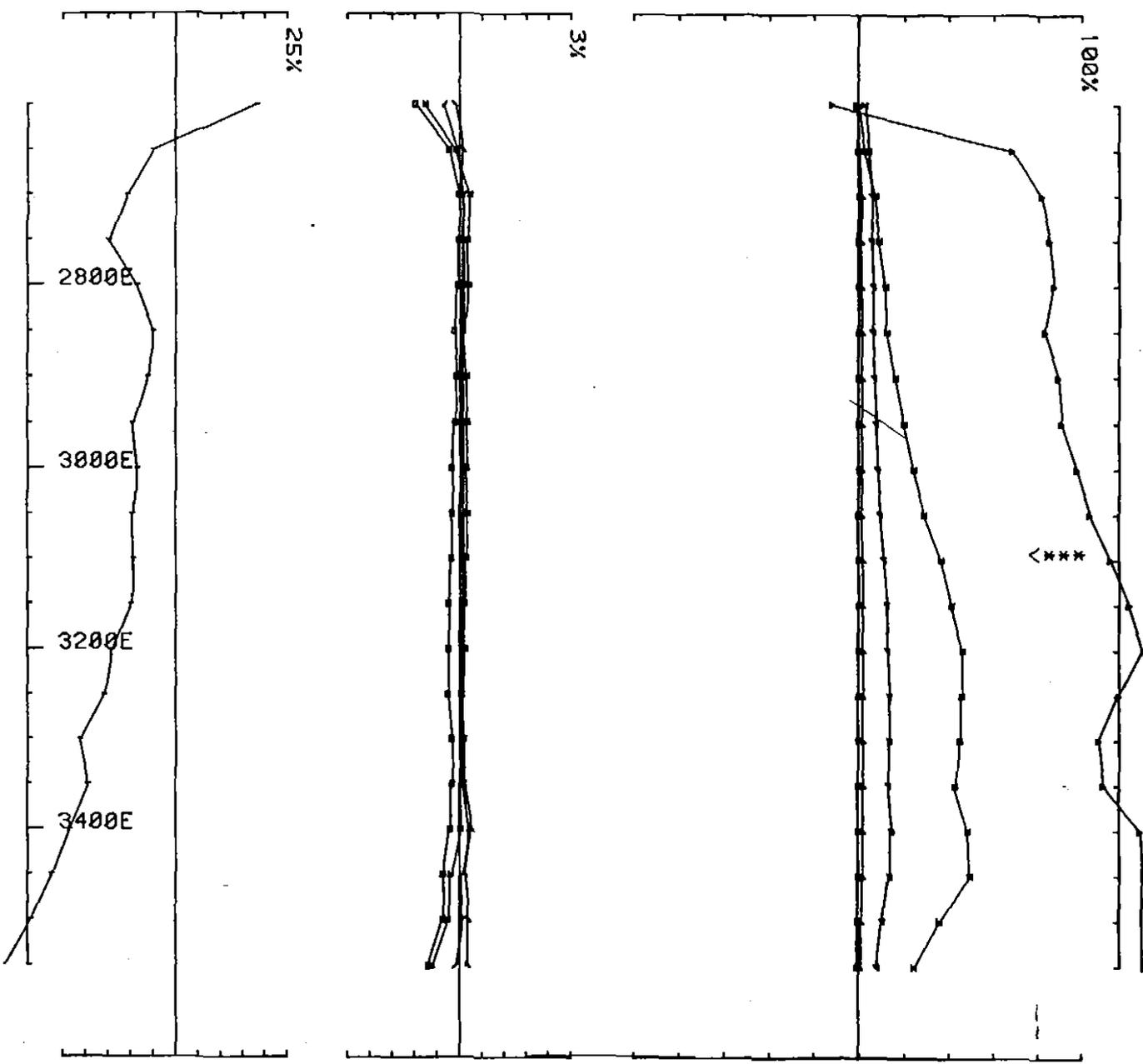
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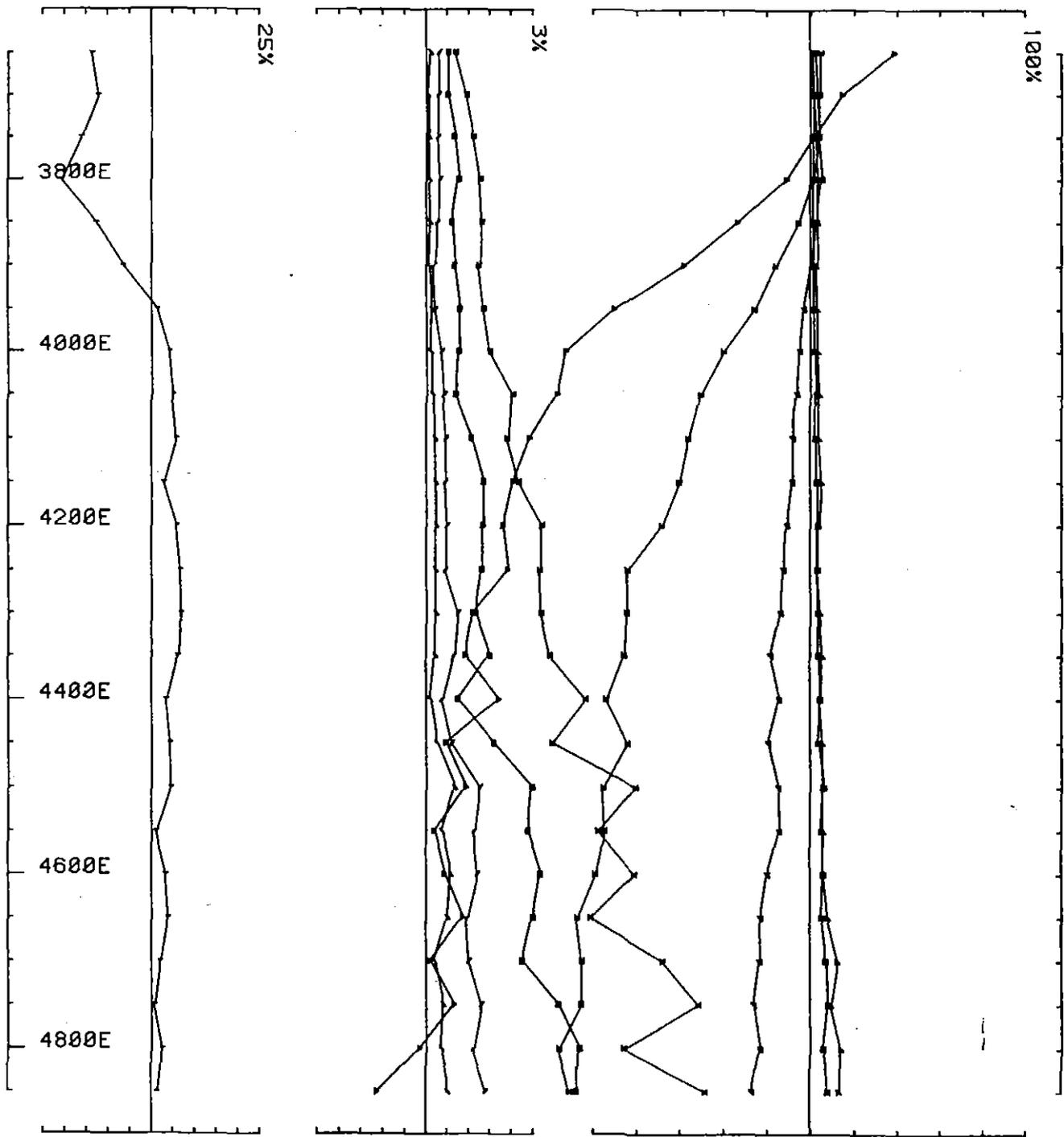
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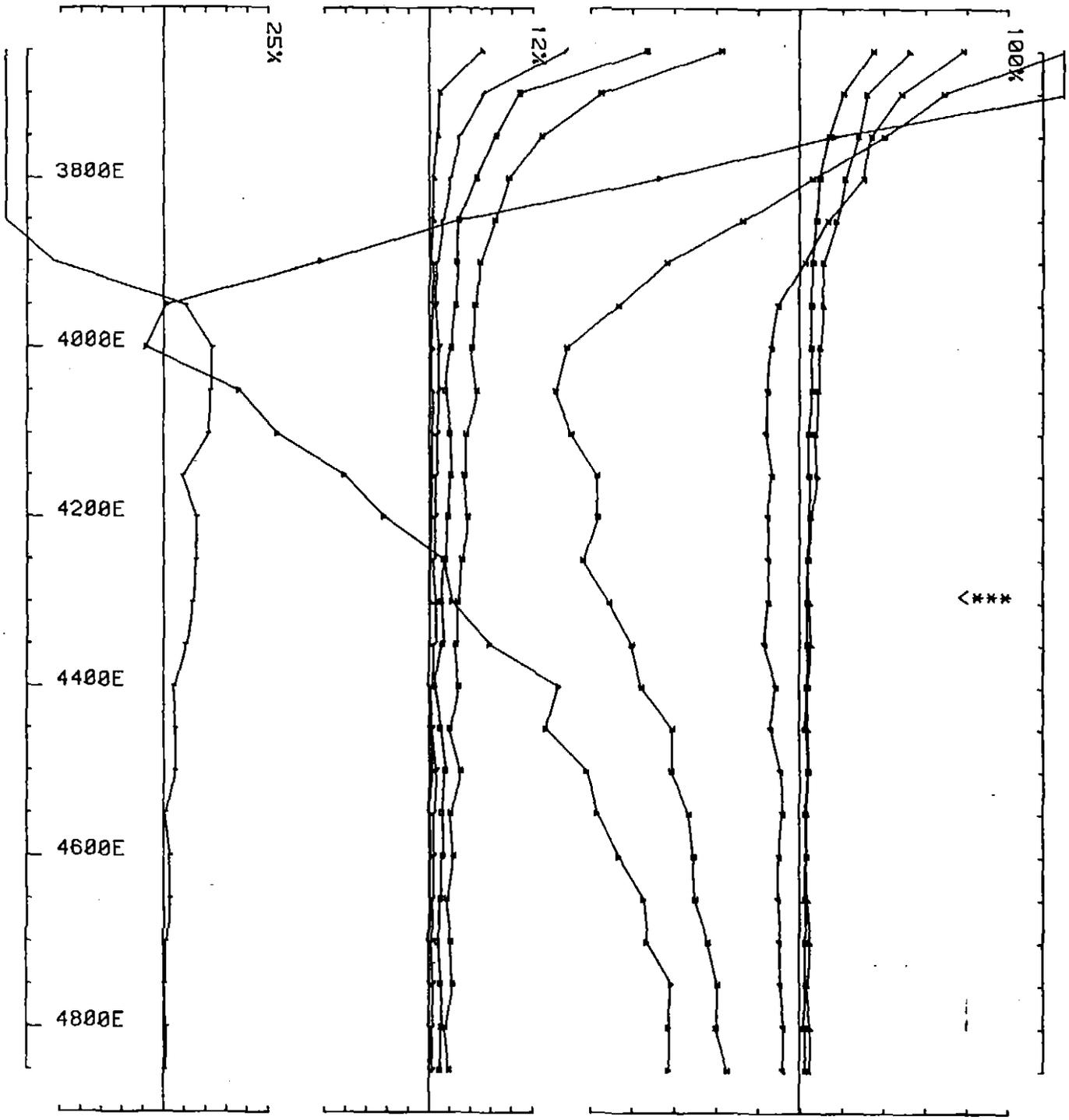
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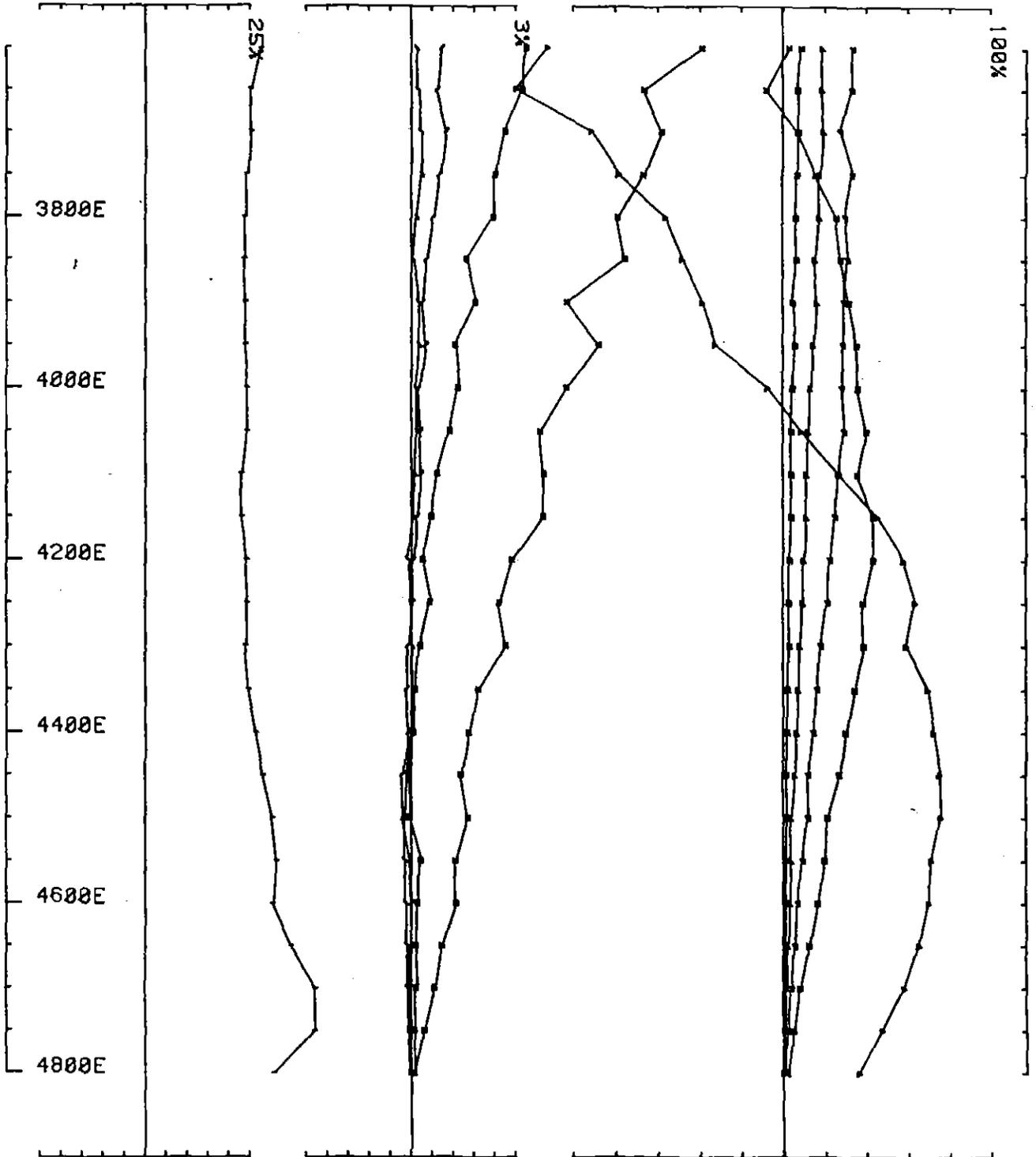
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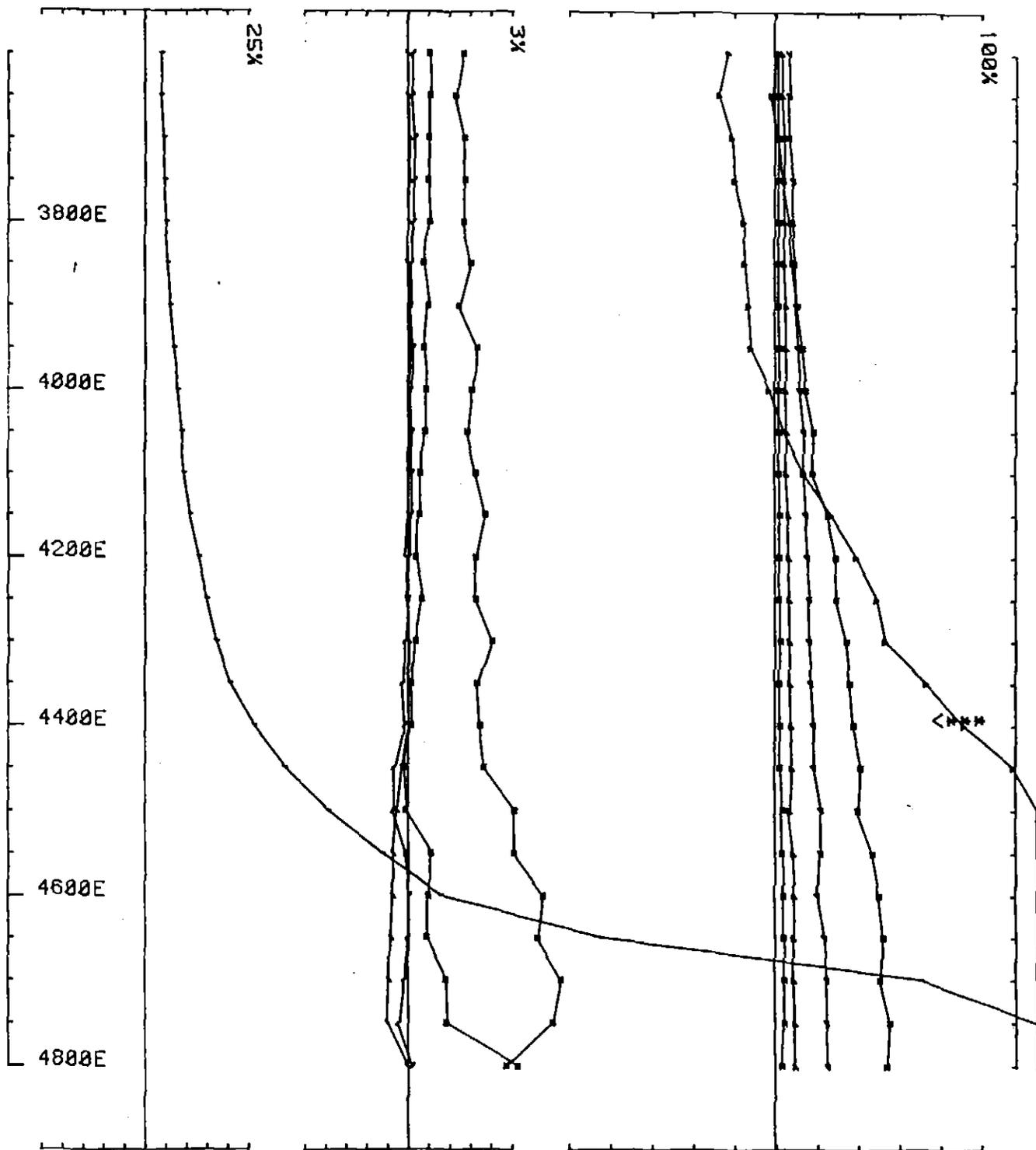
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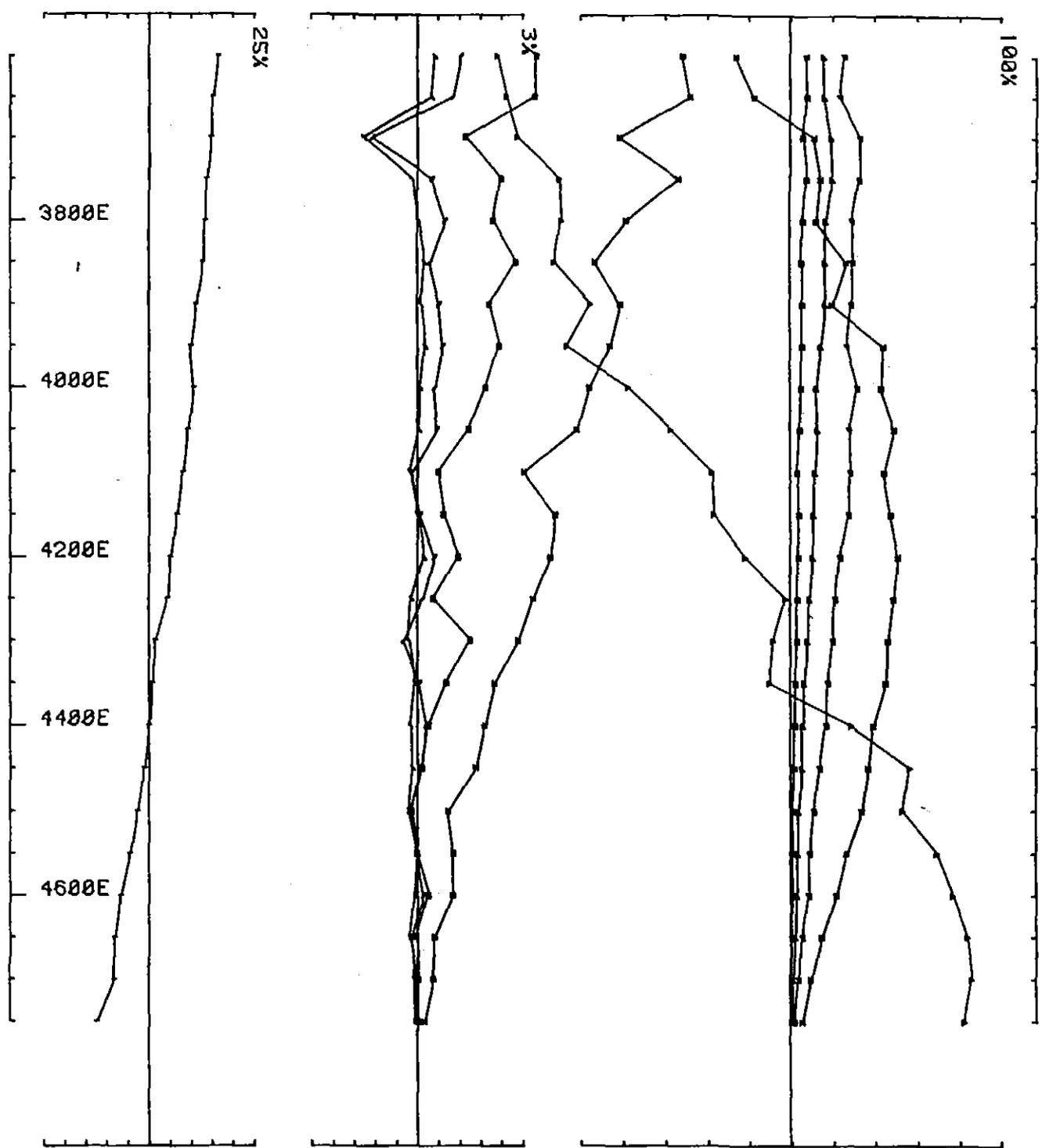
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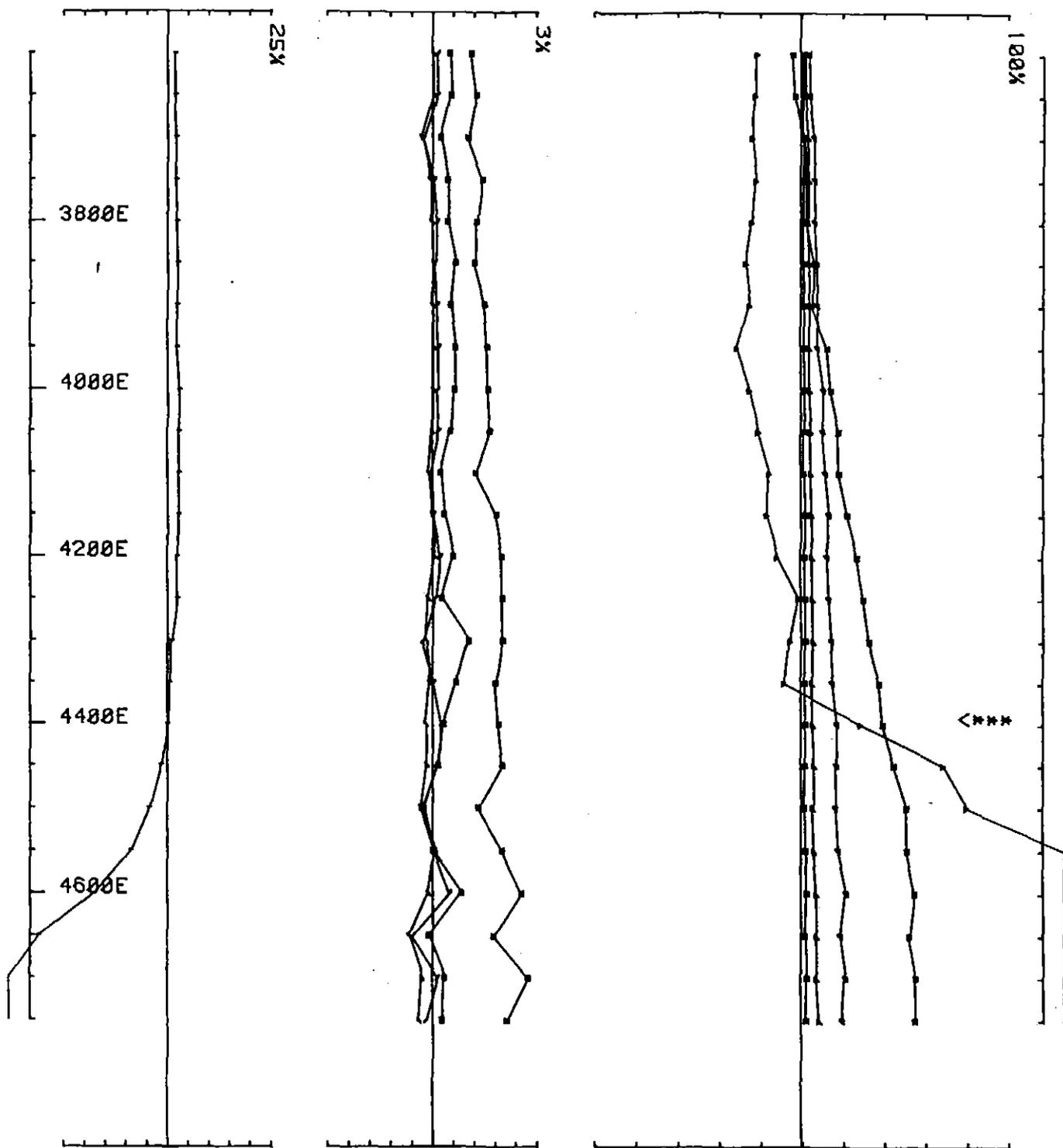
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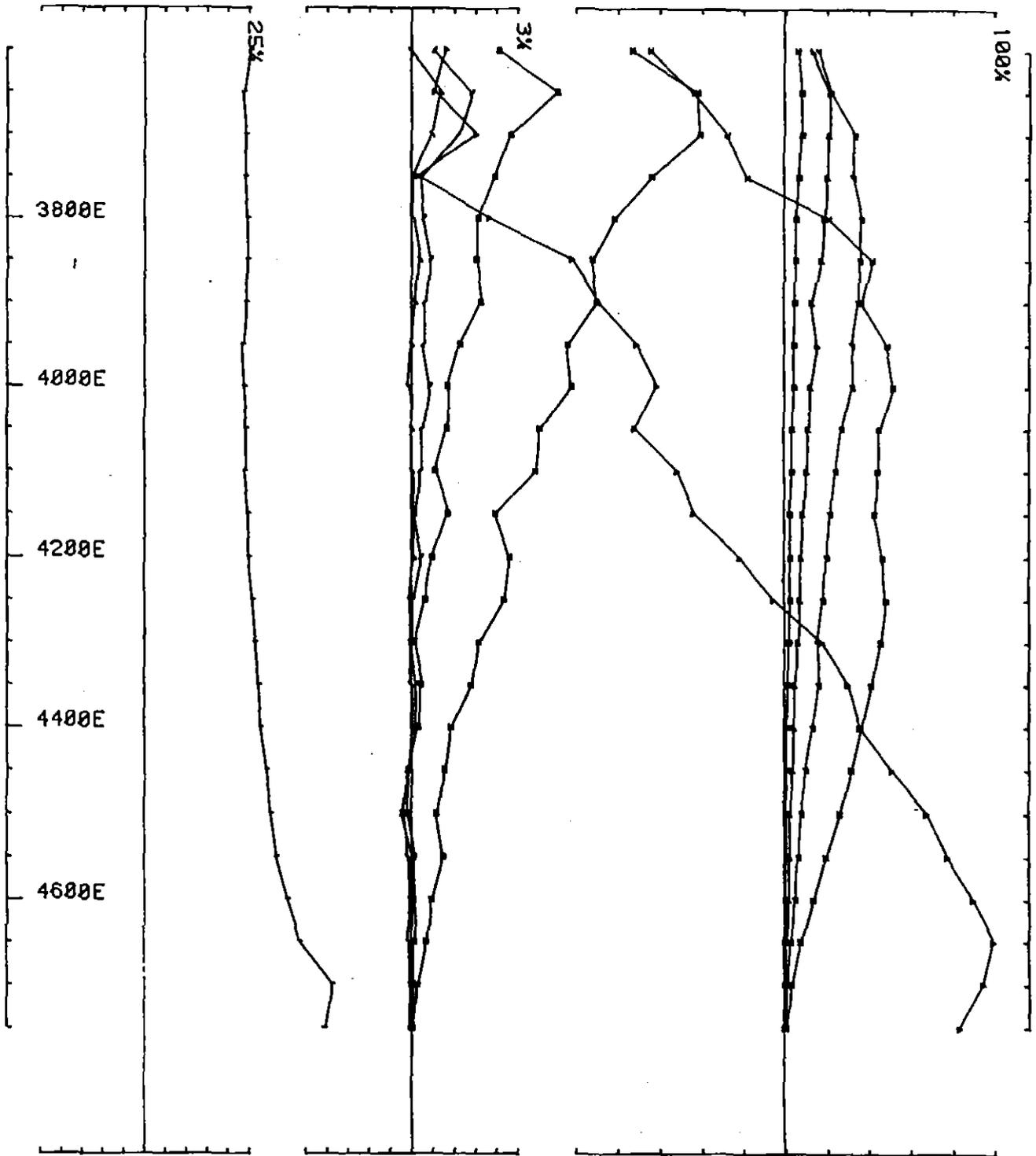
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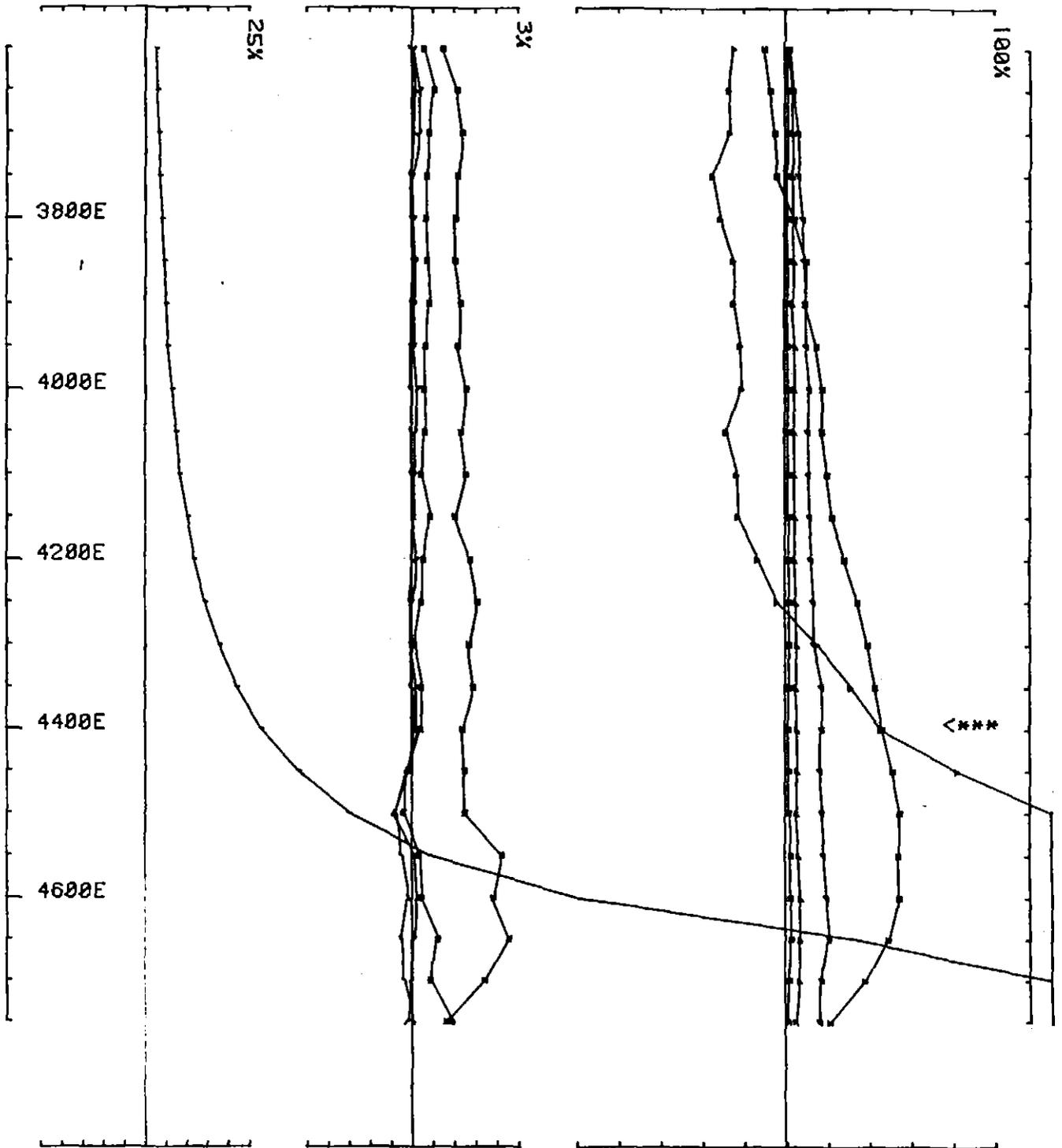
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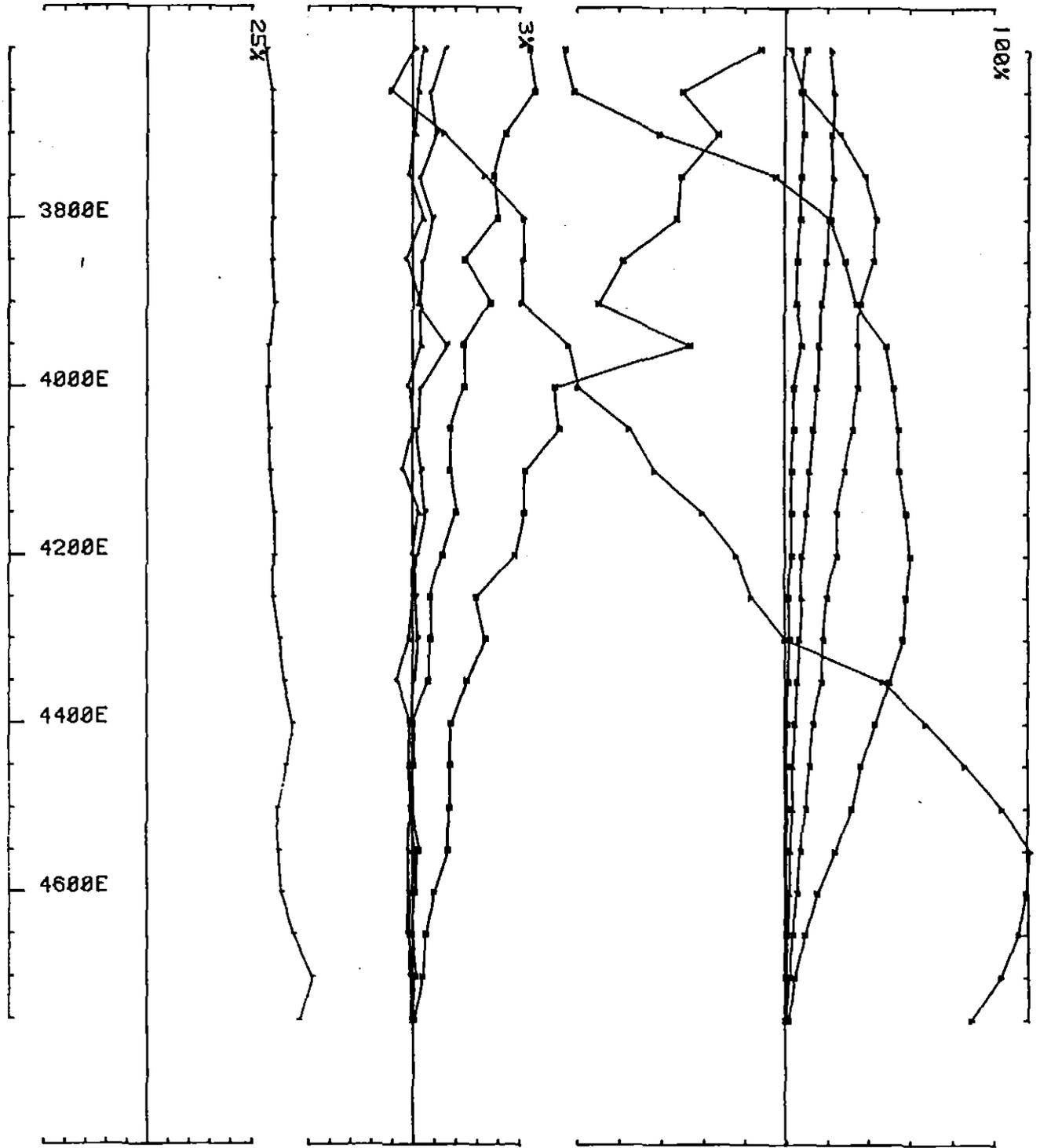
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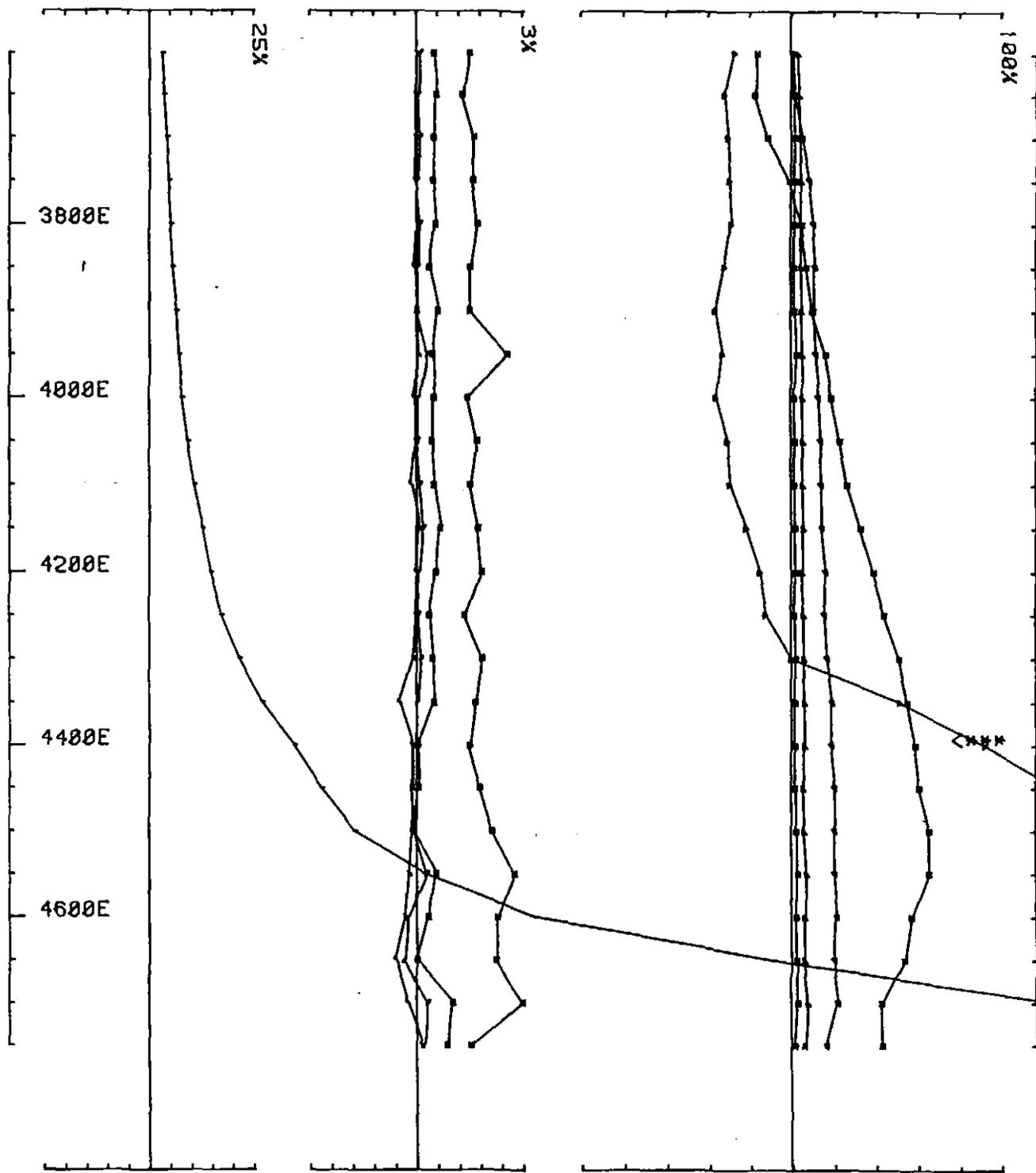
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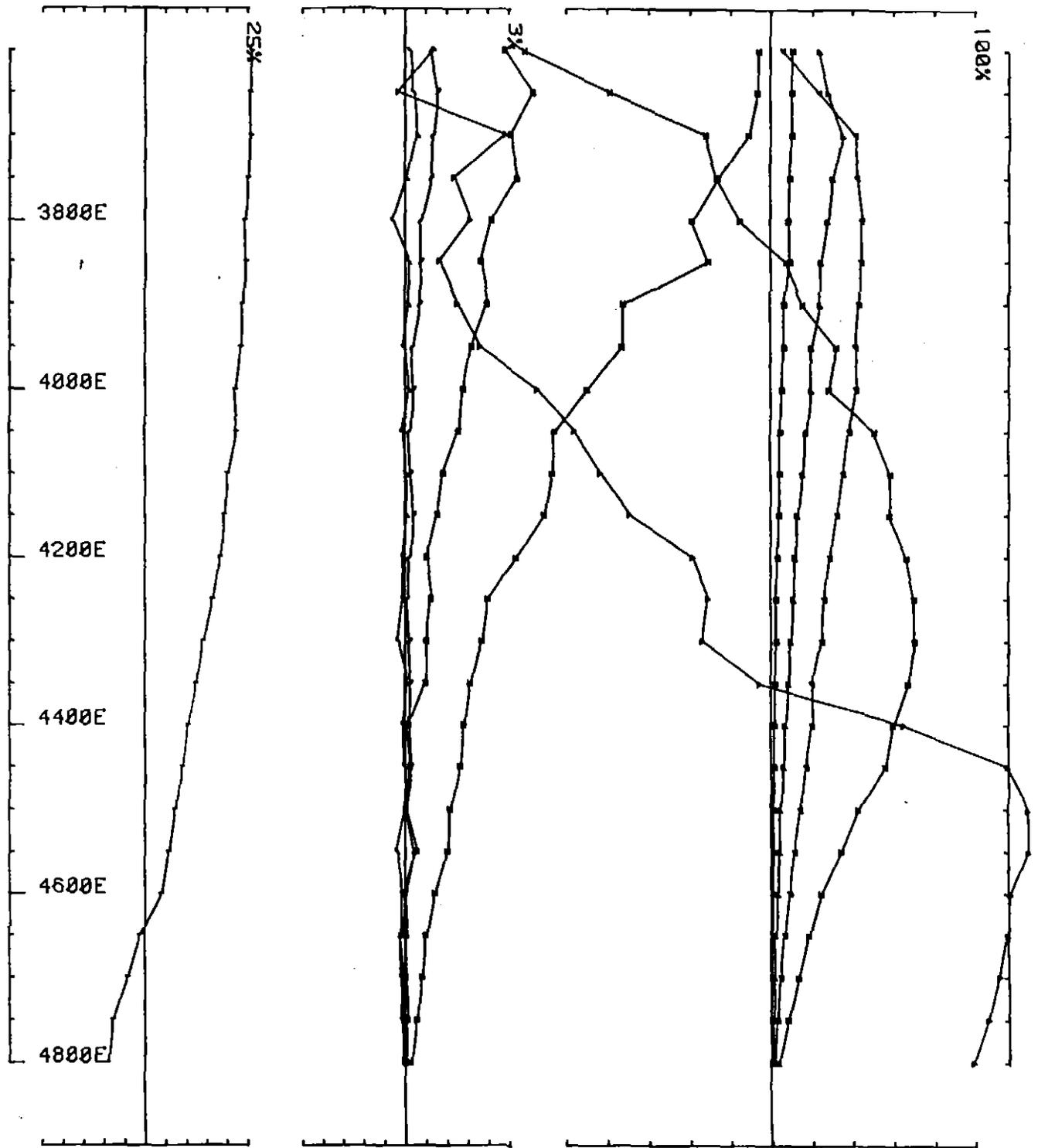
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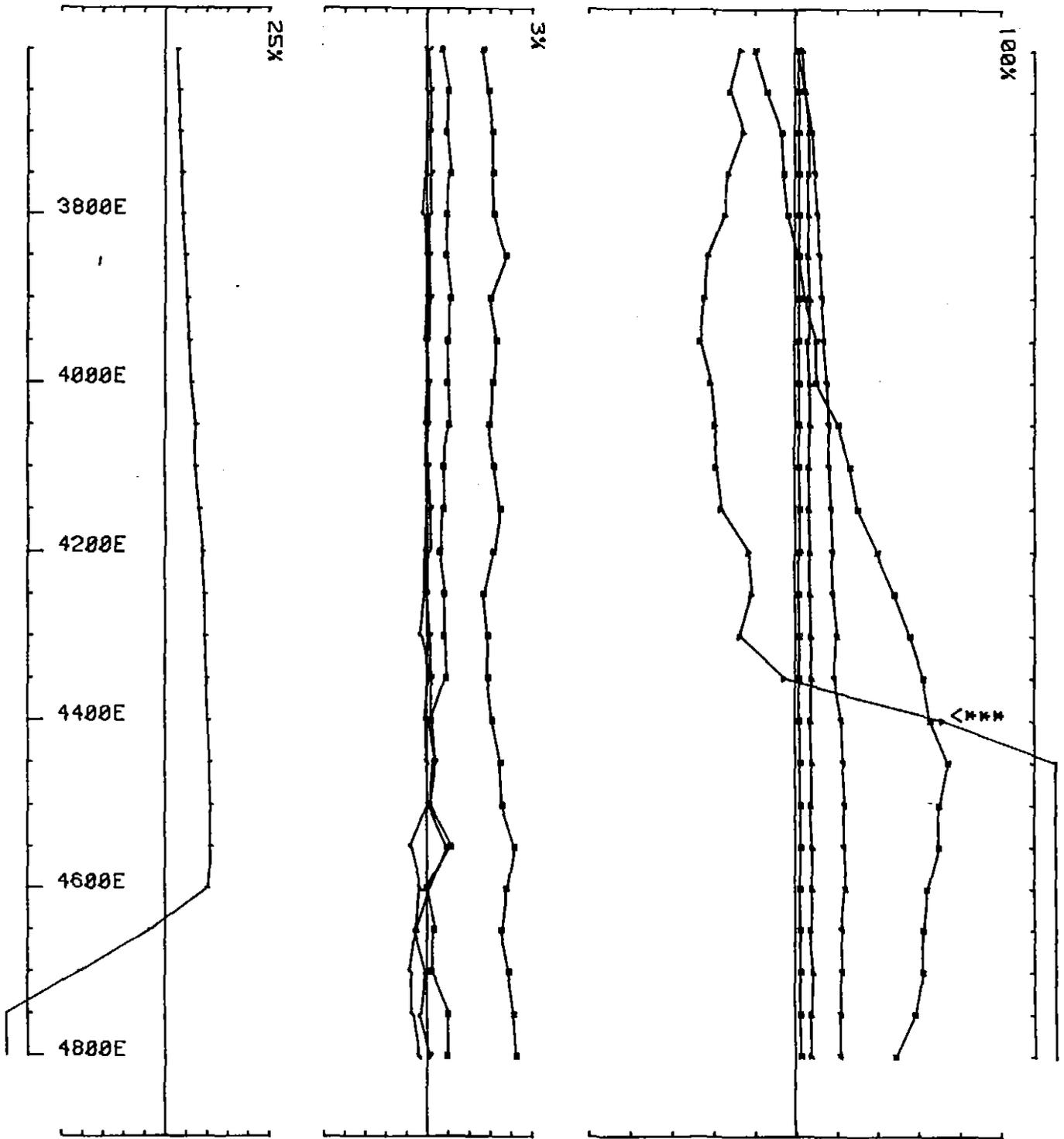
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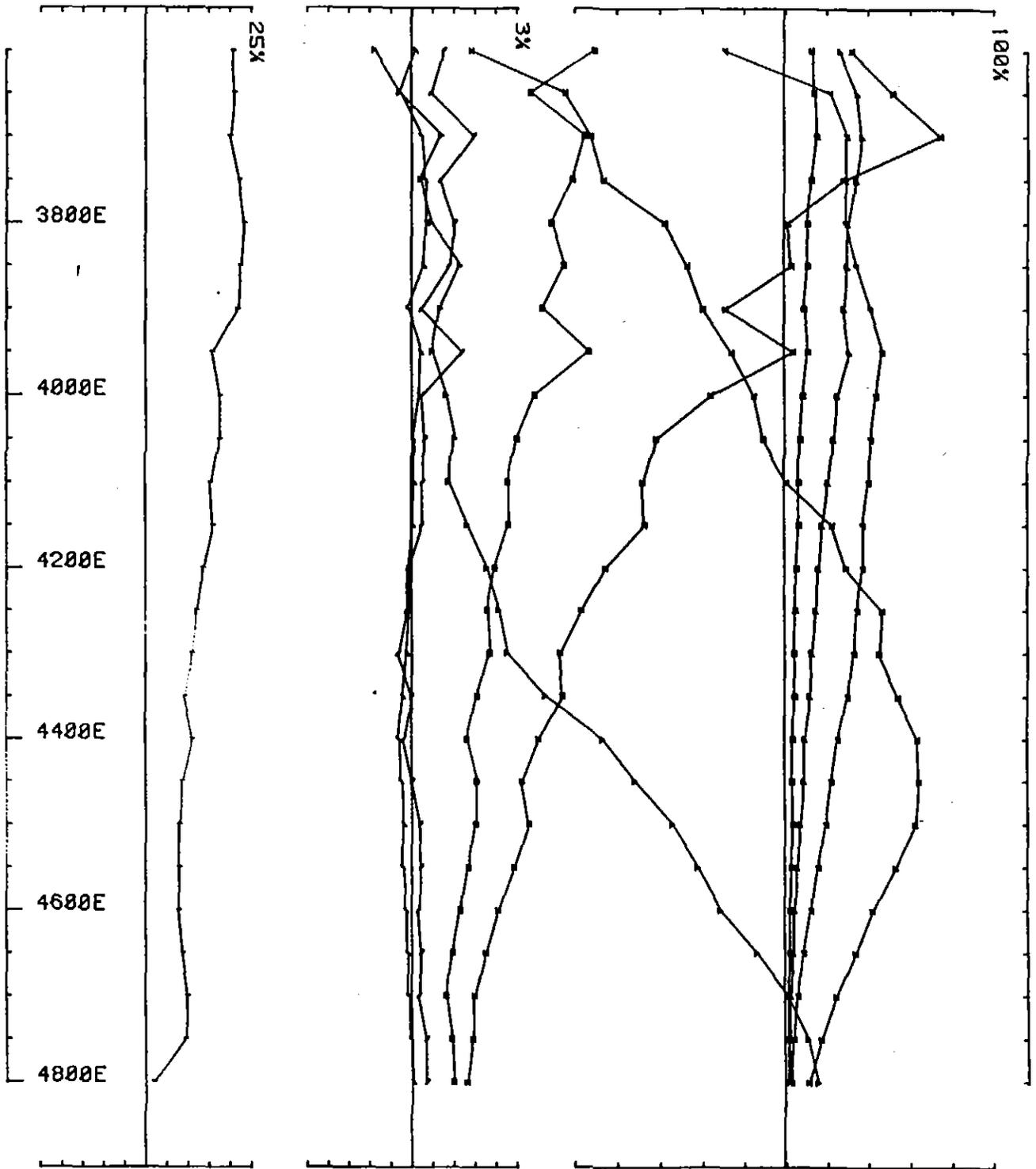
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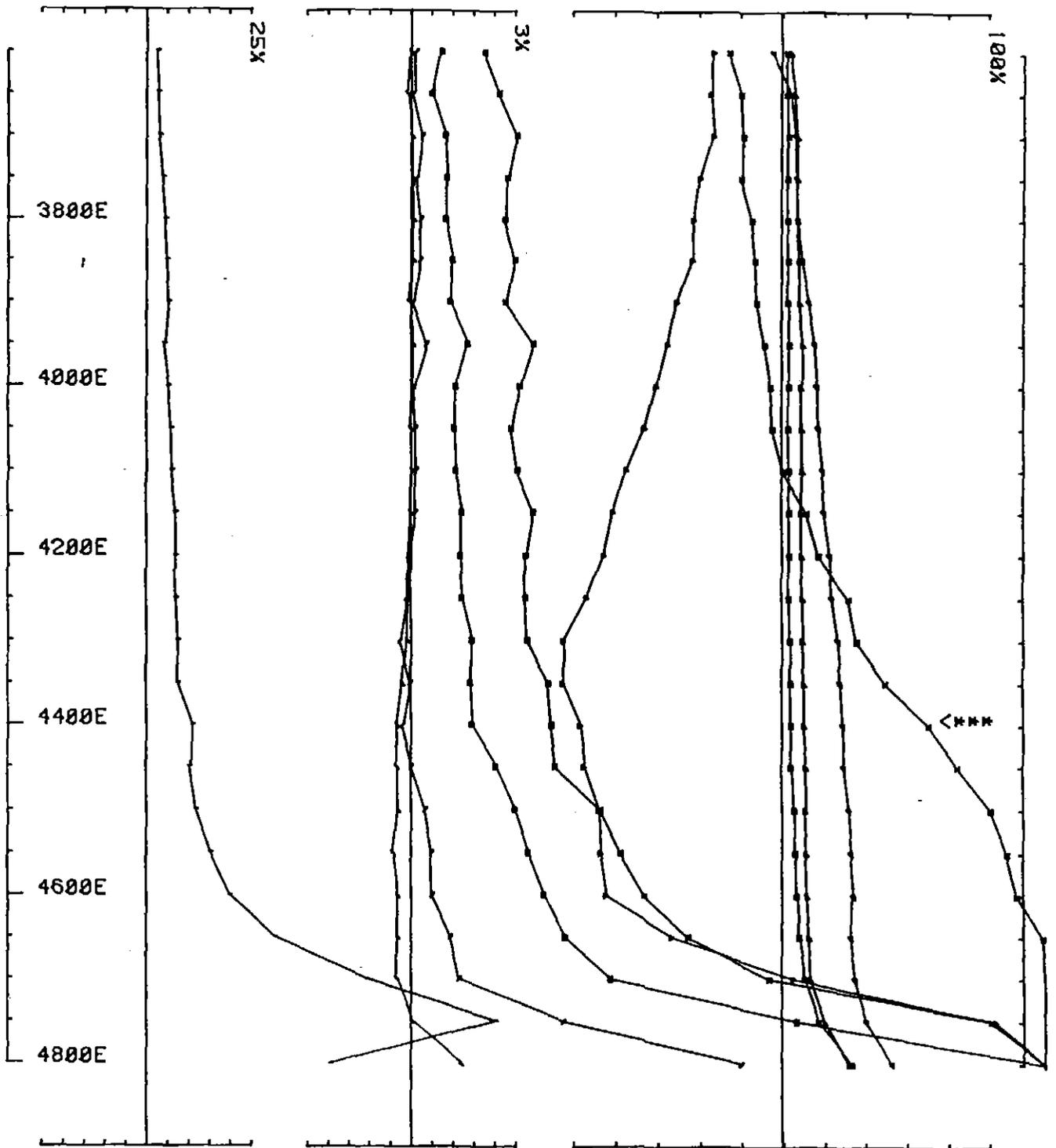
UTEM SURVEY at GARFIELD PROJECT for BHP-UTAH MINERALS
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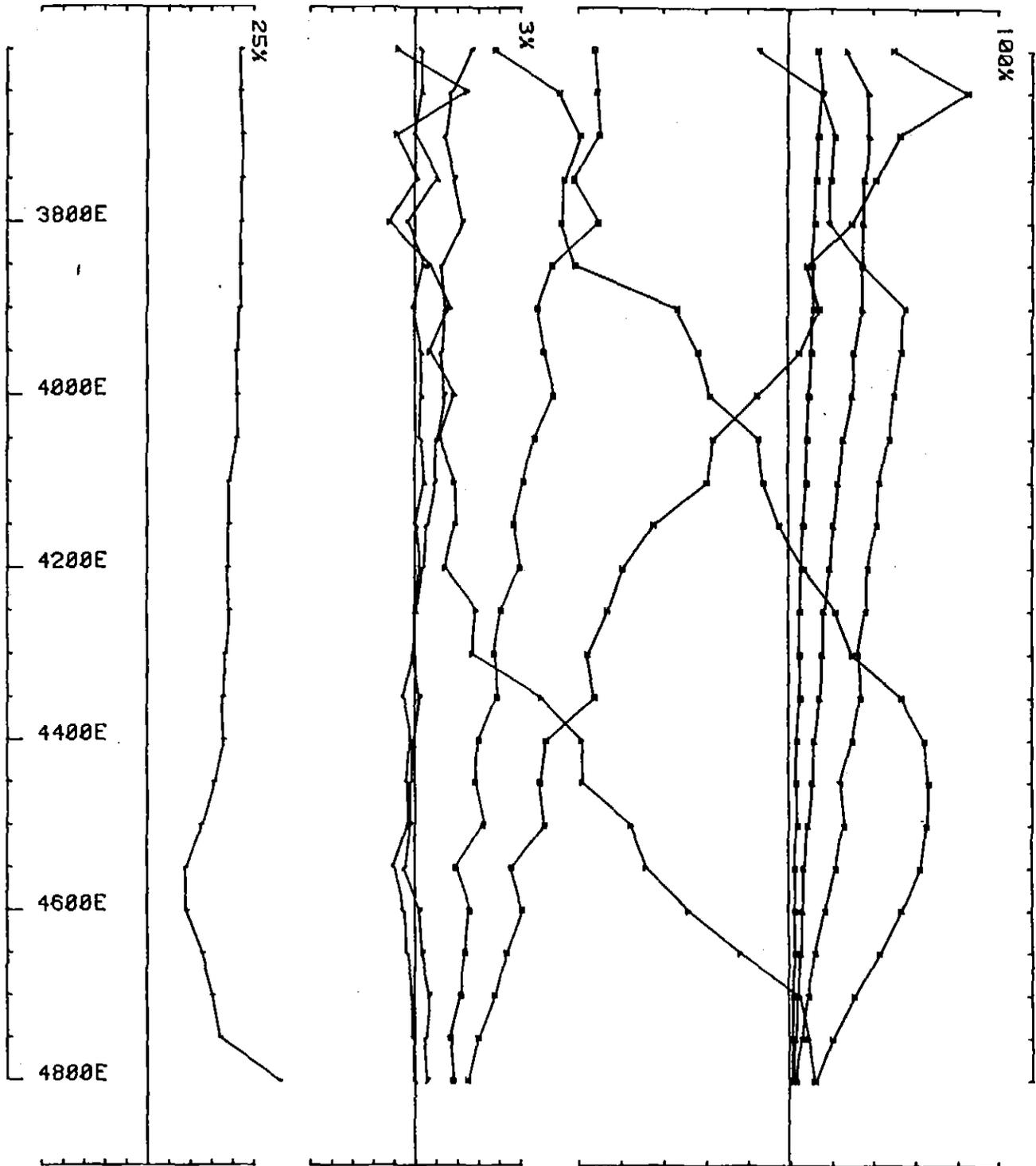
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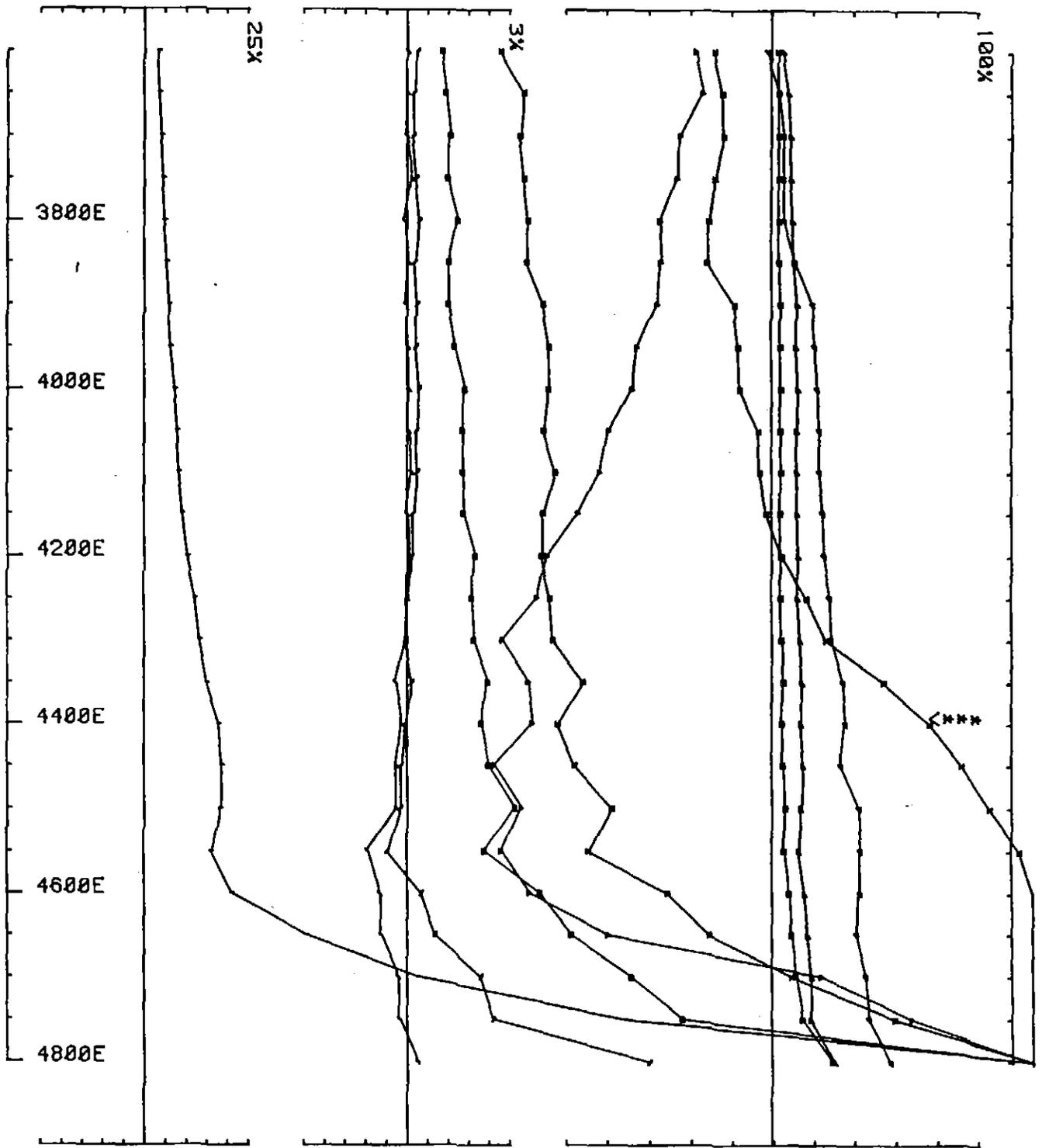
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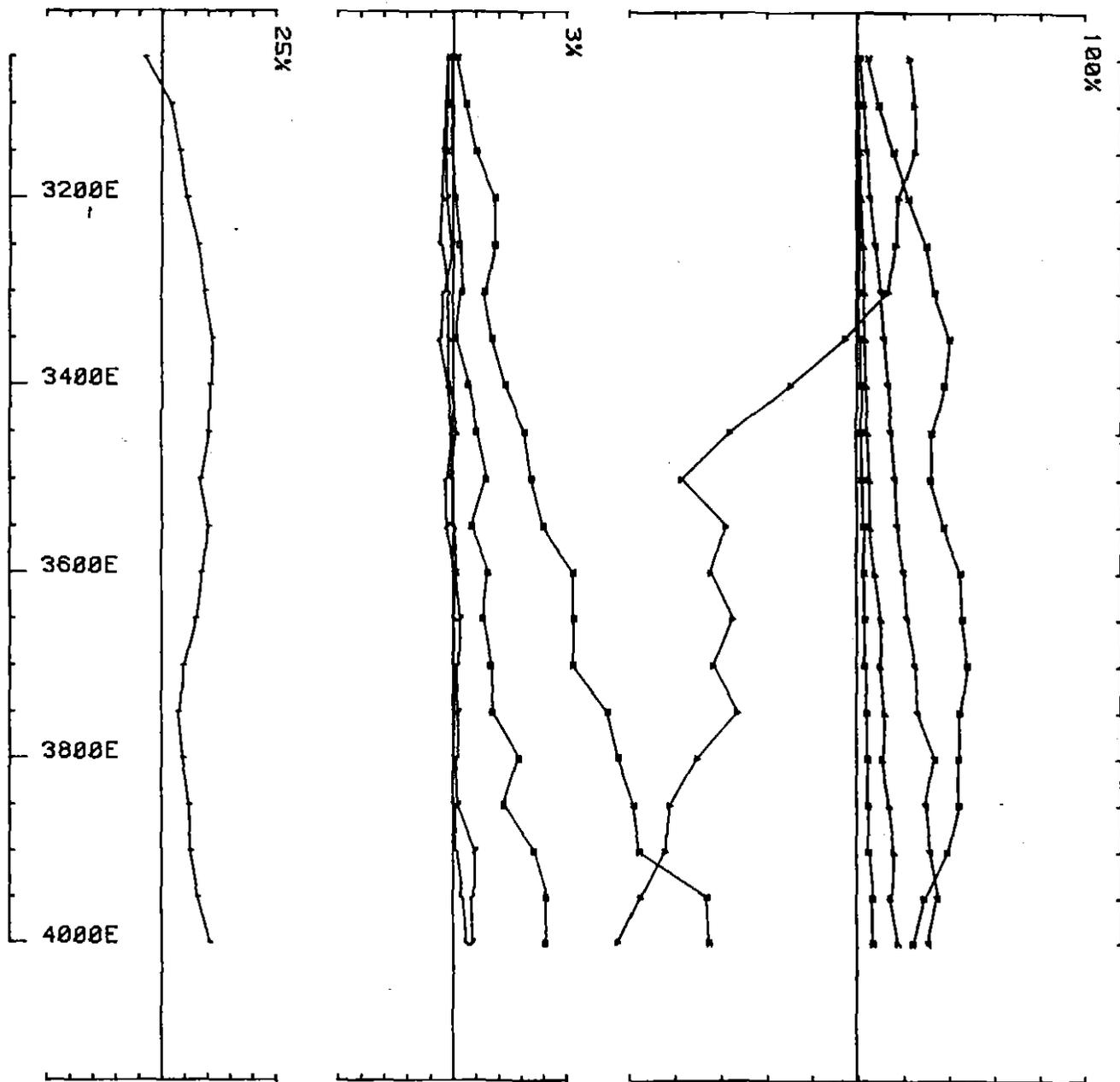
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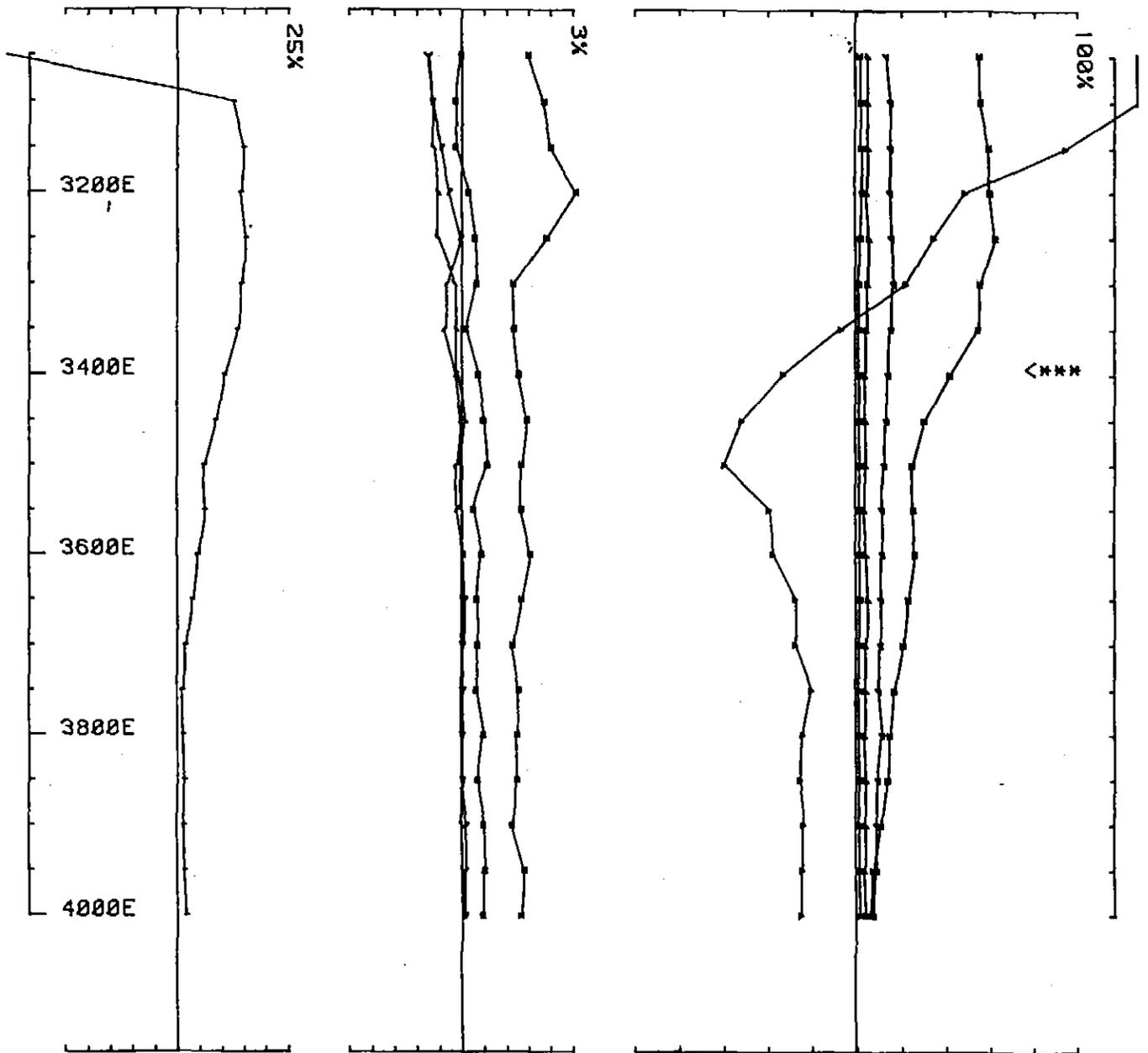
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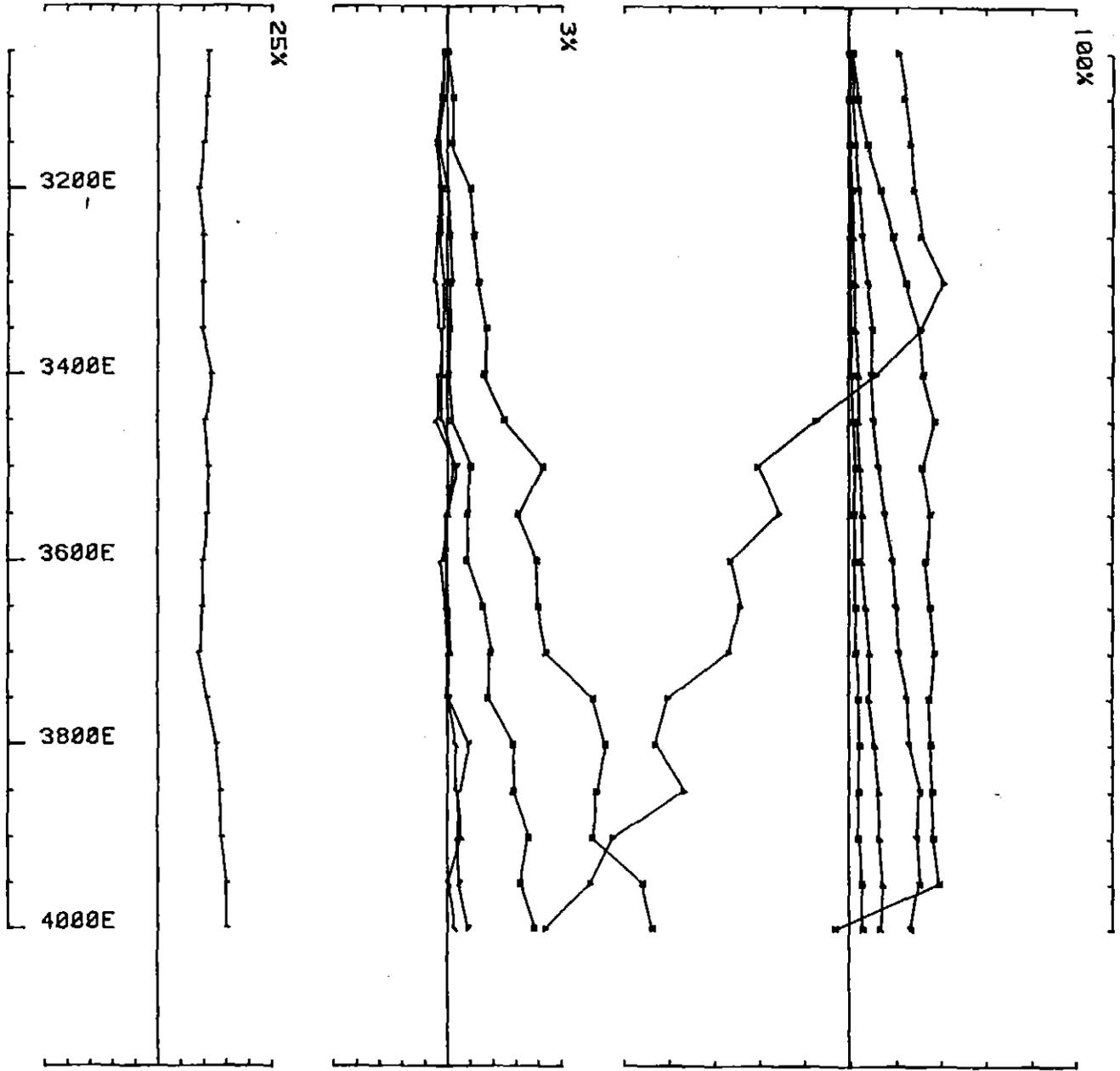
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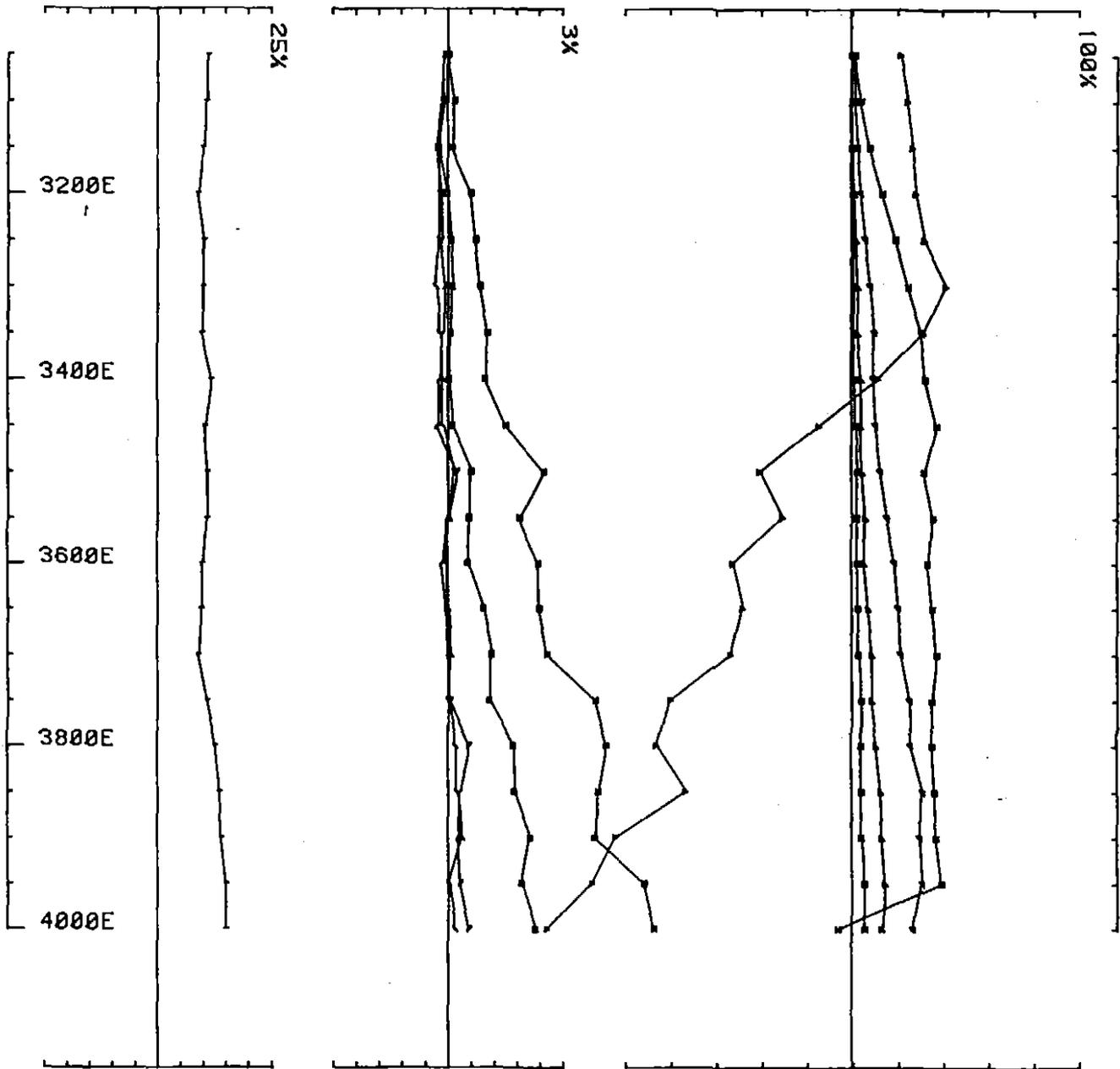
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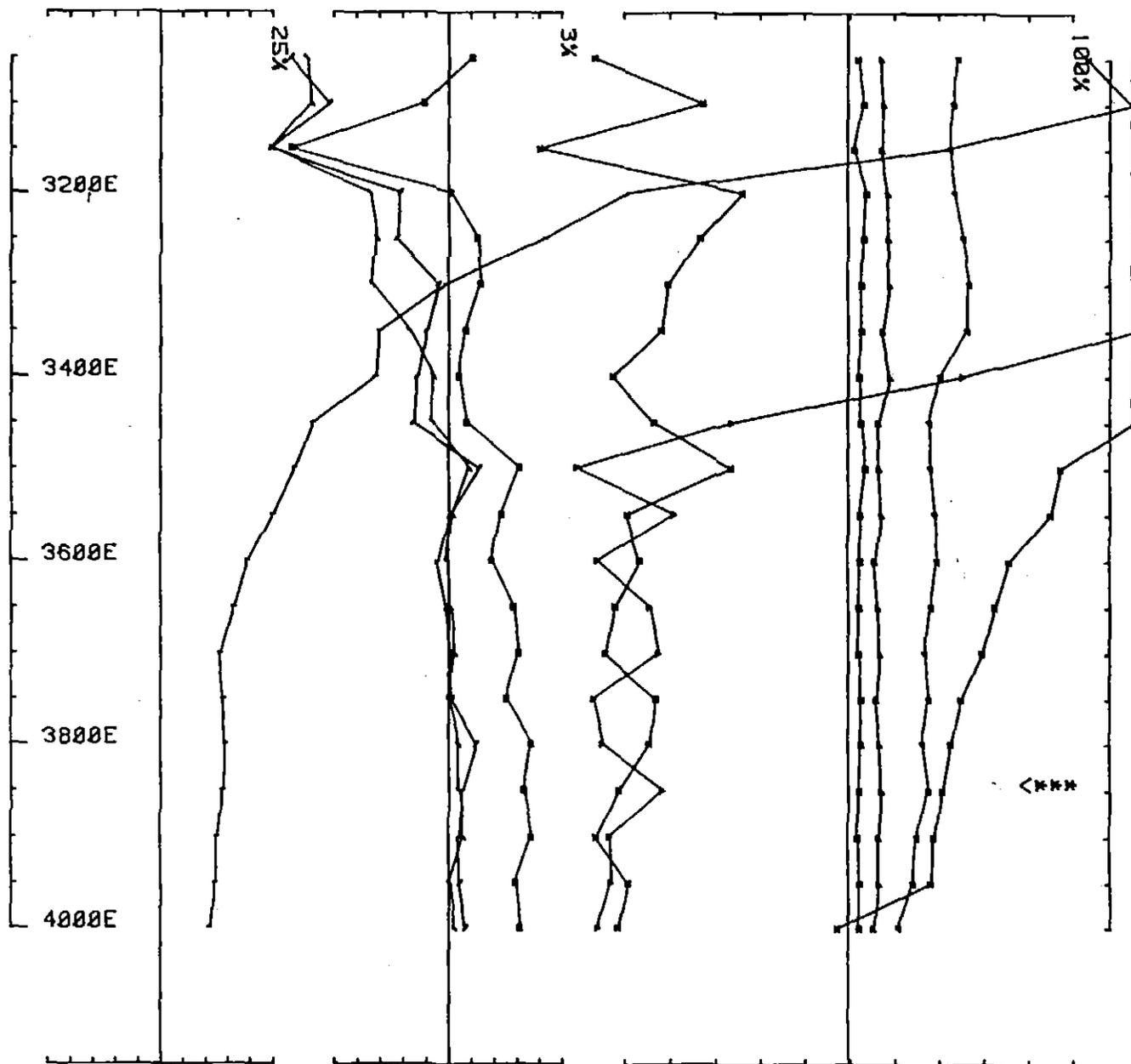
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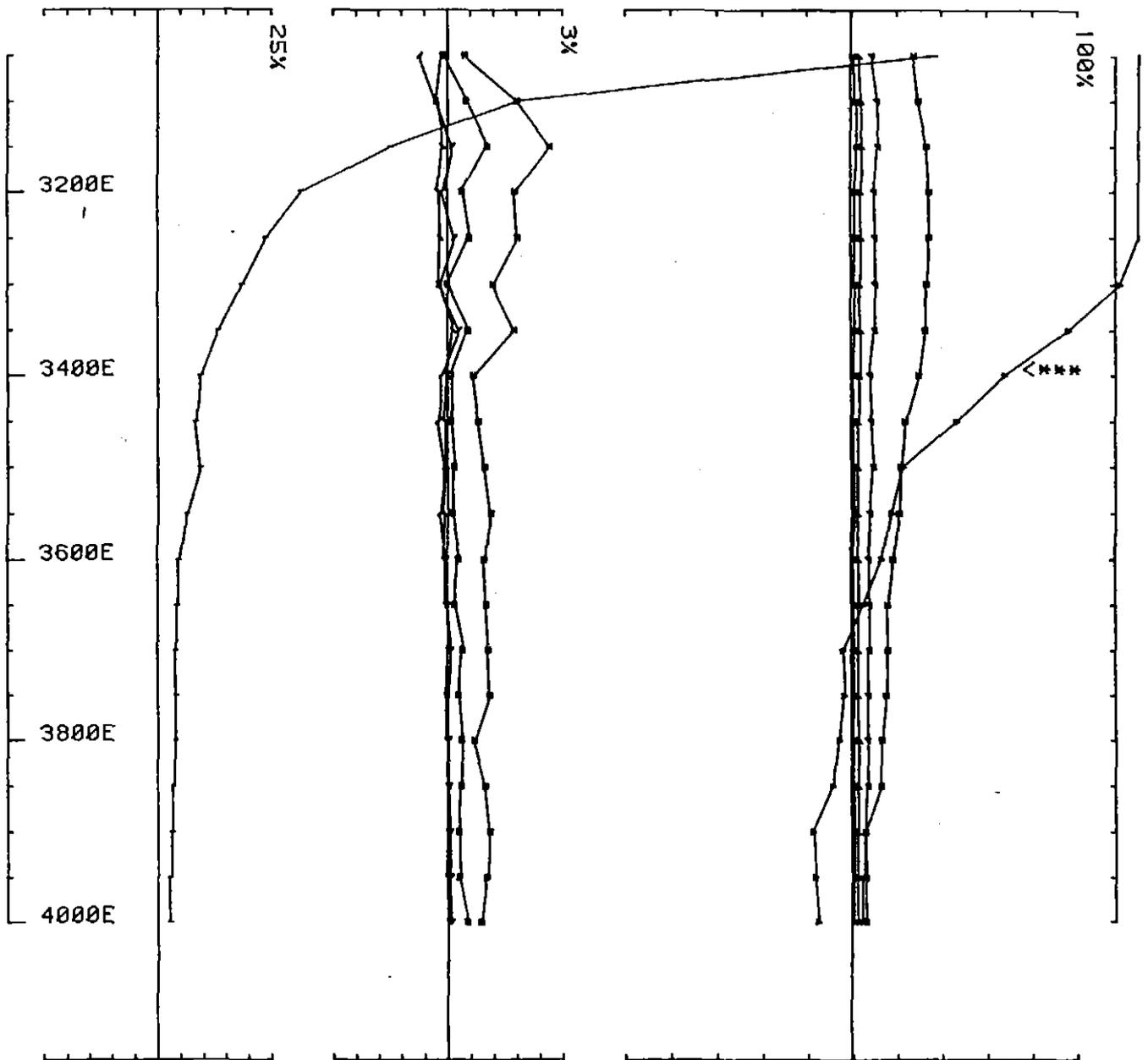
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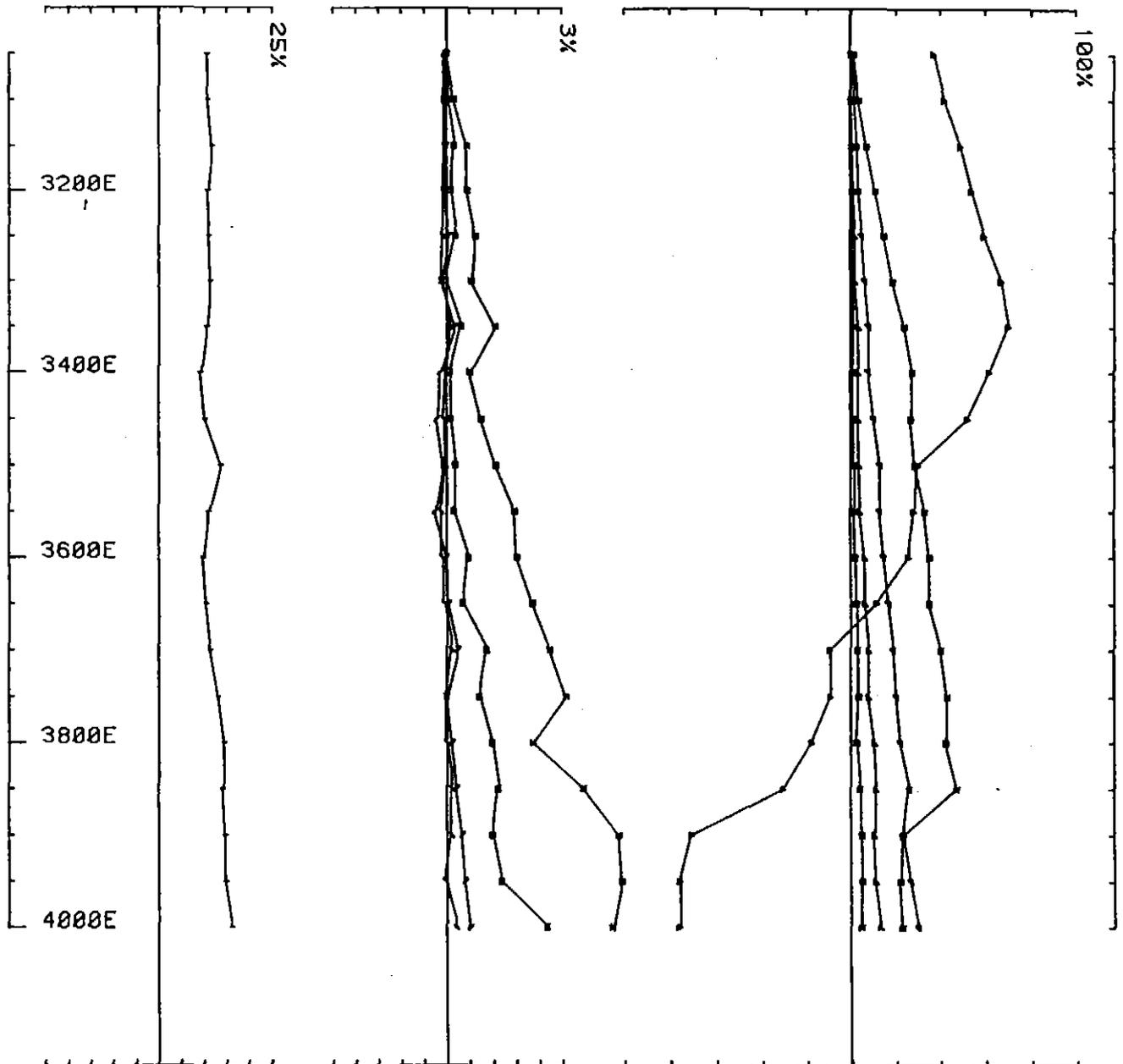
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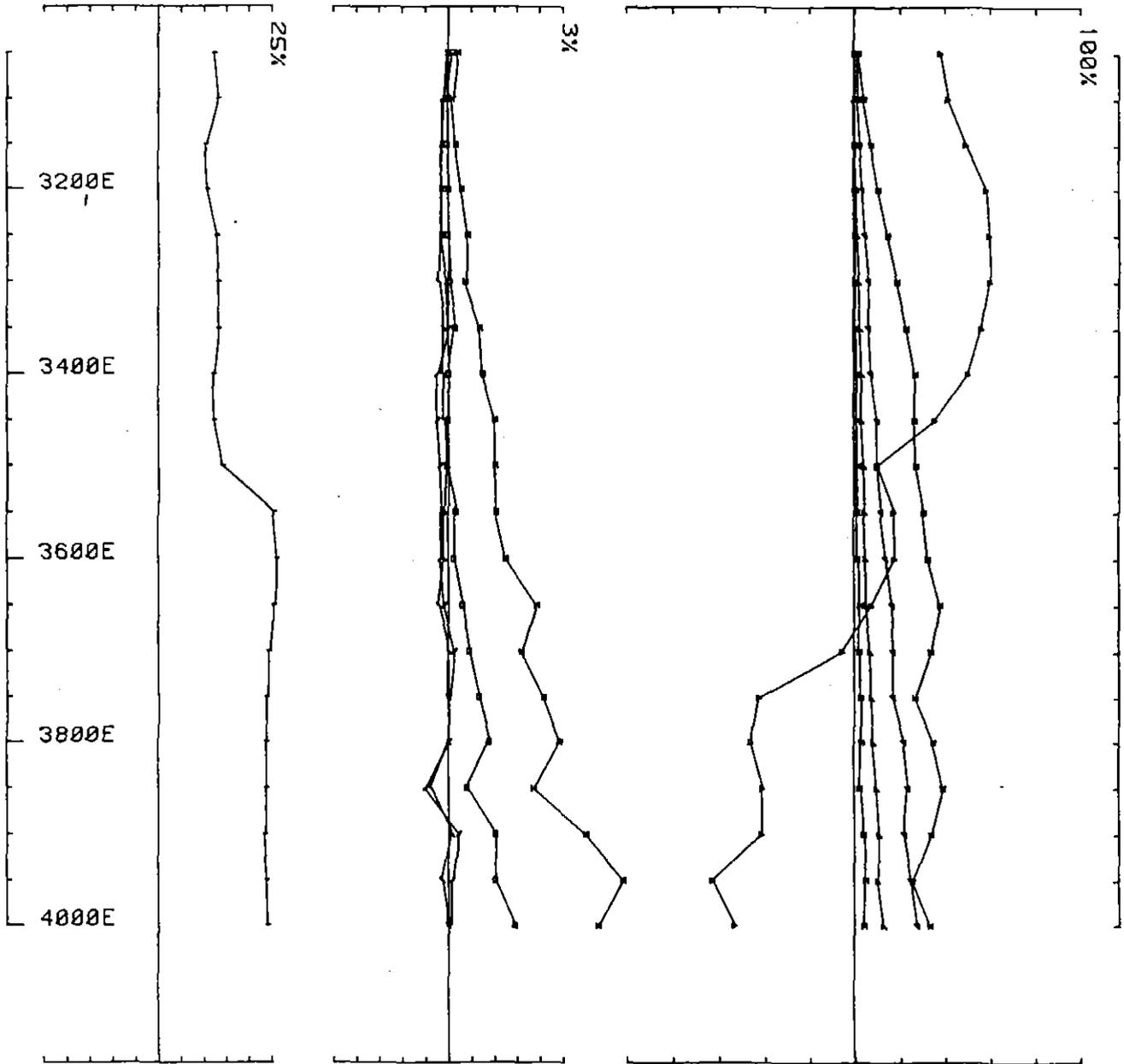
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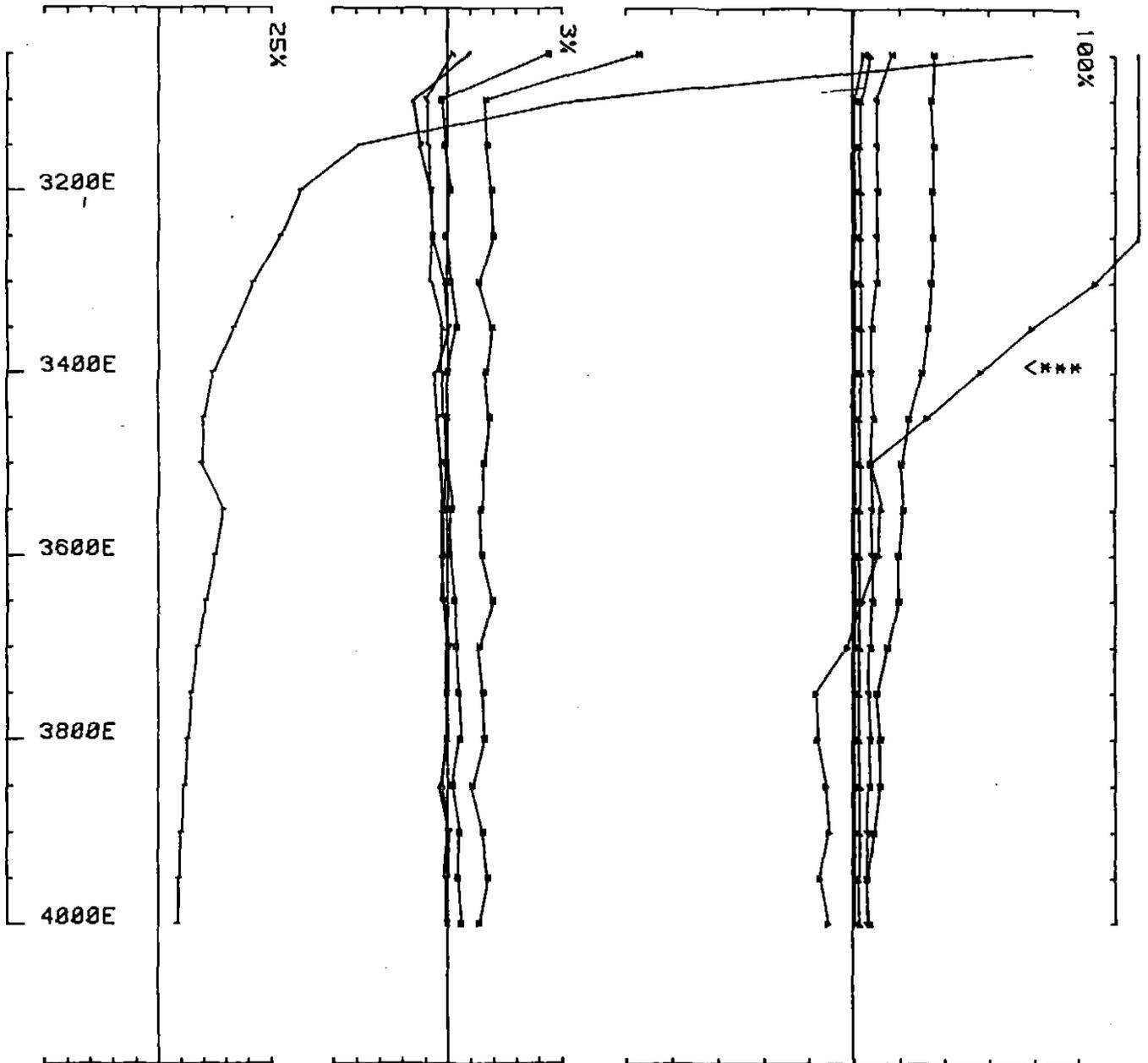
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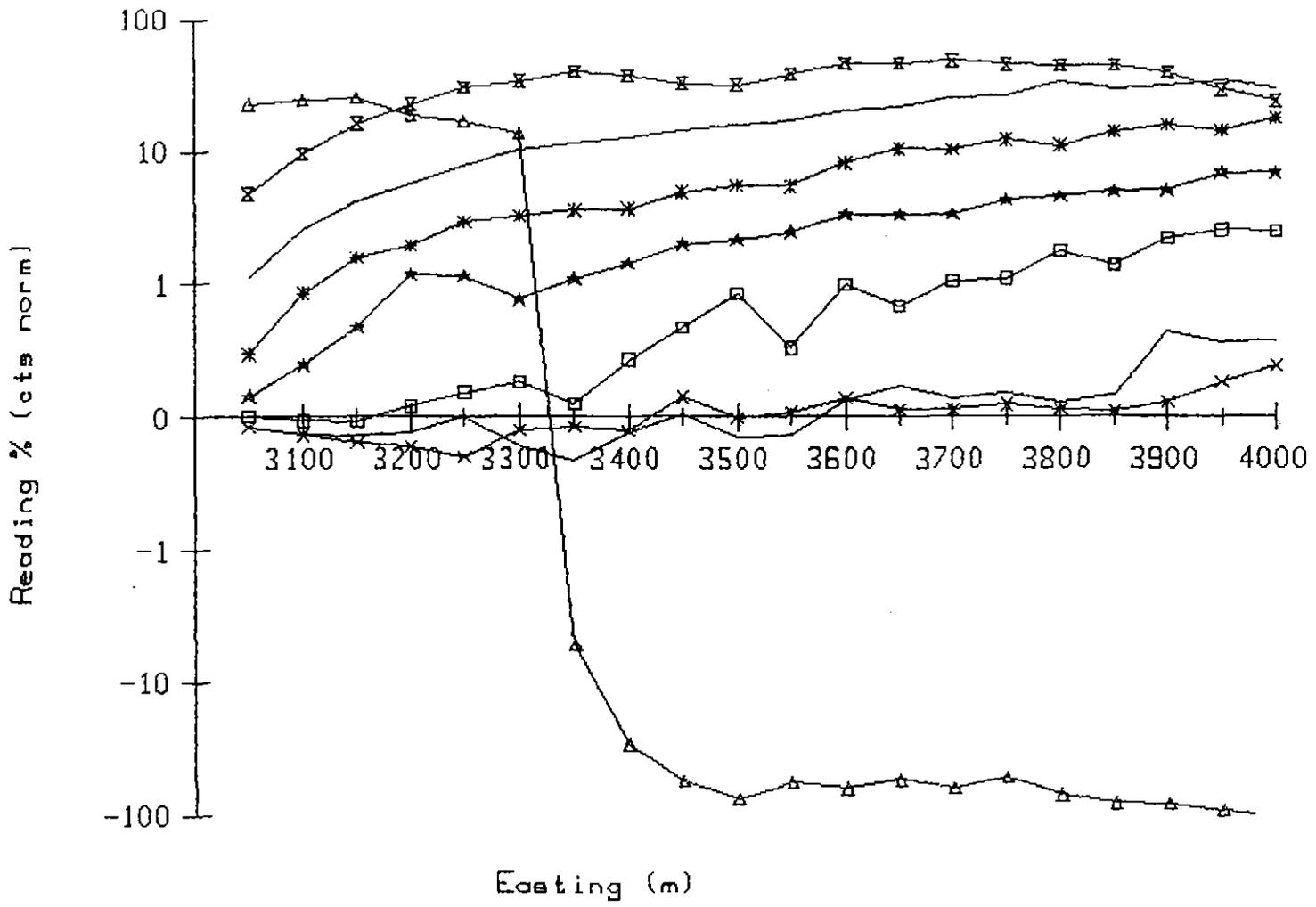


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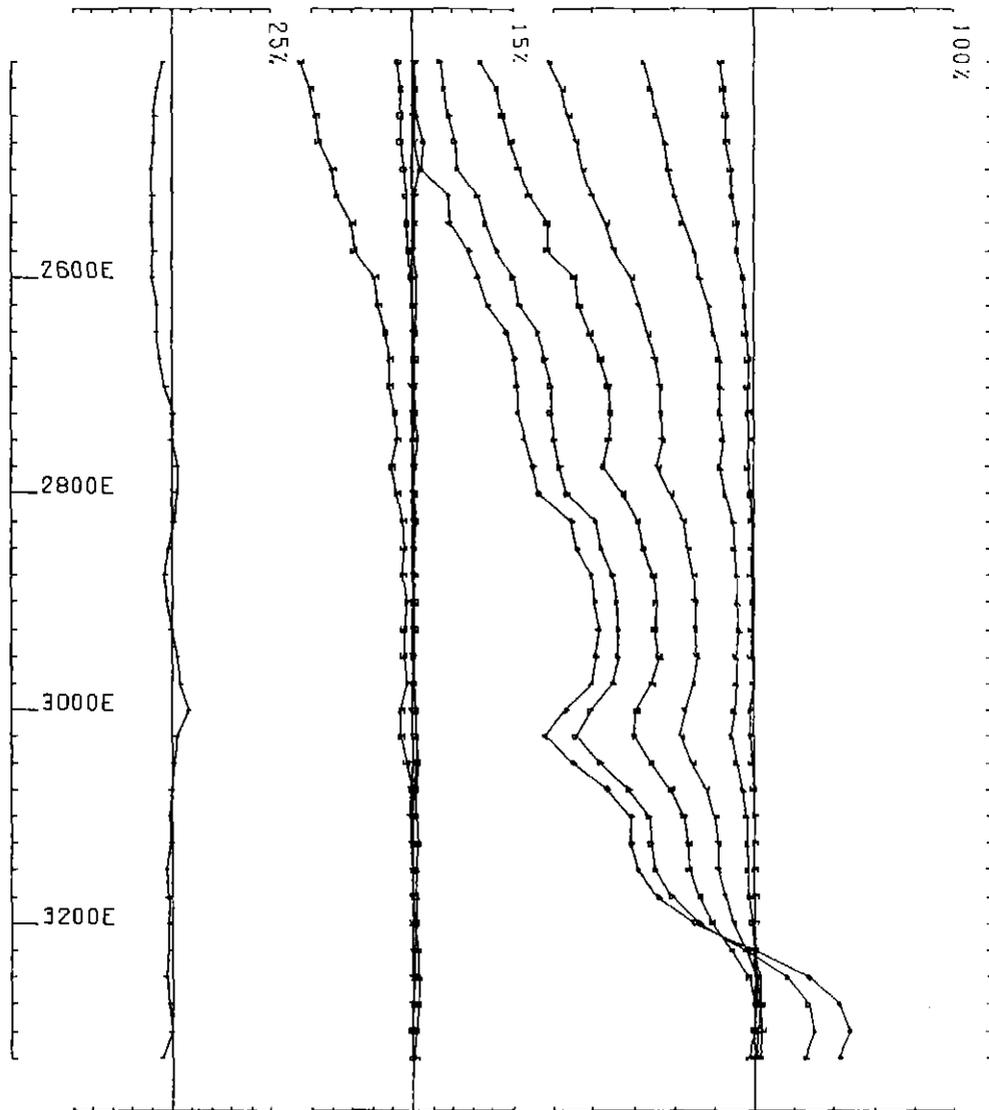
UTEM SURVEY at GARFIELD PROJECT for BHP-UTAH MINERALS
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area name: : GARFIELD PROJECT: Loop 0008: Line 600N: Rx=X CH= 2- 9

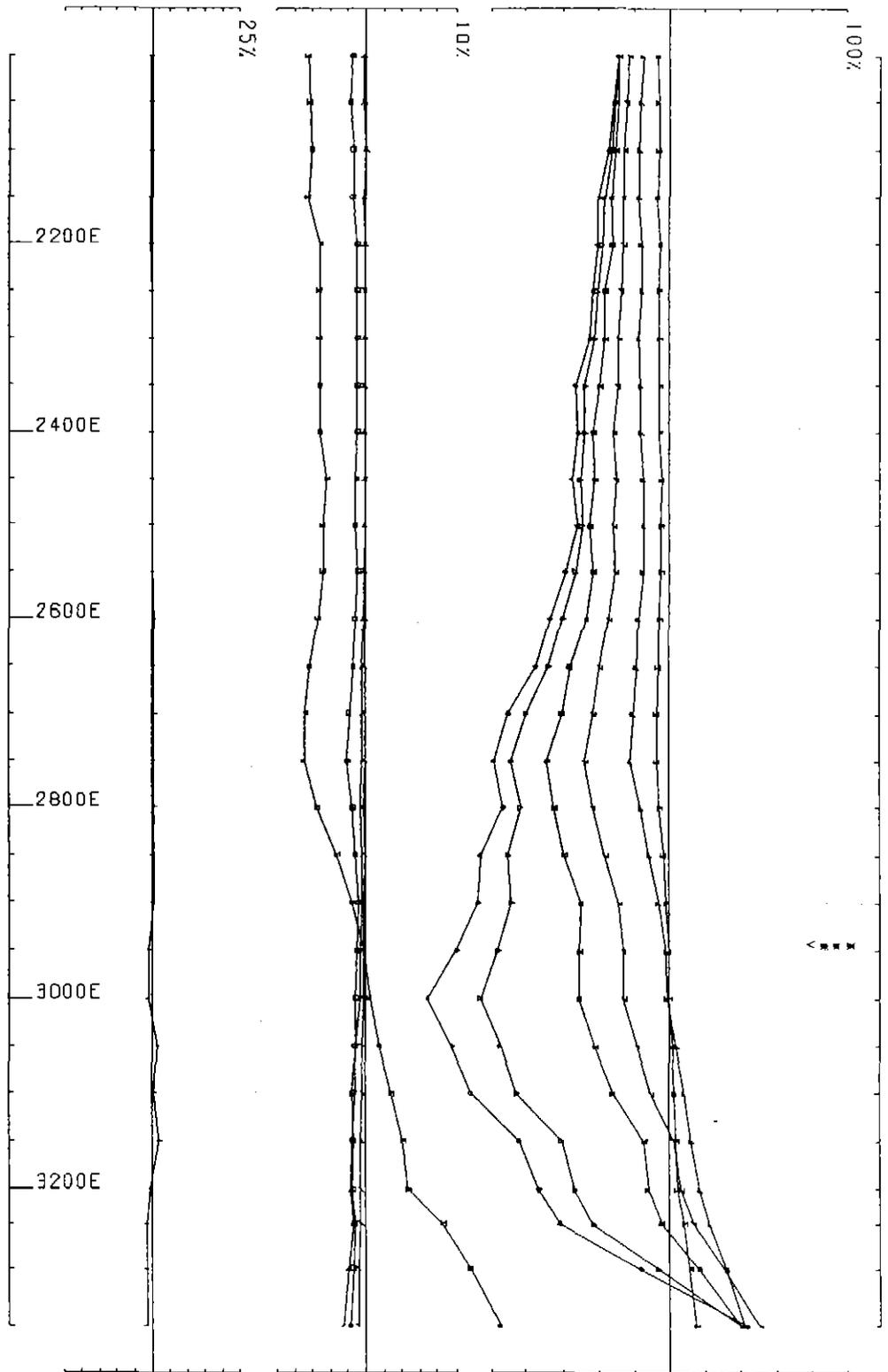


APPENDIX 4

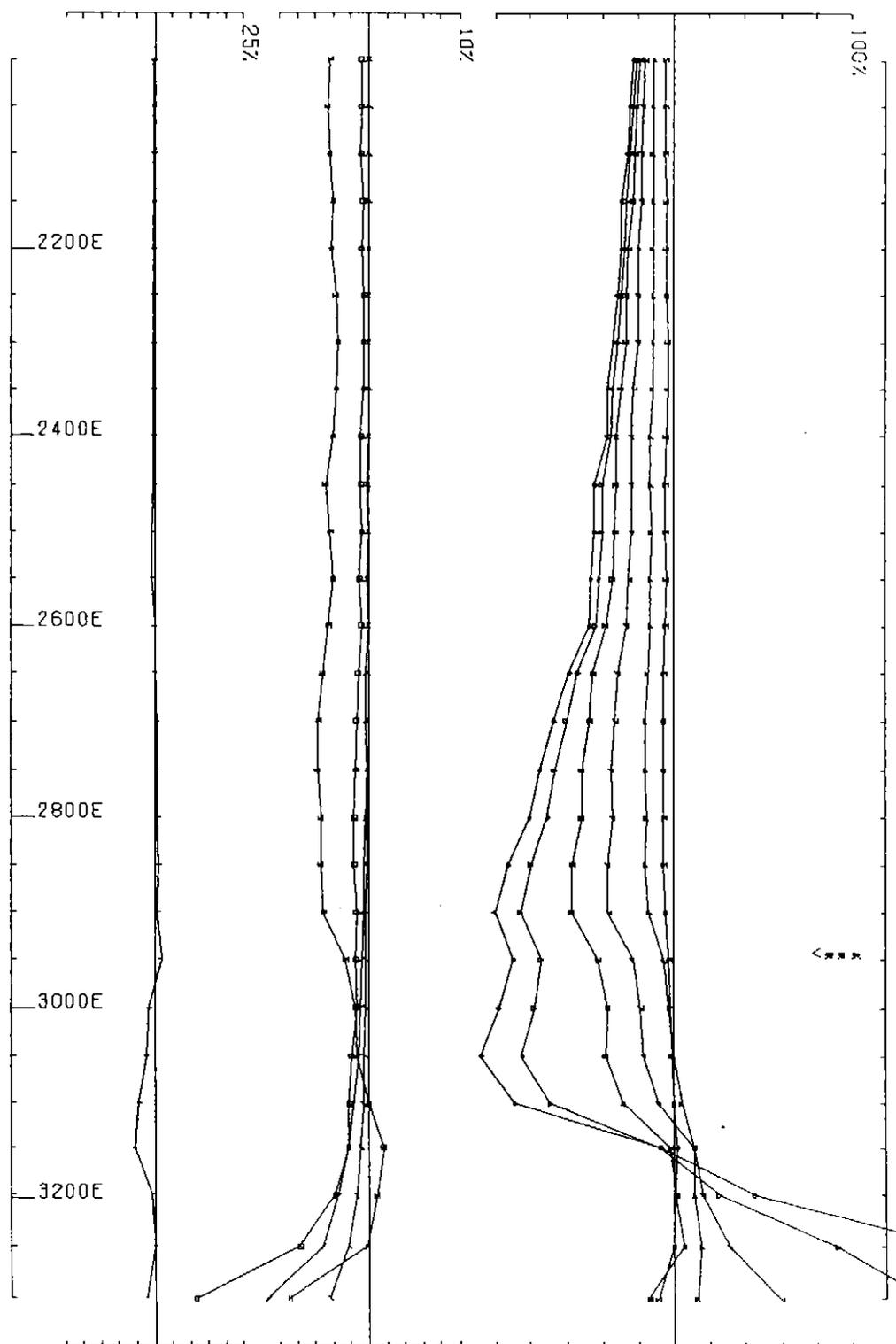
FOLLOW-UP GARFIELD UTEM SURVEY DATA PROFILES



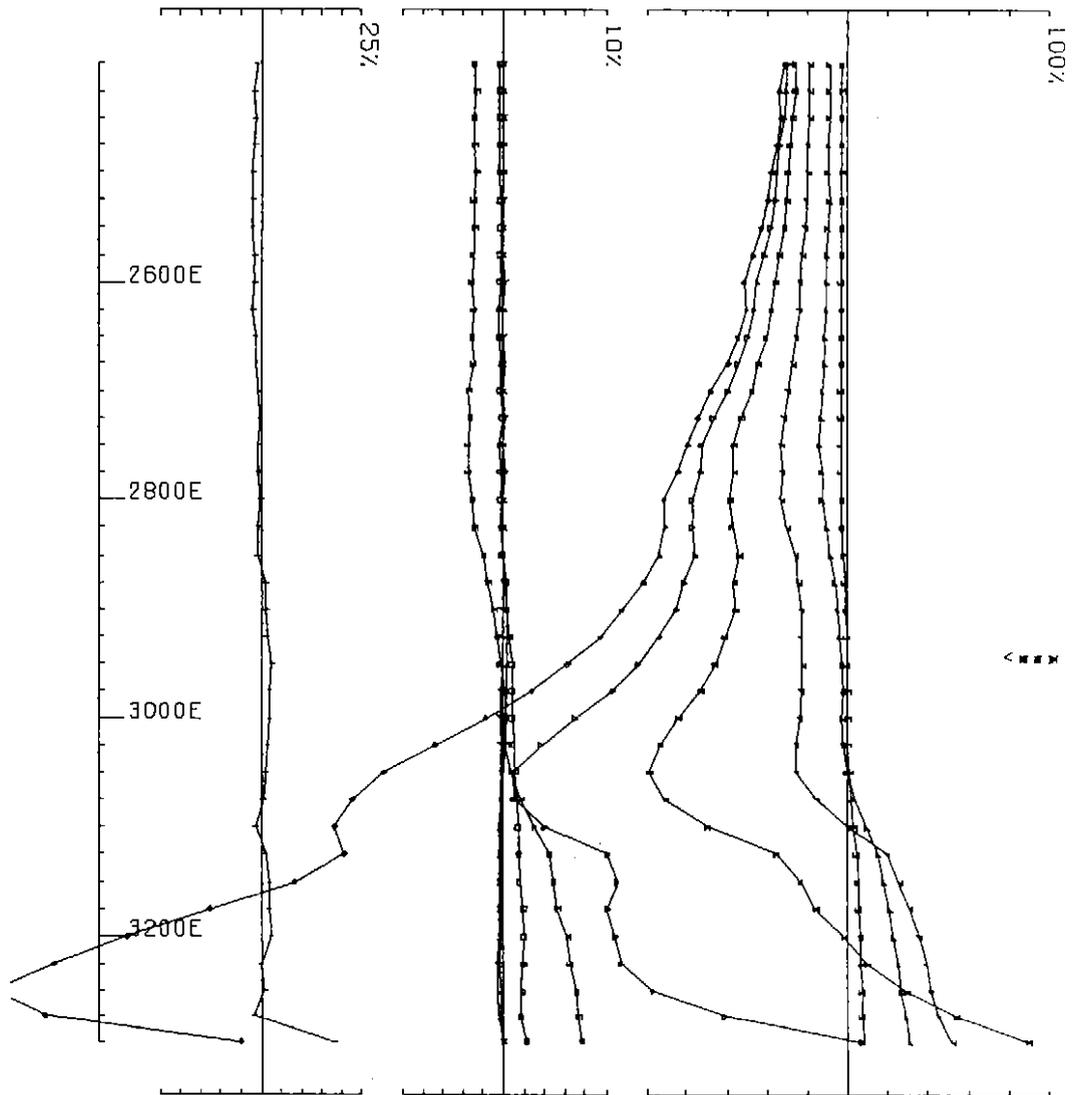
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
CONDUCTED BY LANONTAGNE GEOPHYSICS LTD JOB 0090 BASE FREQ (HZ) 26.23
LOOP NO 2 LINE 3600 N COMPONENT HZ SECONDARY FIELD CH1 CONTIN. NORM.



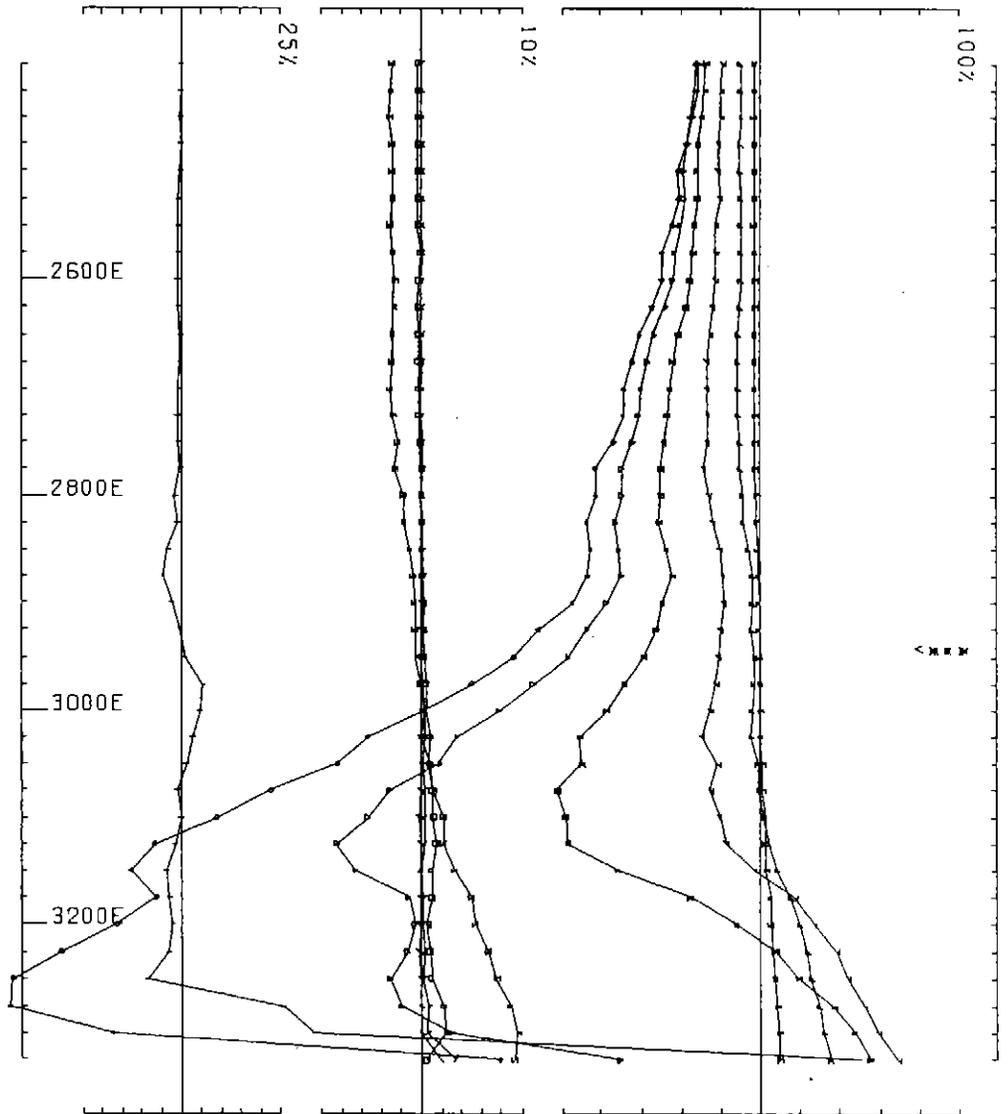
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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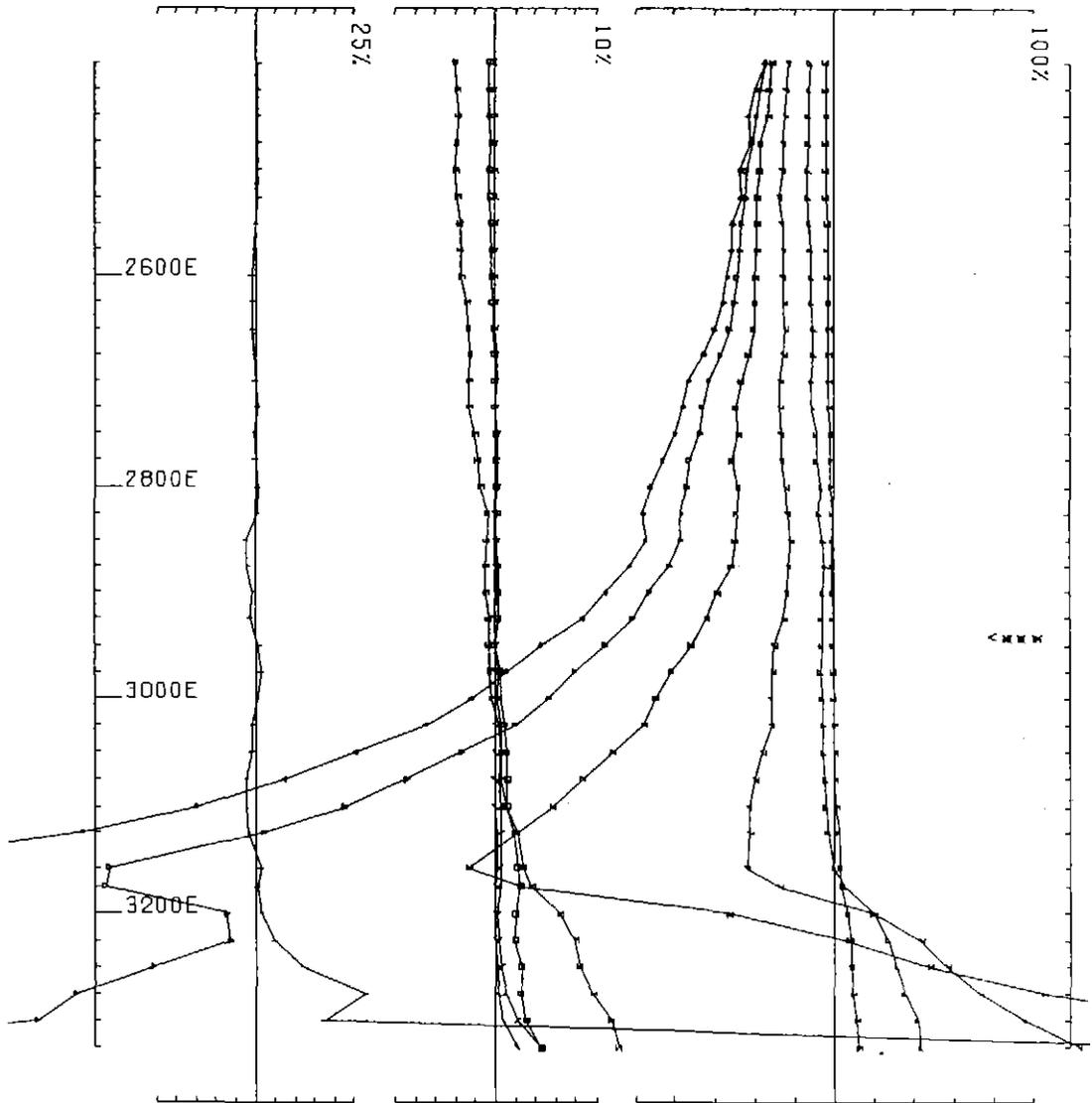
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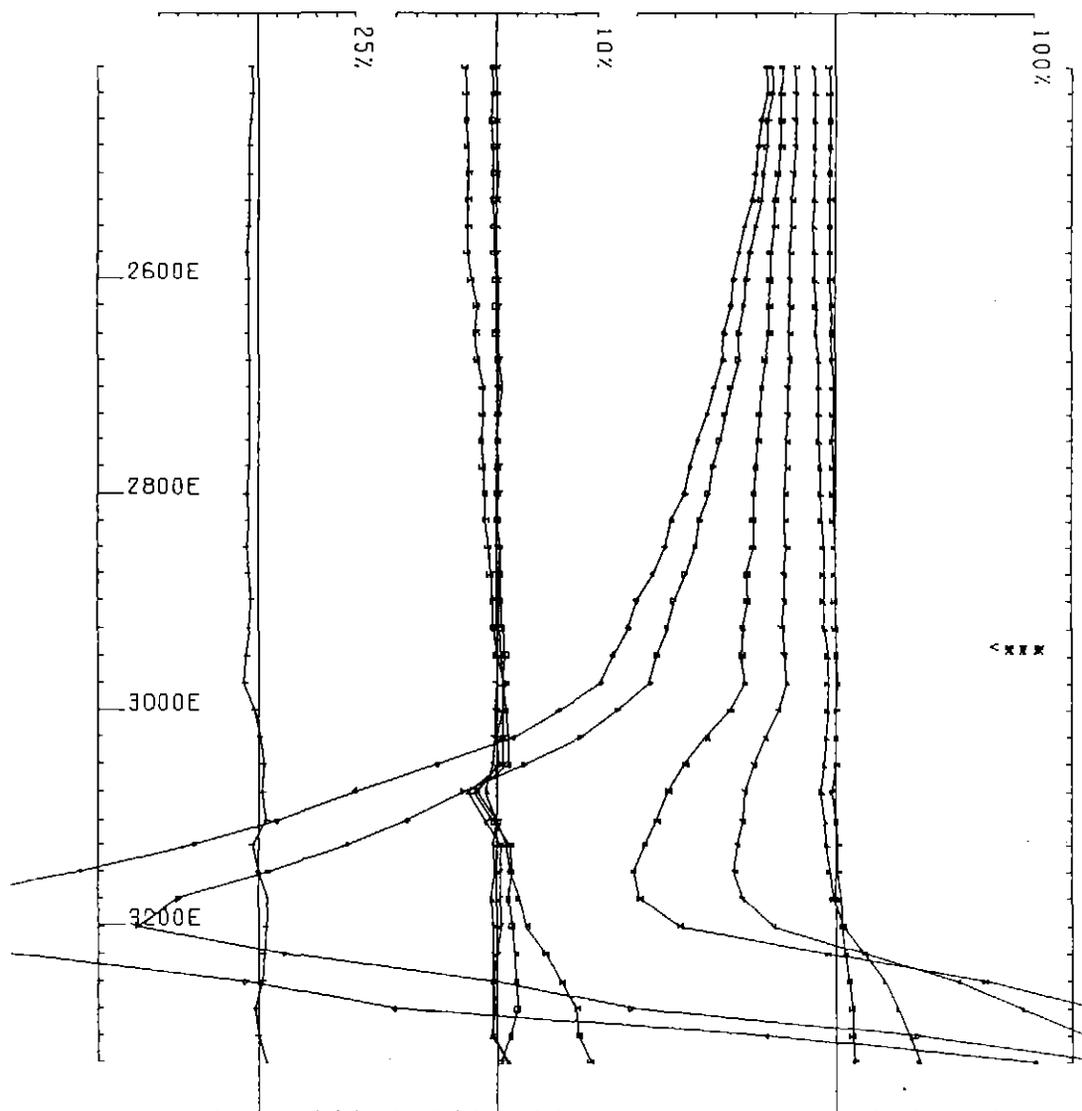
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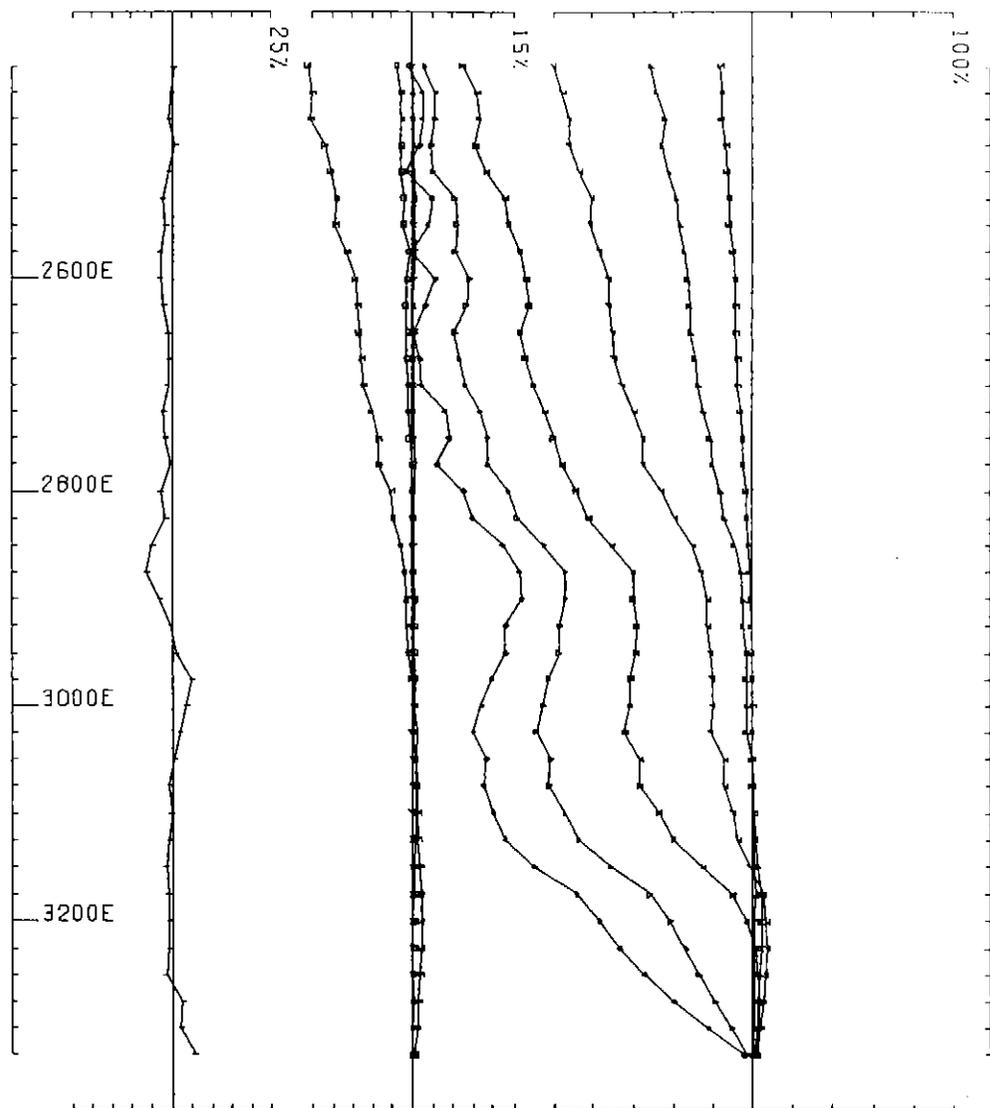
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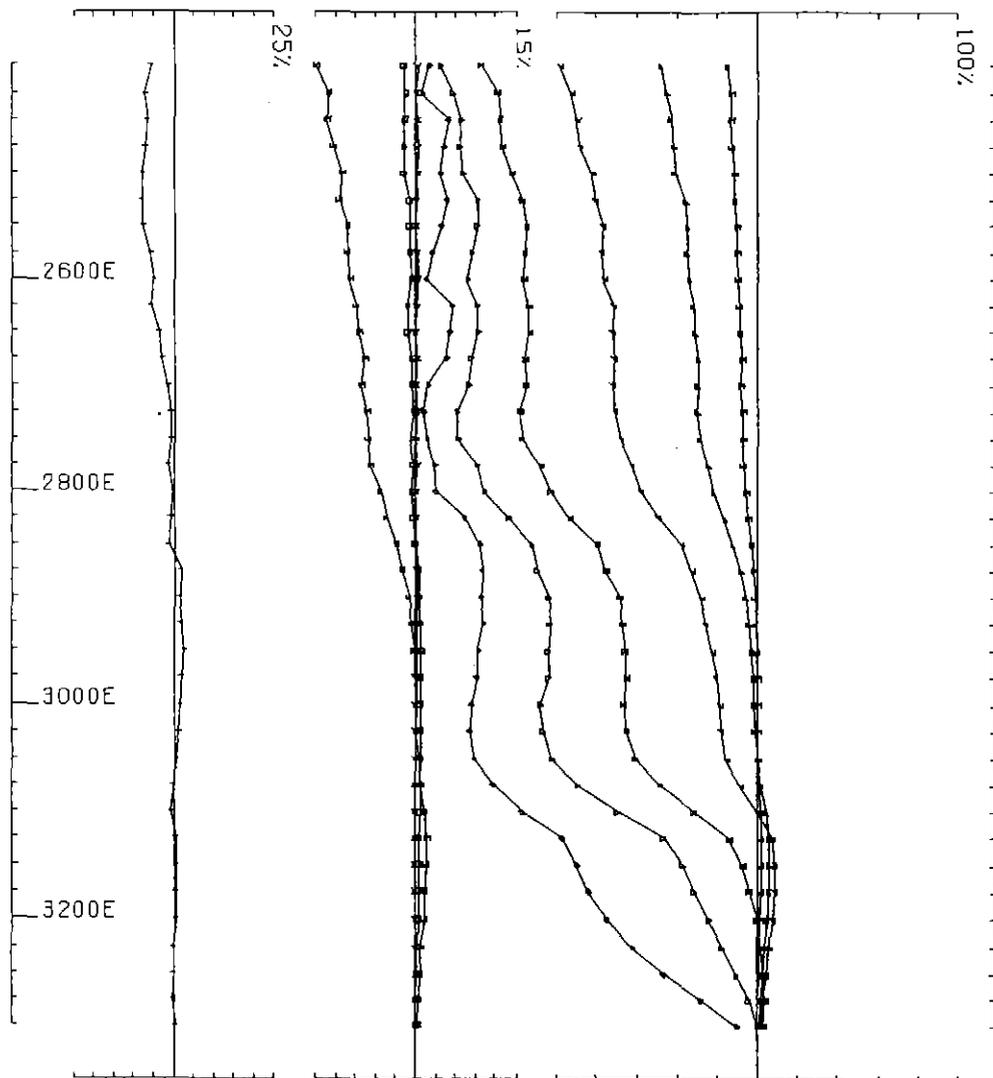
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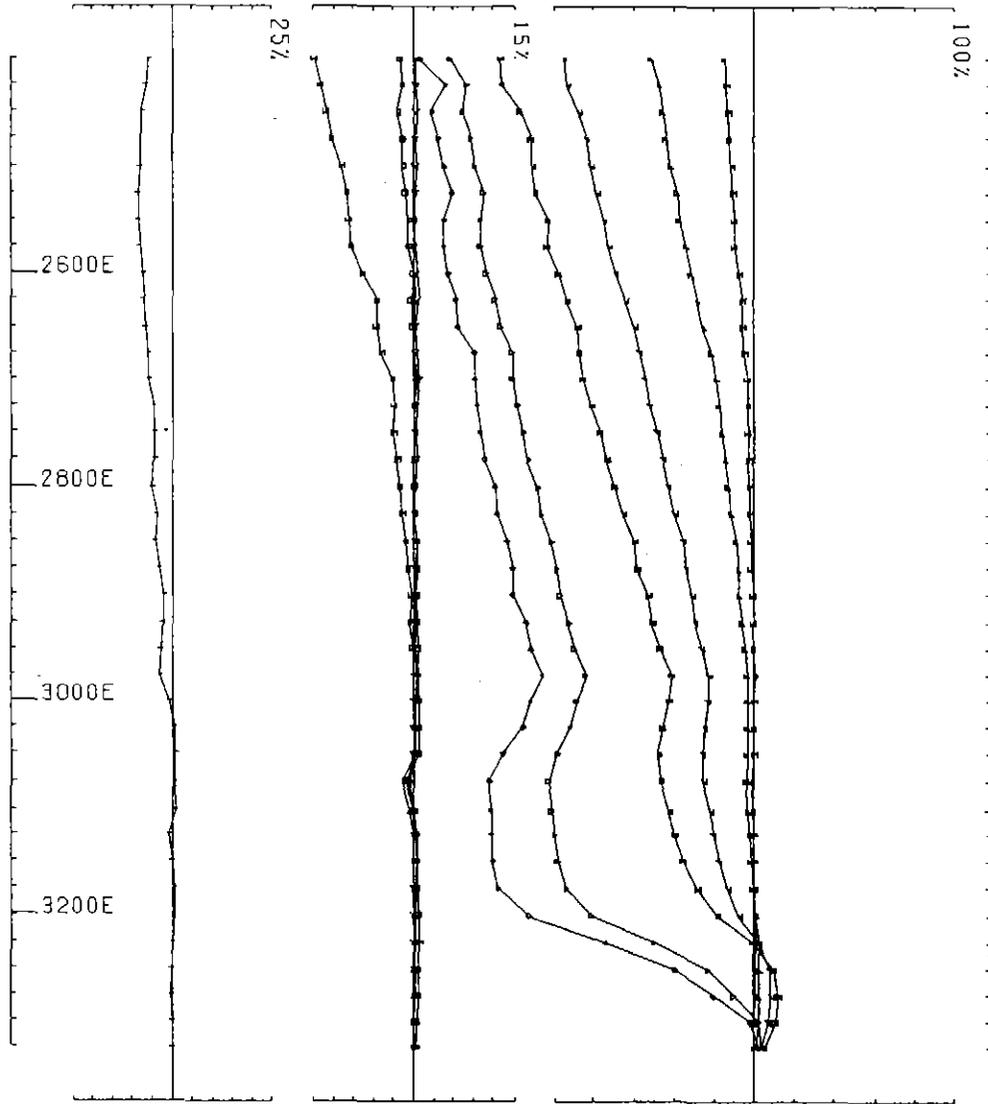
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 25.23
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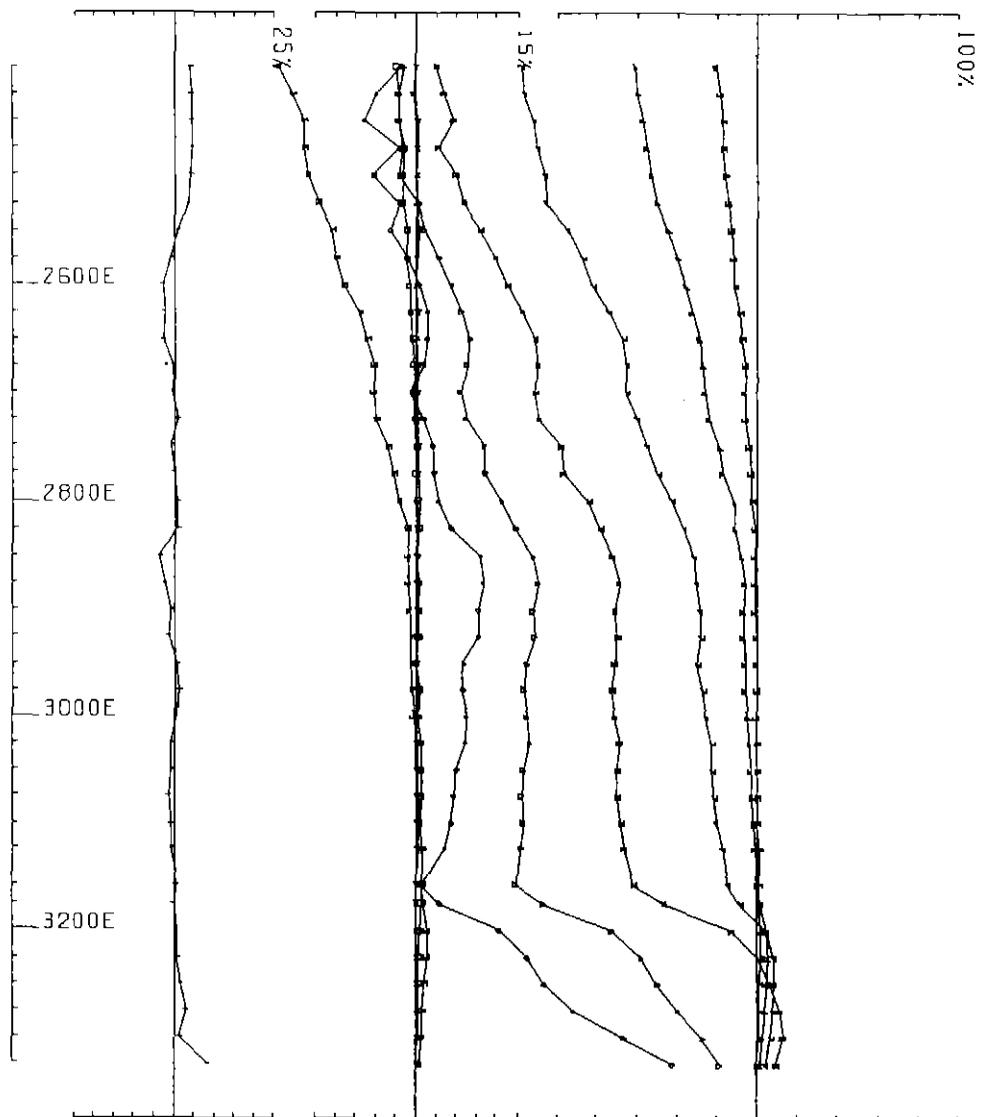
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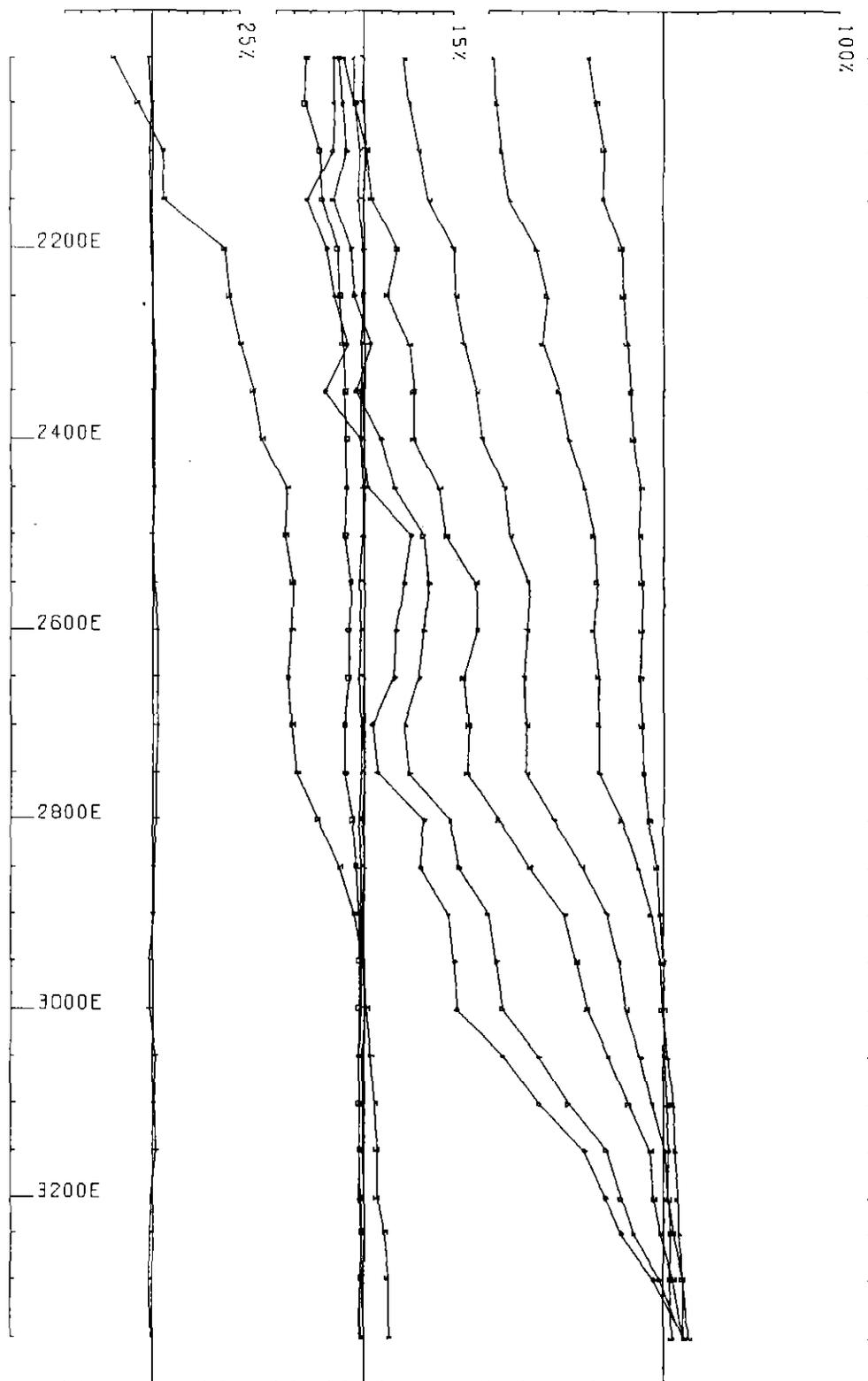
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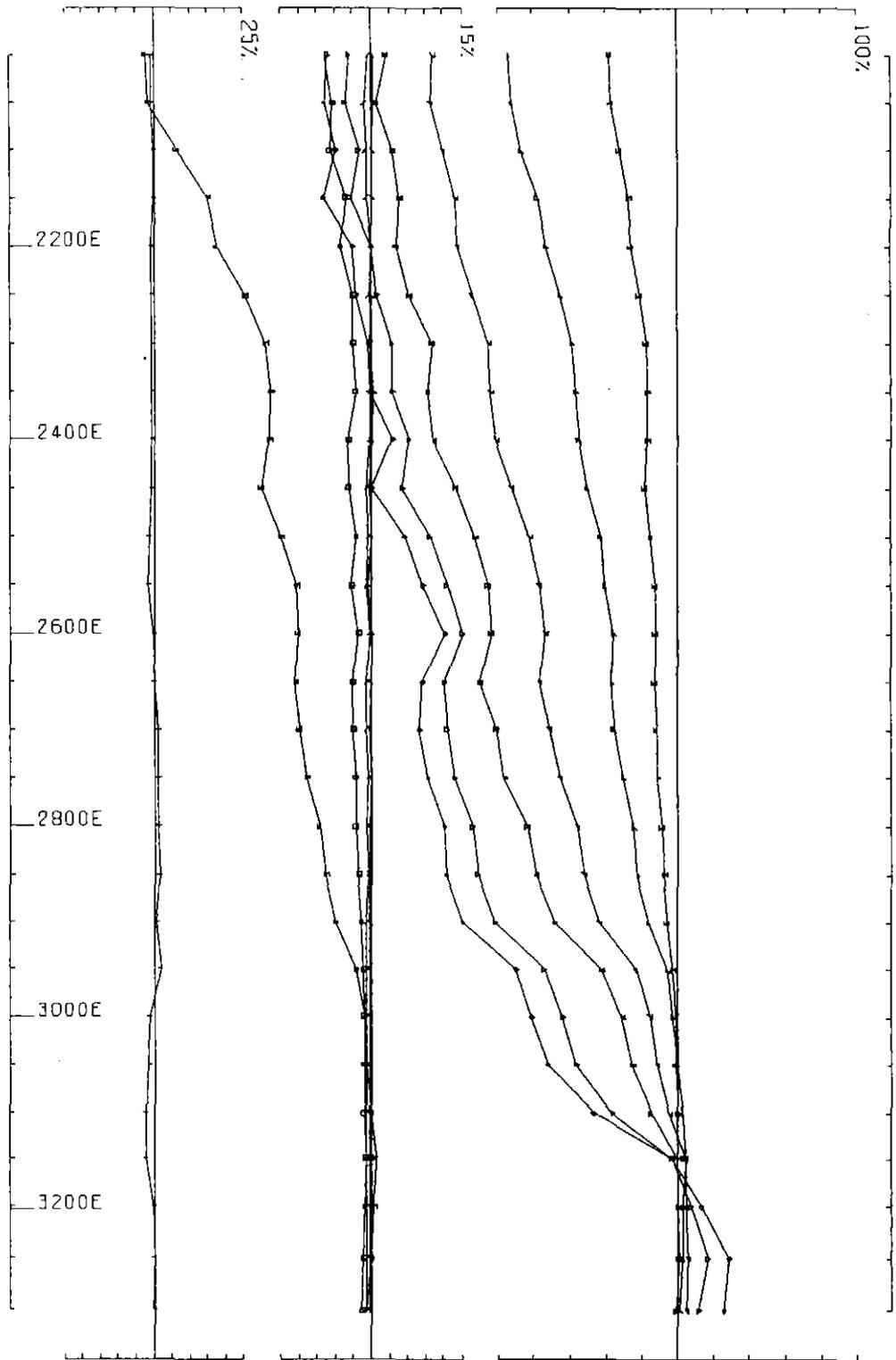
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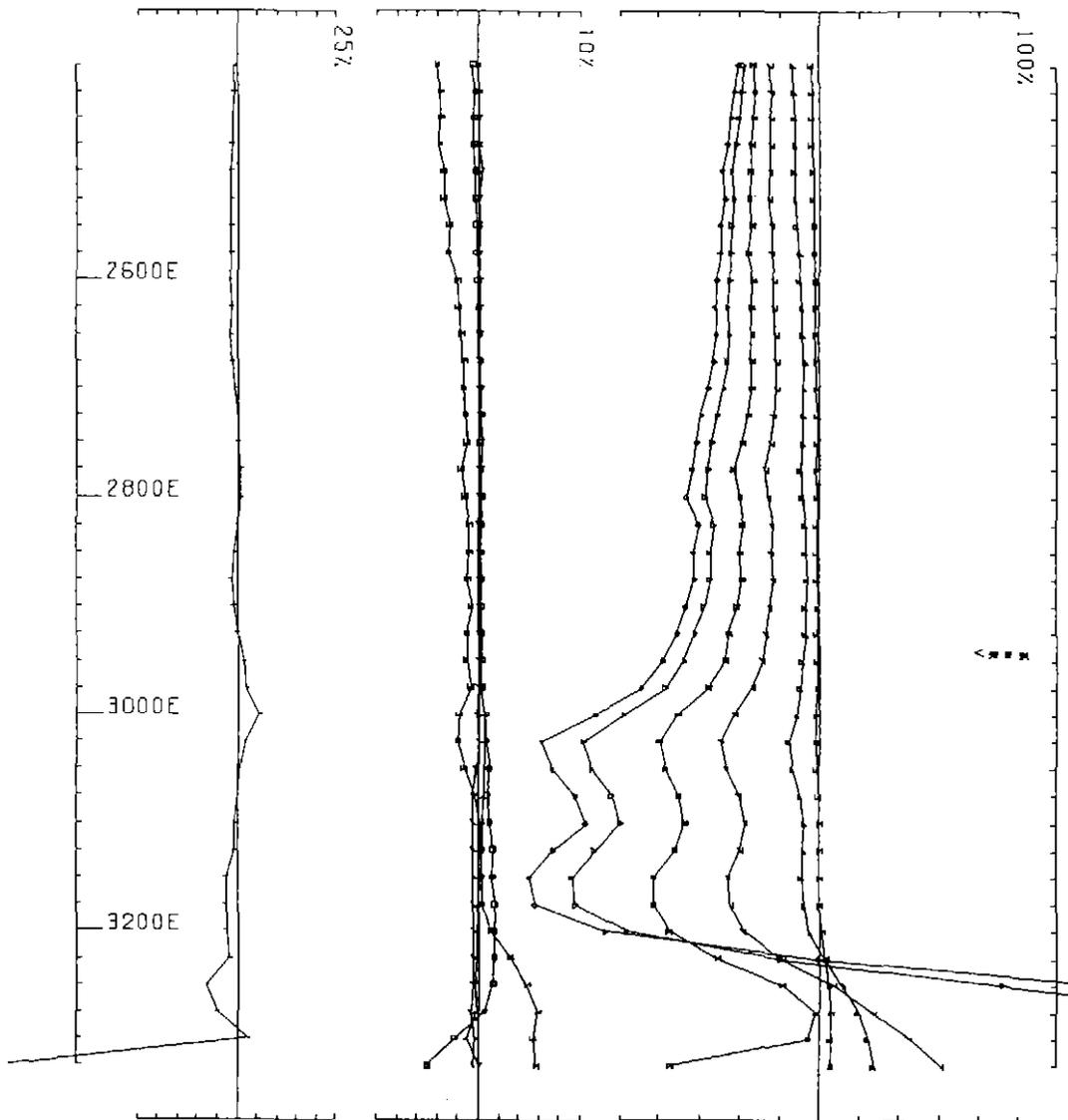
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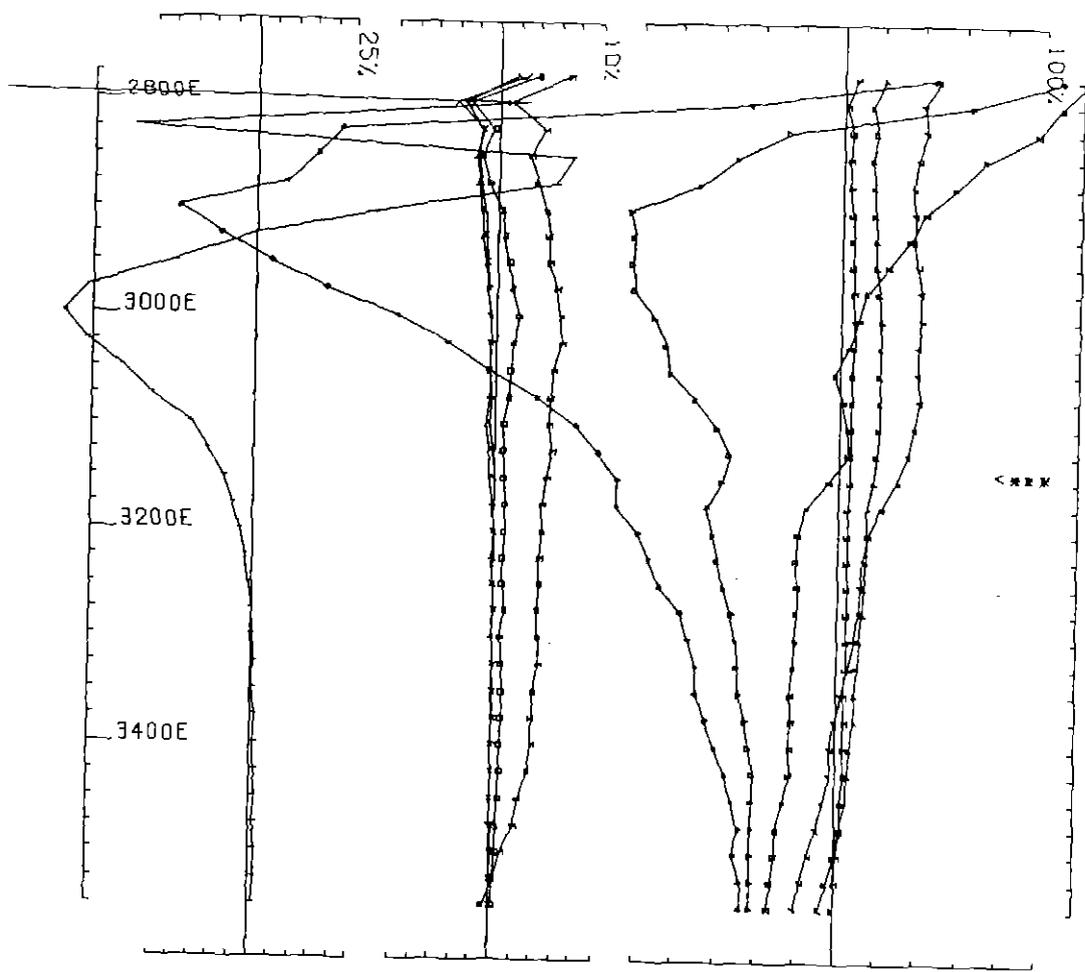
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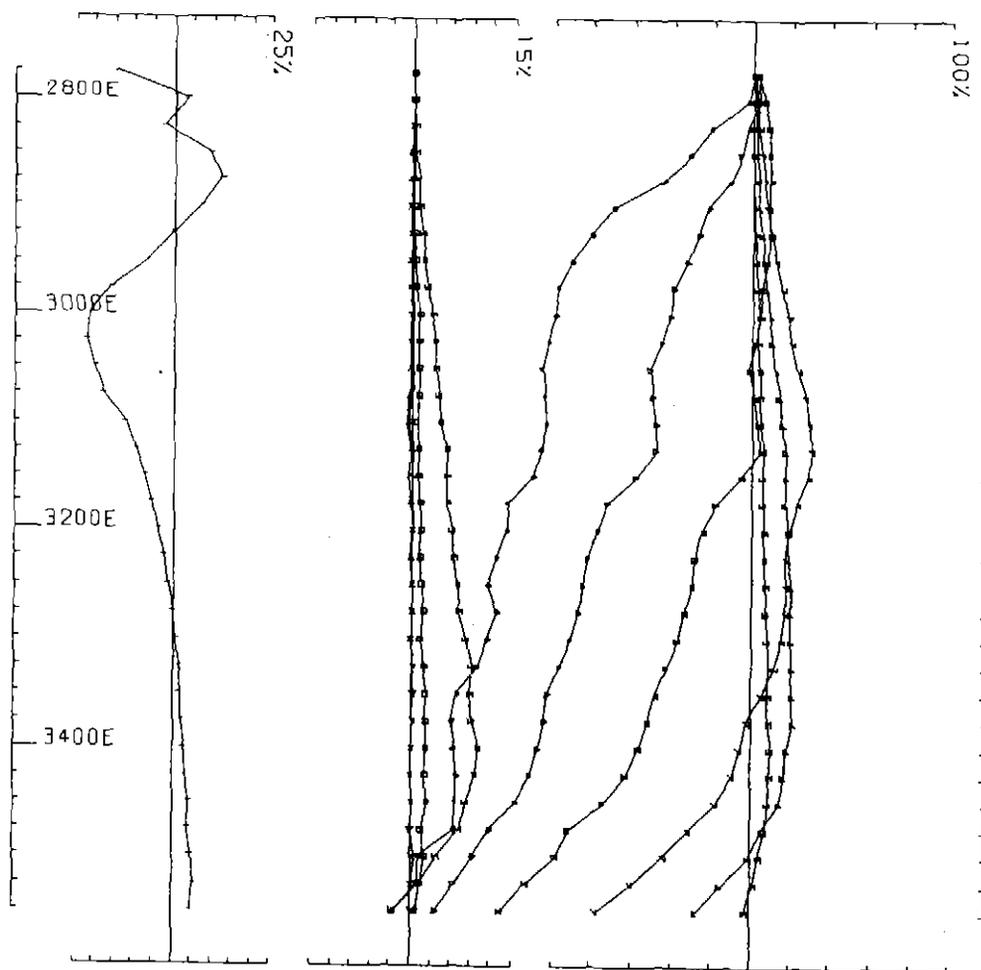
UTEM SURVEY AT CARFIELD FOR BHP - UTAH NOVEMBER 1990
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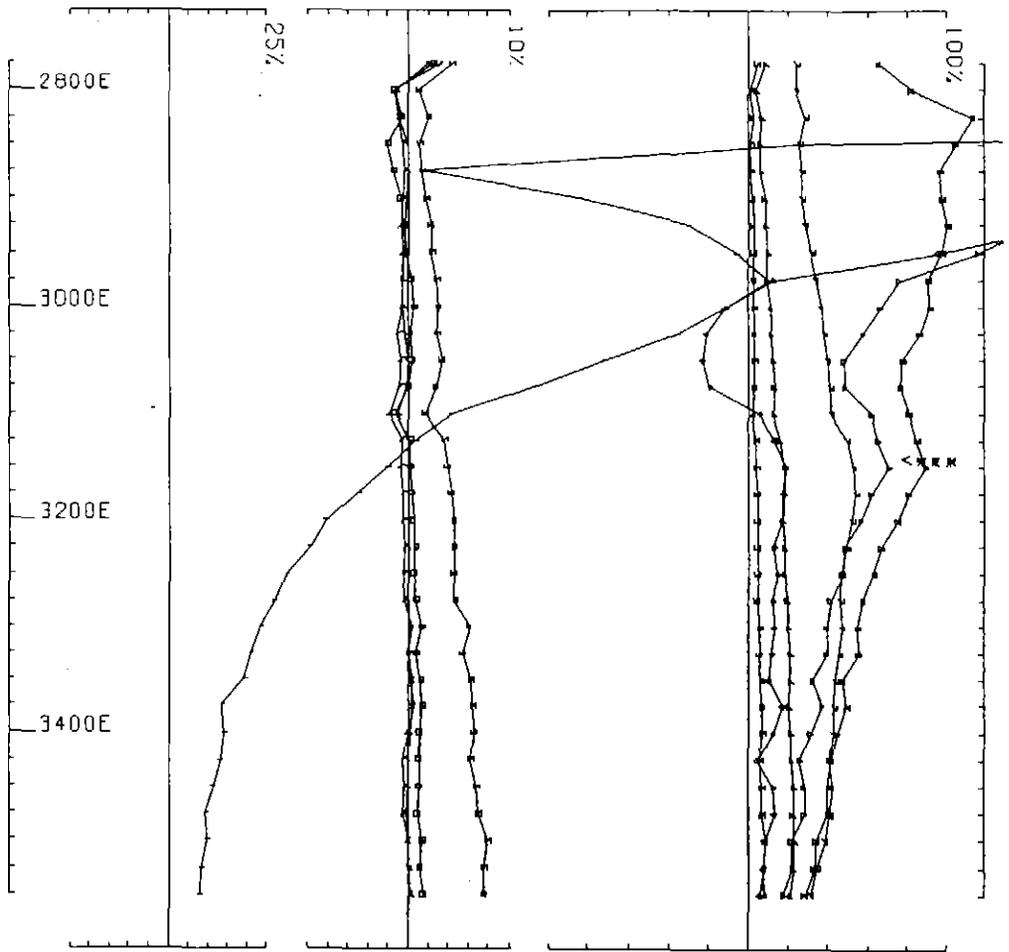
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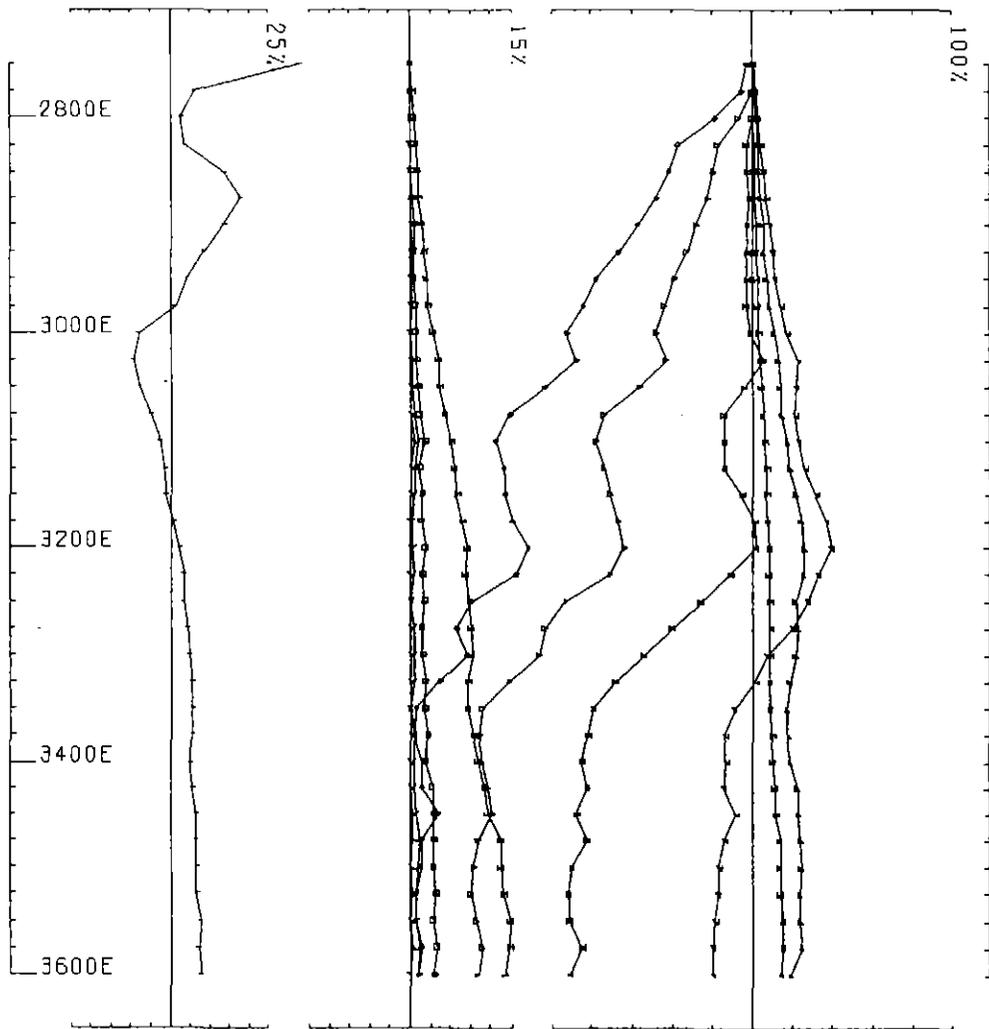
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UTEM SURVEY AT GARFIELD FOR BHP - UTAH
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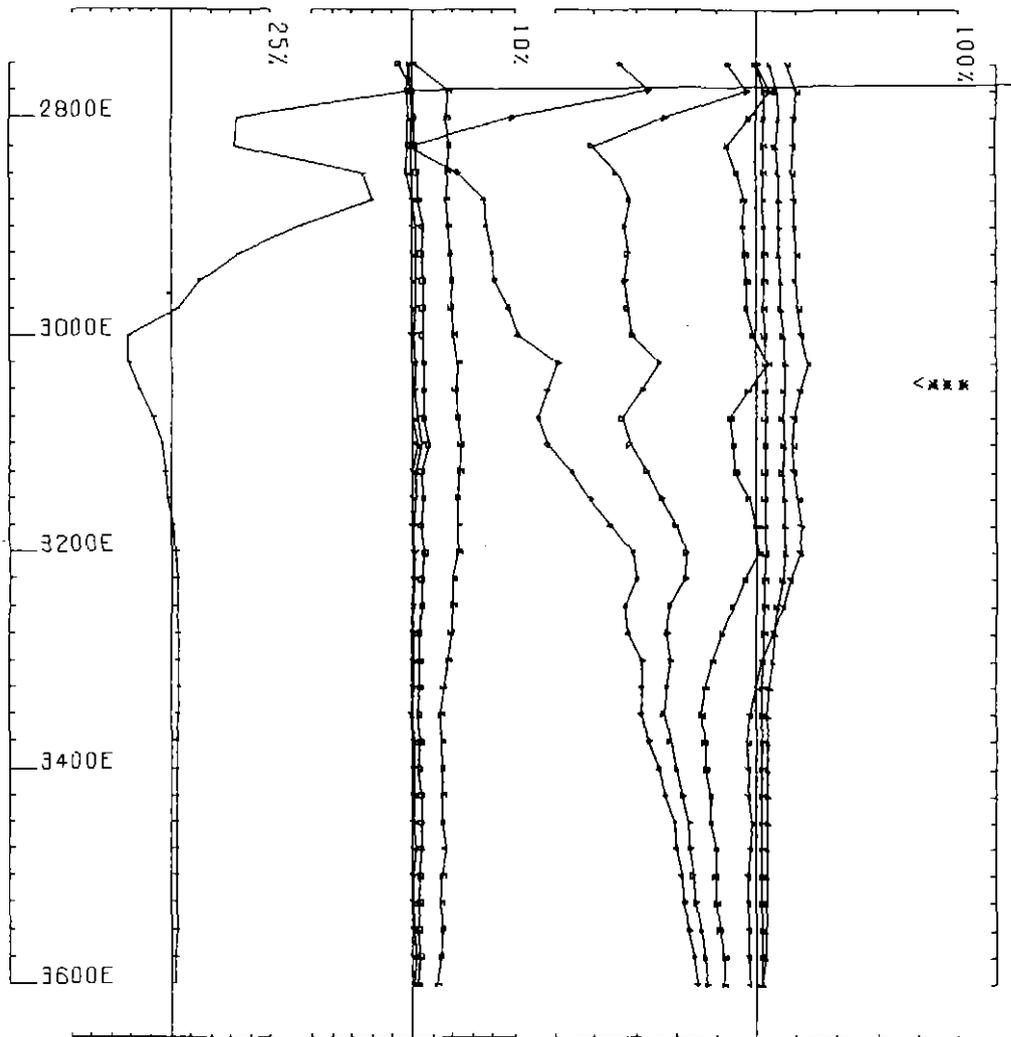
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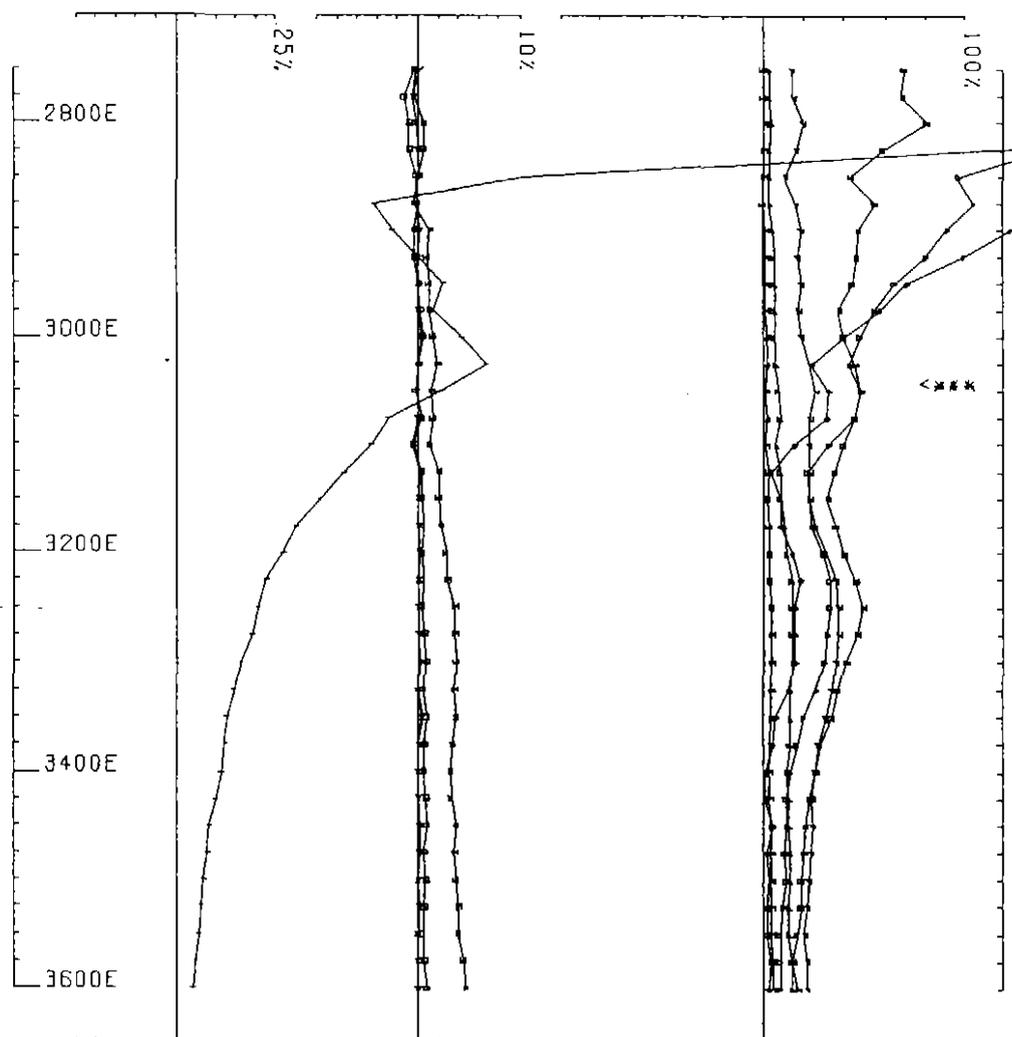
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0182

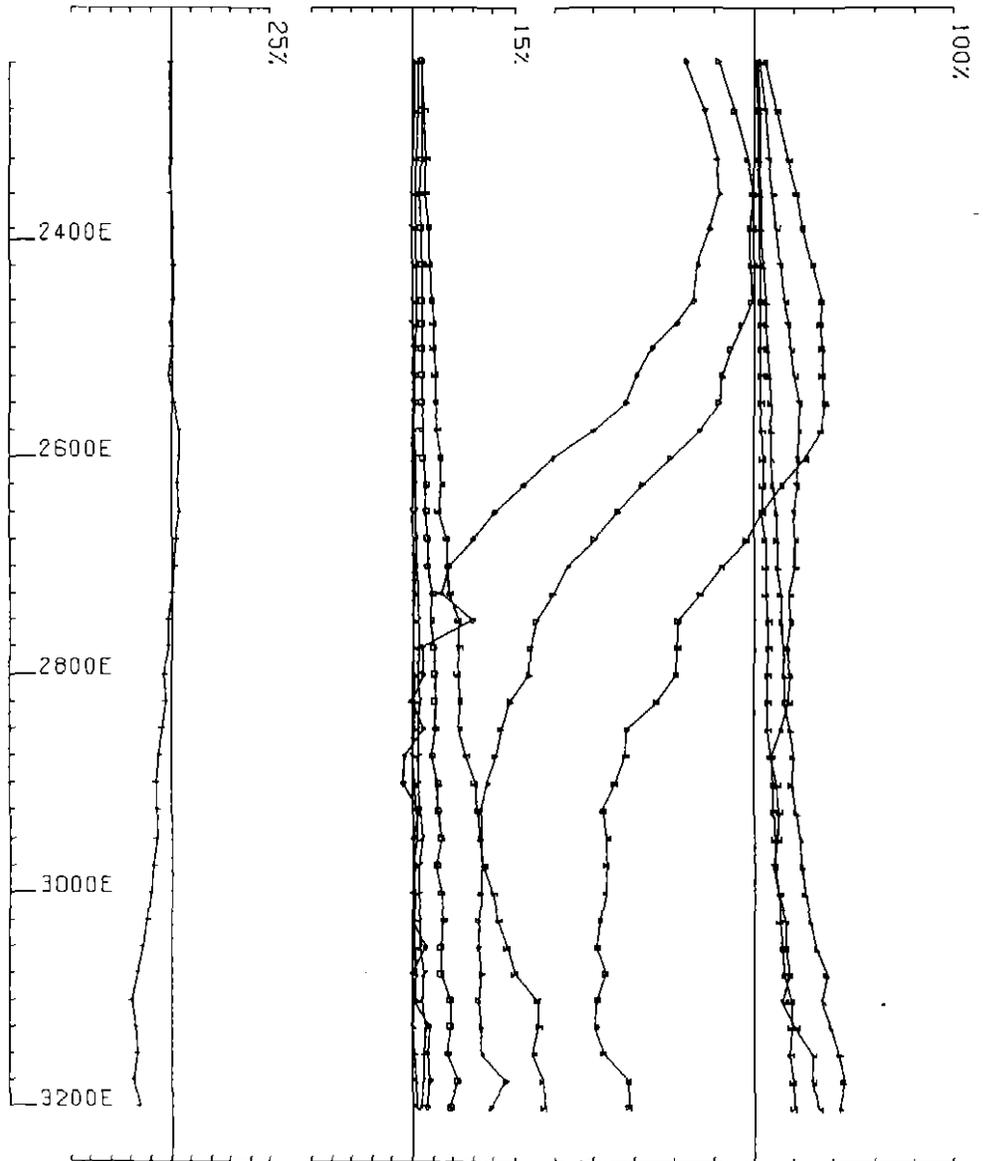
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UTEM SURVEY AT OARFIELD FOR BHP - UTAH NOVEMBER 1990
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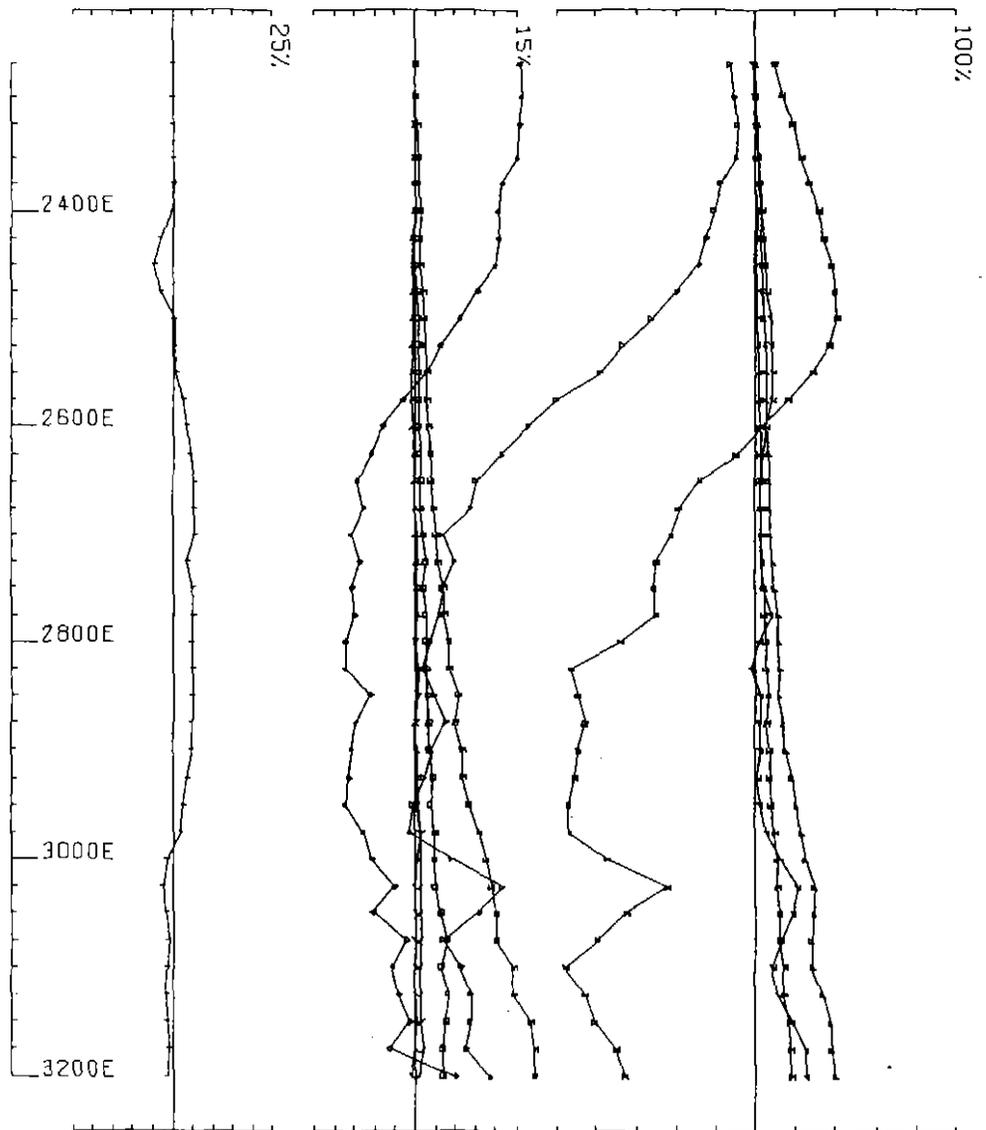


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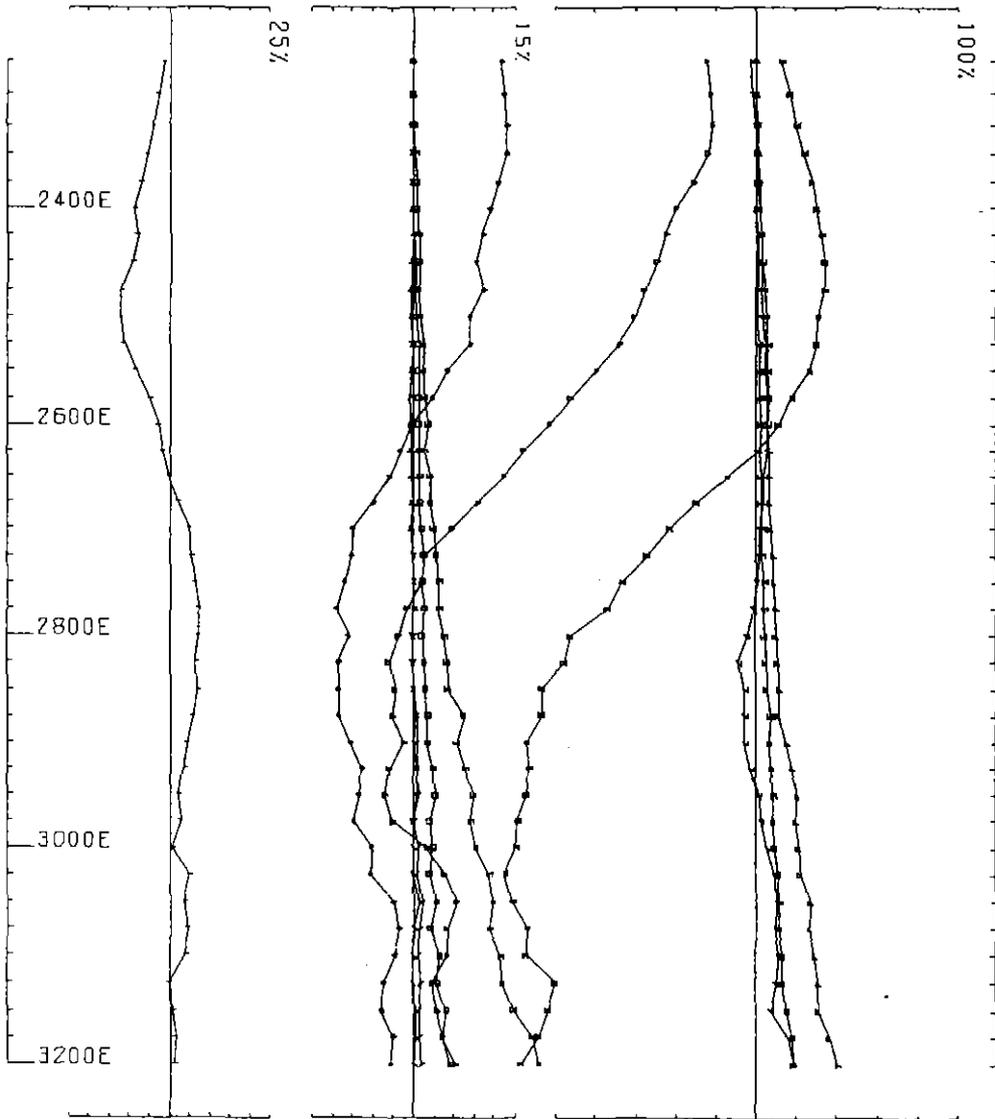


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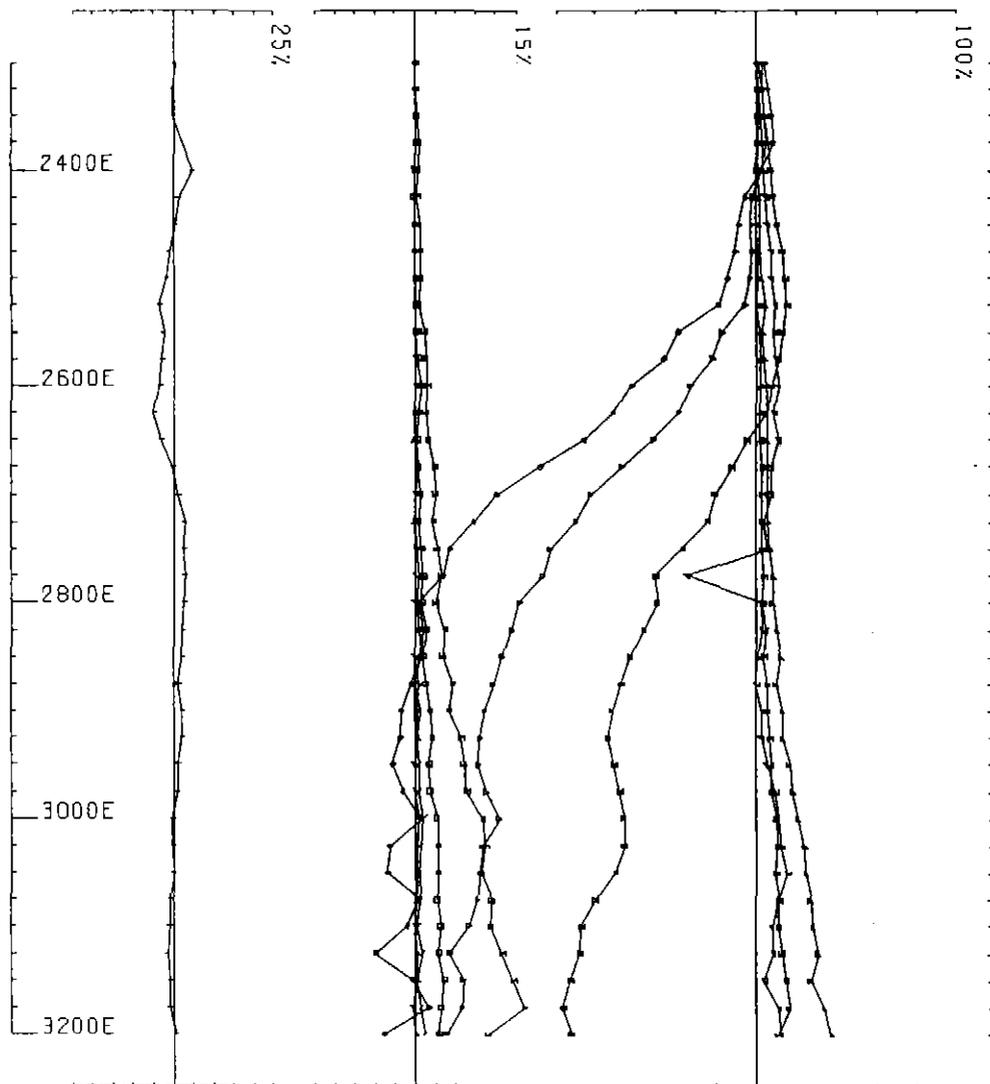
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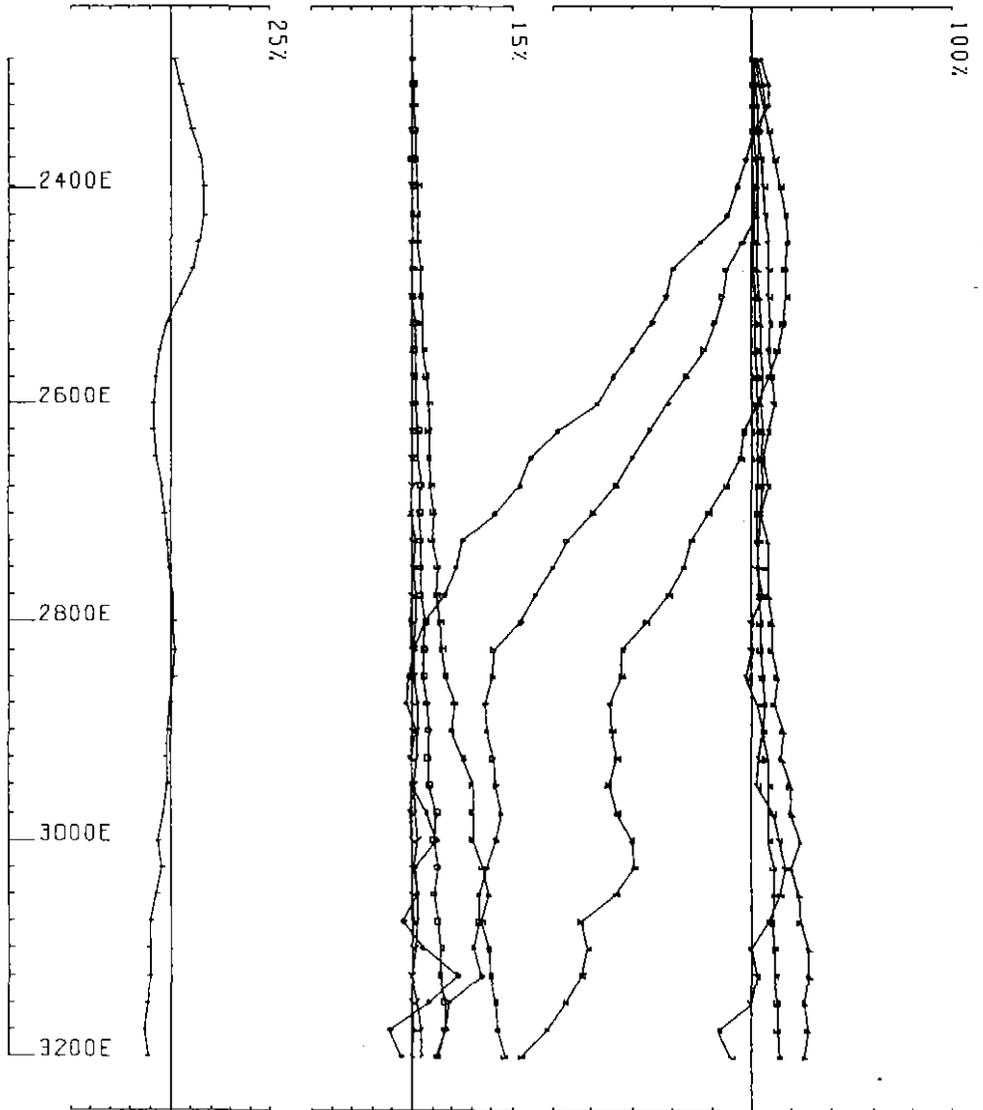
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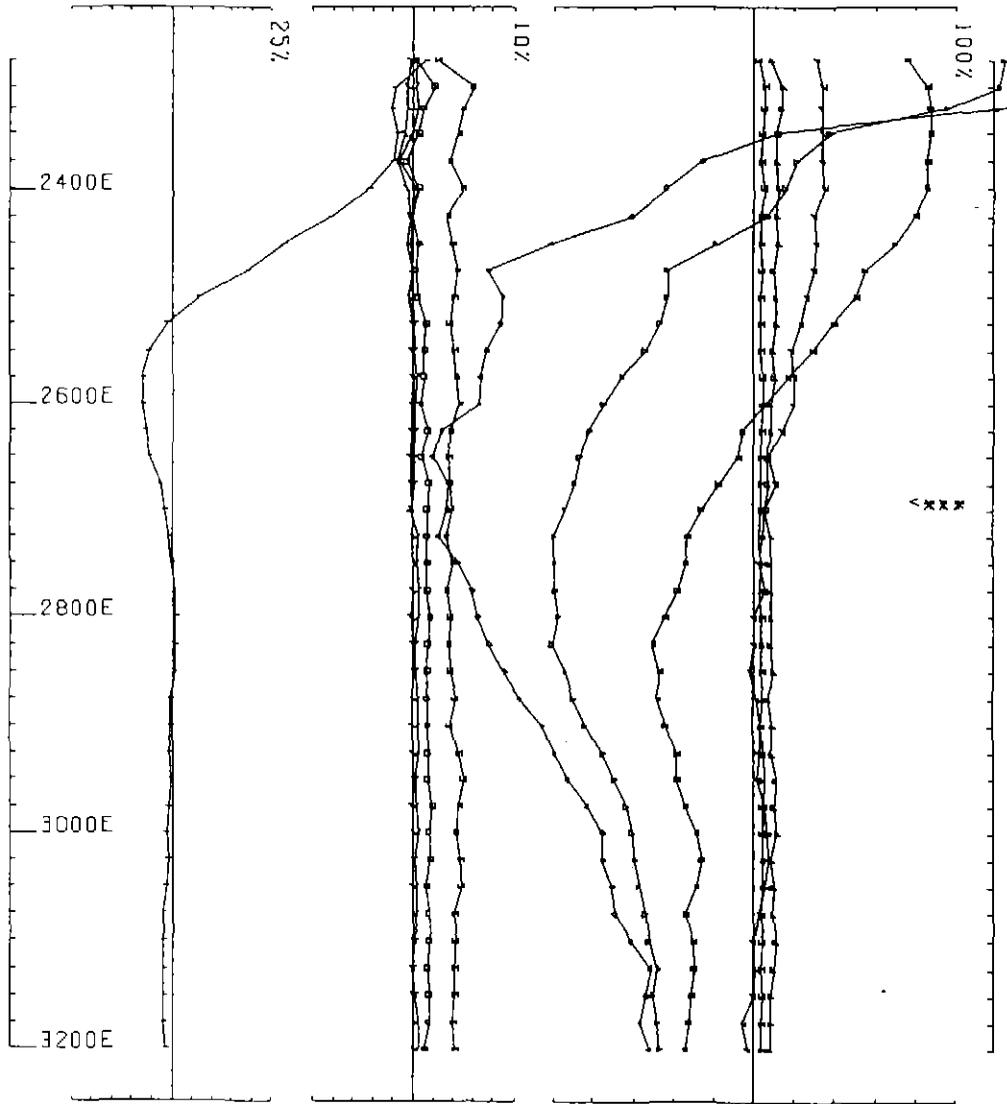
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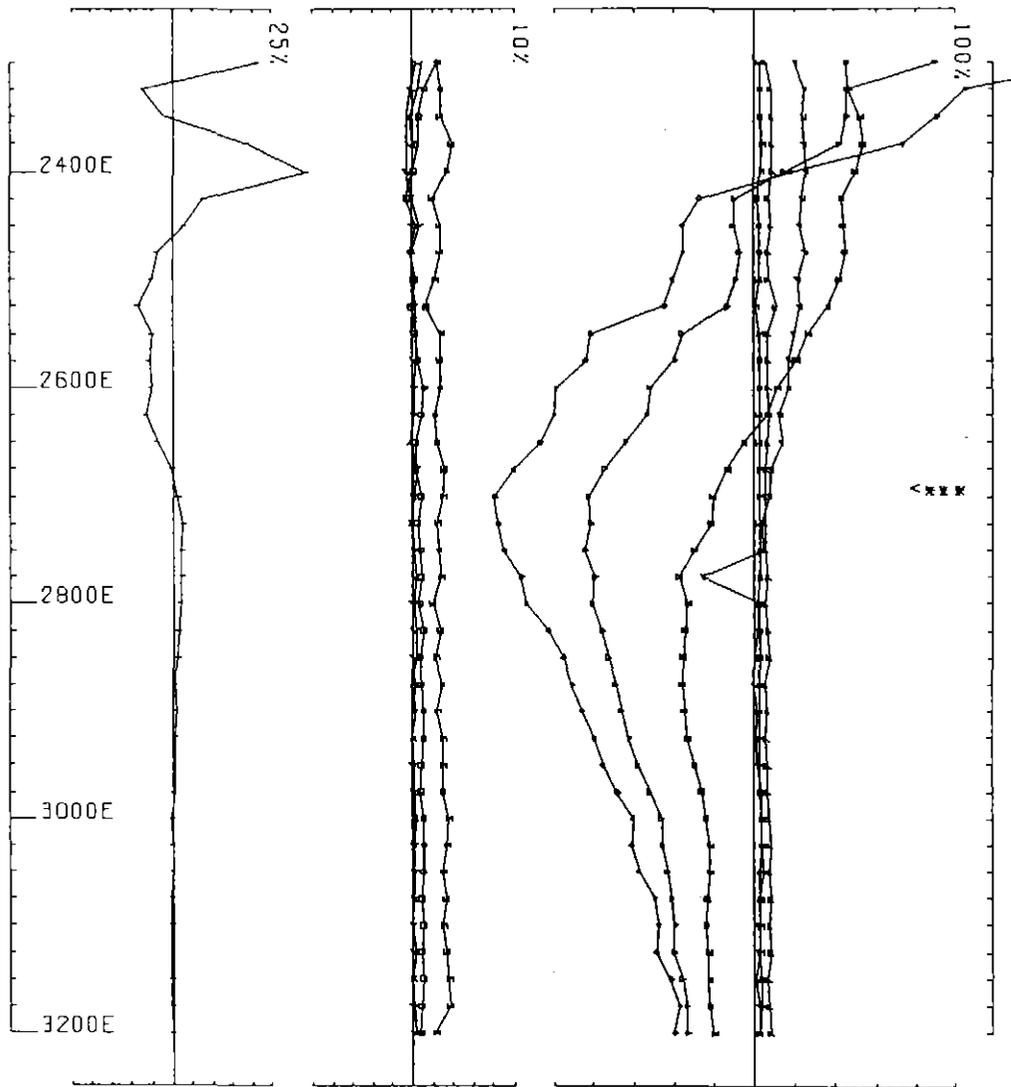
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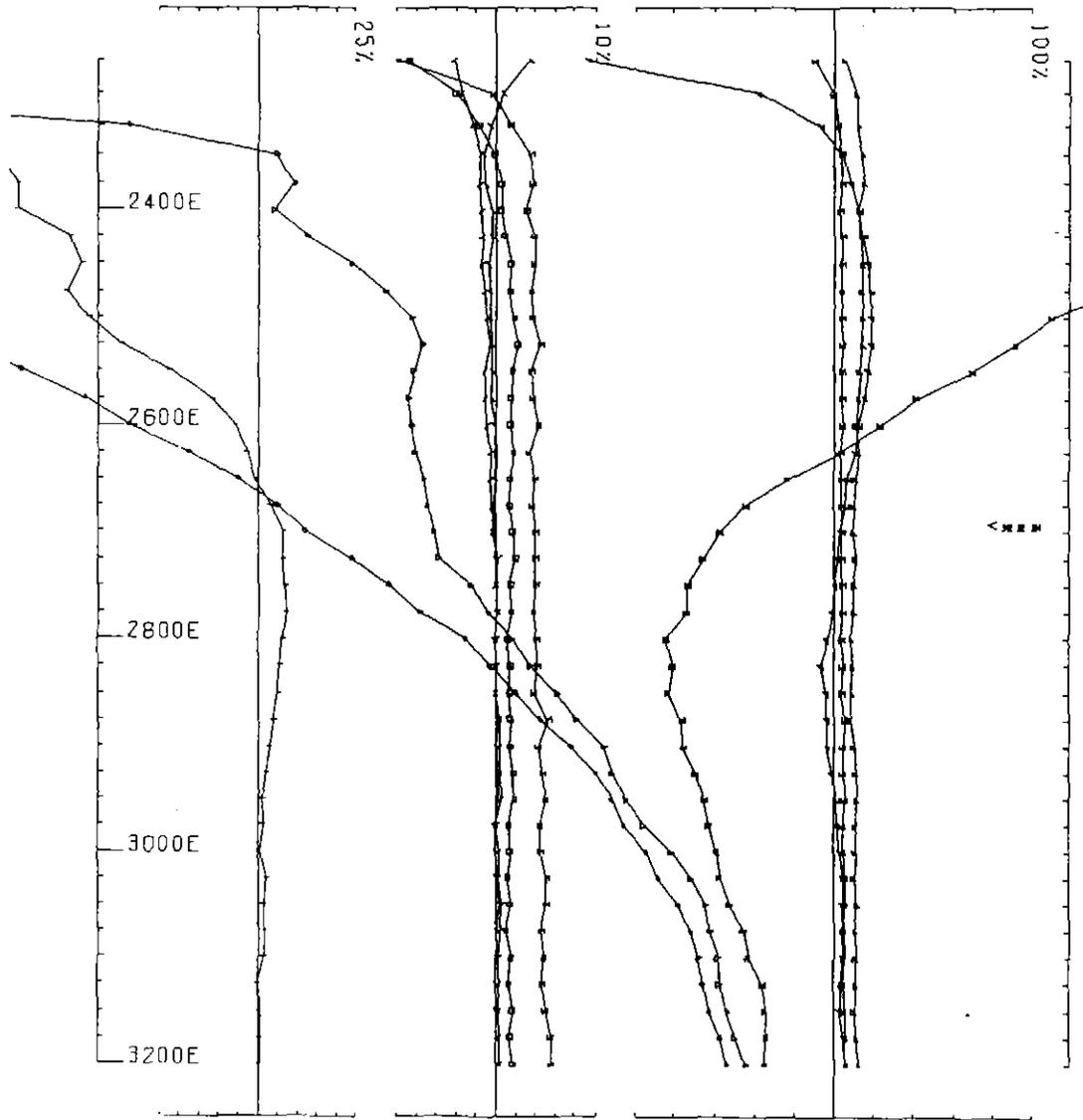
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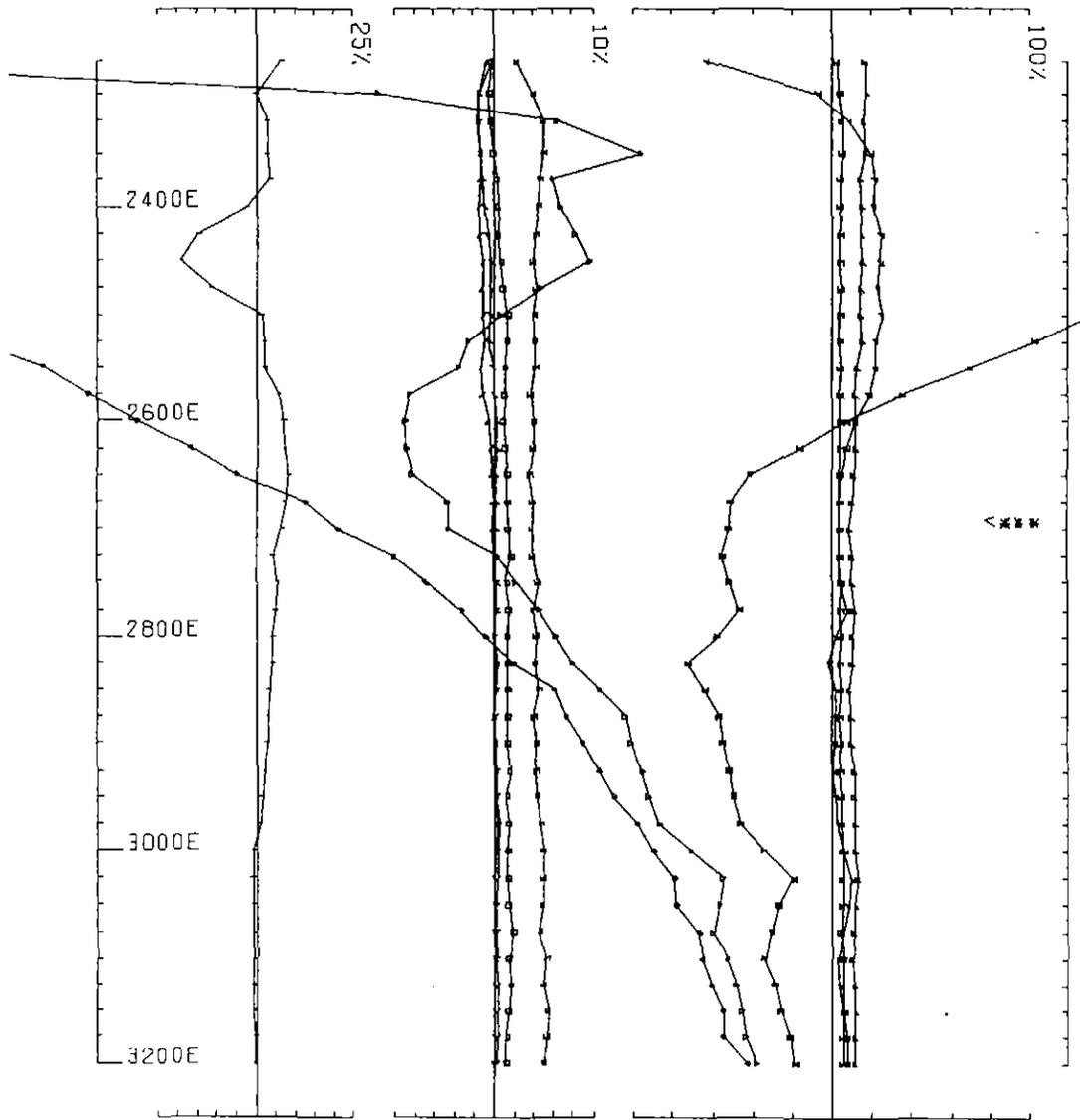
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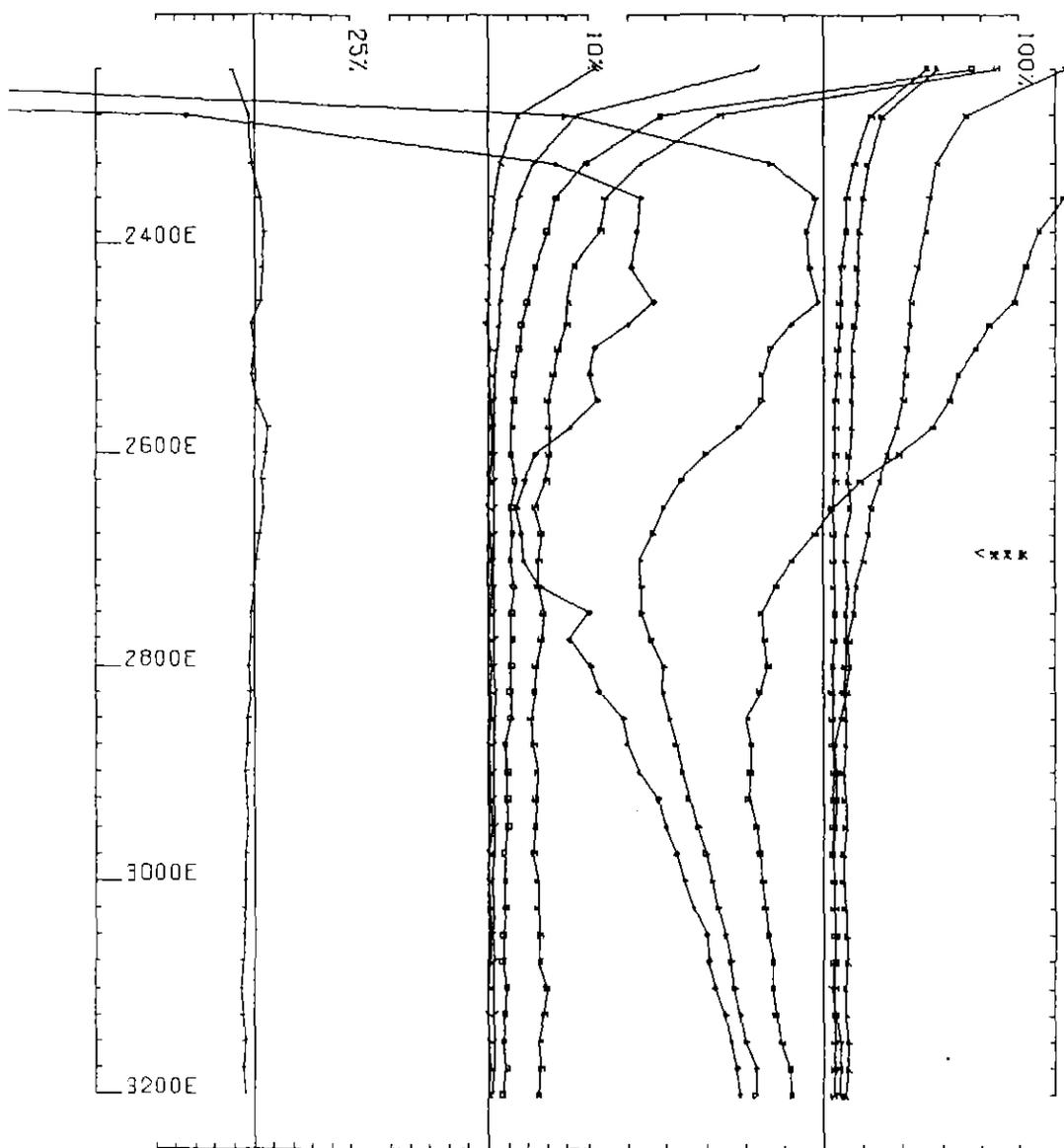
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LOOP NO 11 LINE 3200 N COMPONENT HZ SECONDARY FIELD CH1 POINT NBRM.



UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 0090 BASE FREQ (HZ) 26.23
LOOP NO 11 LINE 3400 N COMPONENT HZ SECONDARY FIELD CH1 POINT NORM.



UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26.23
LOOP NO 11 LINE 3600 N COMPONENT HZ SECONDARY FIELD CHI POINT NORM.



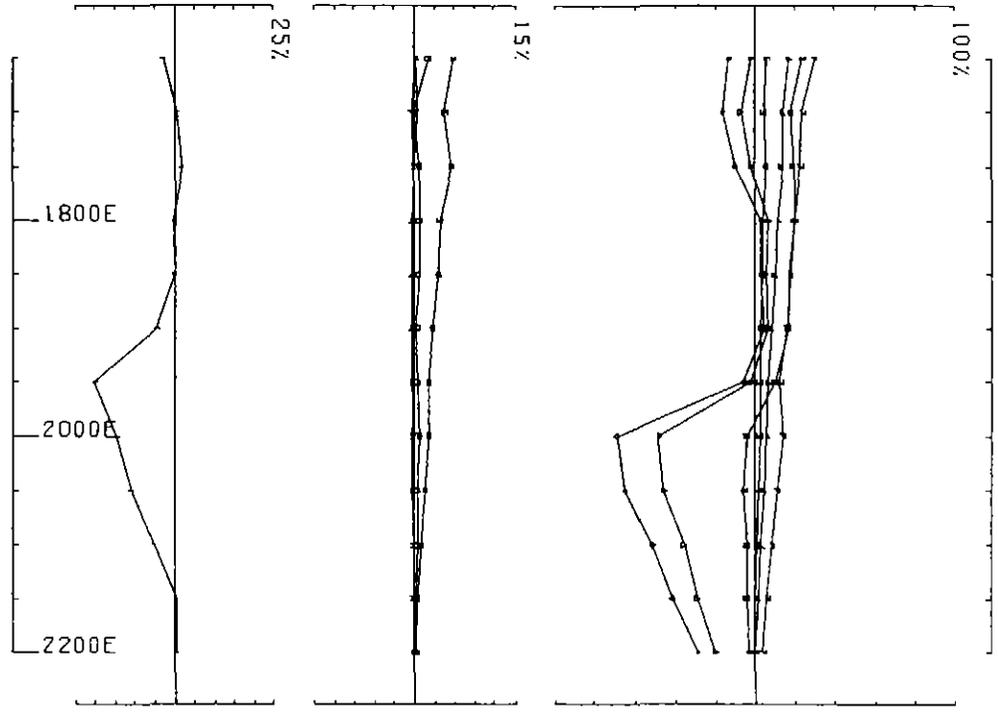
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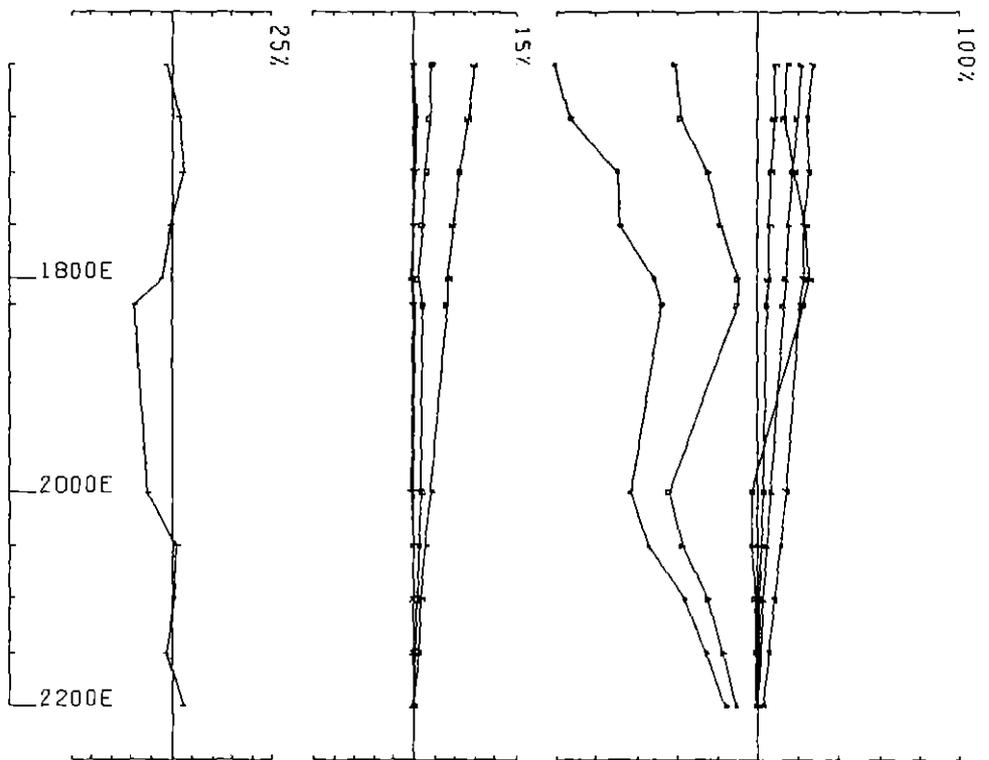
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APPENDIX 5

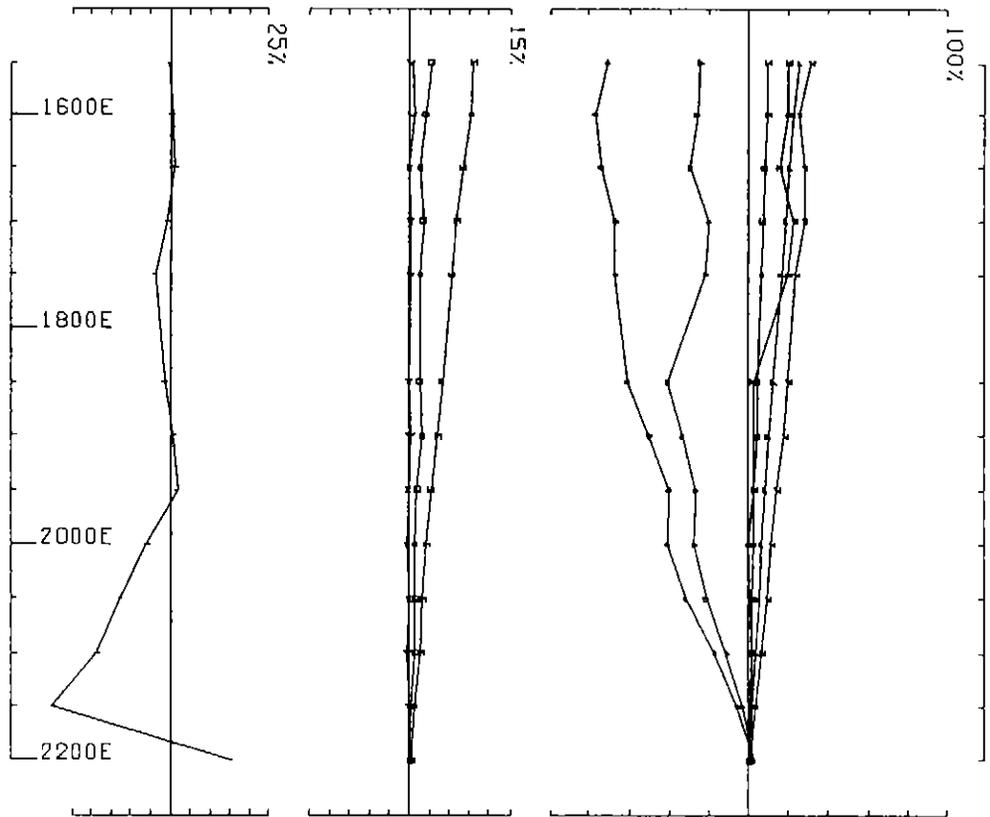
CLARK VALLEY EXTENSION UTEM SURVEY DATA PROFILES



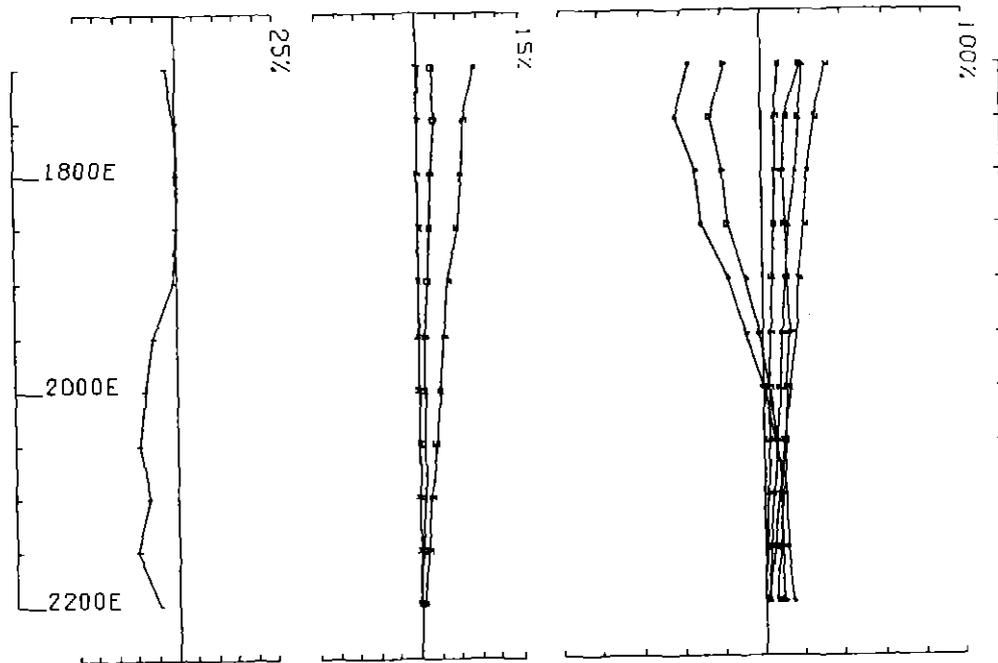
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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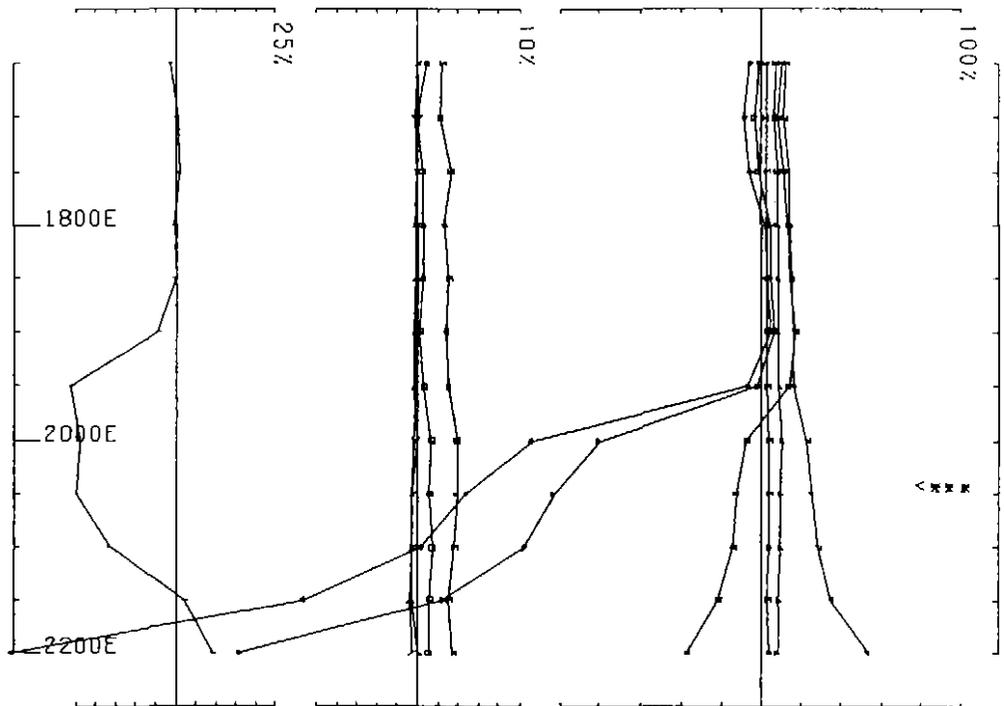
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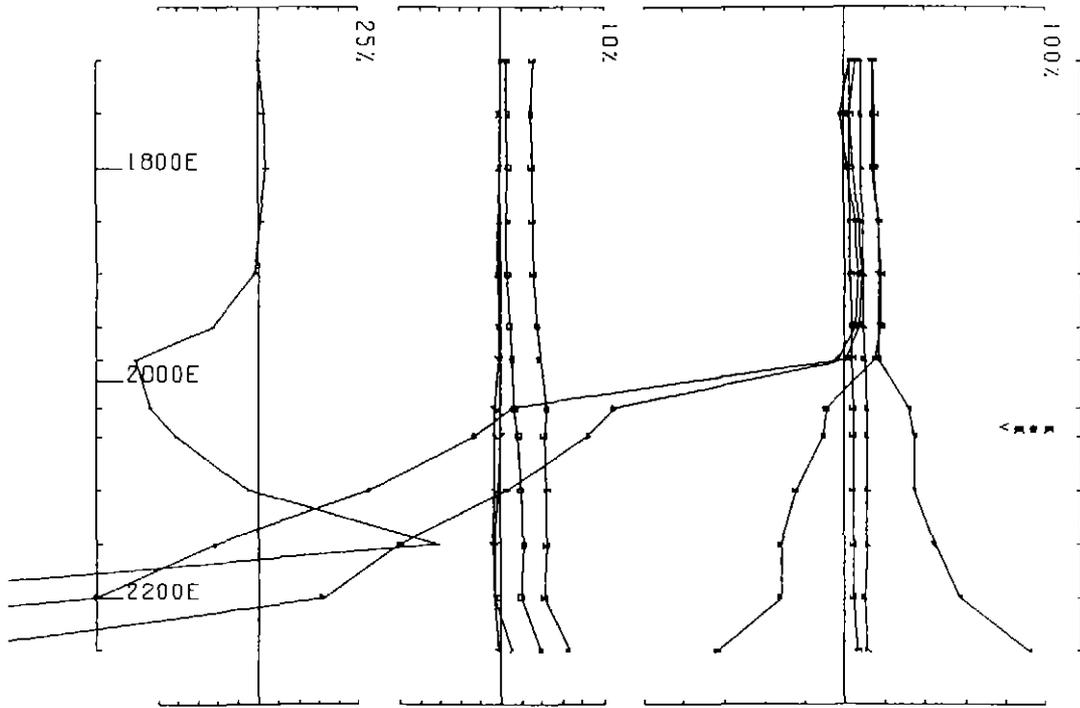
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26.23
LOOP NO 12 LINE 3200 N COMPONENT HZ SECONDARY FIELD CH1 CONTIN. NORM.



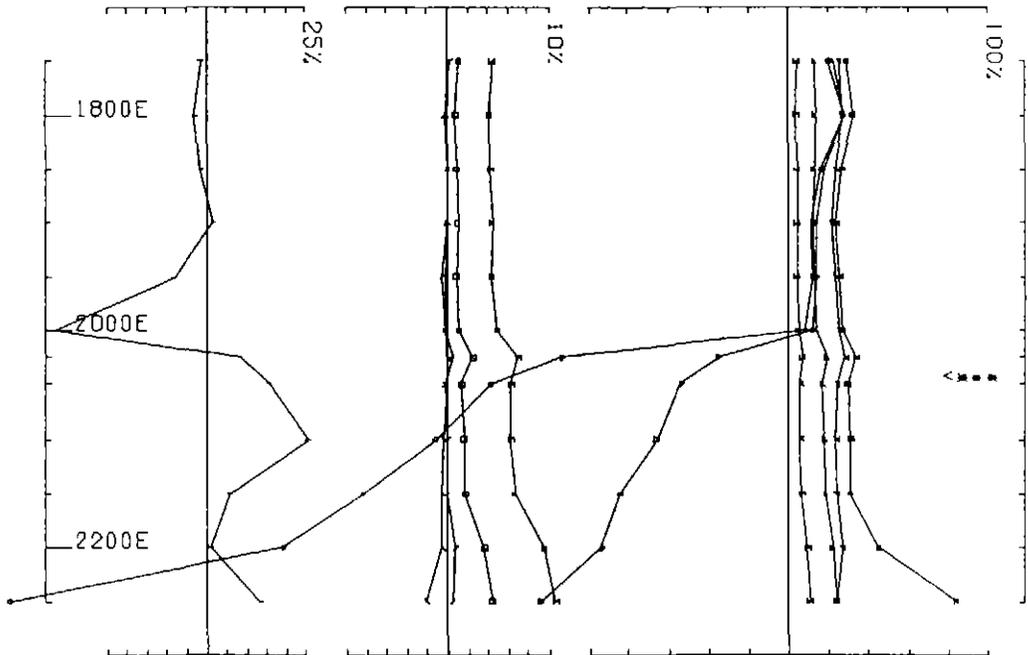
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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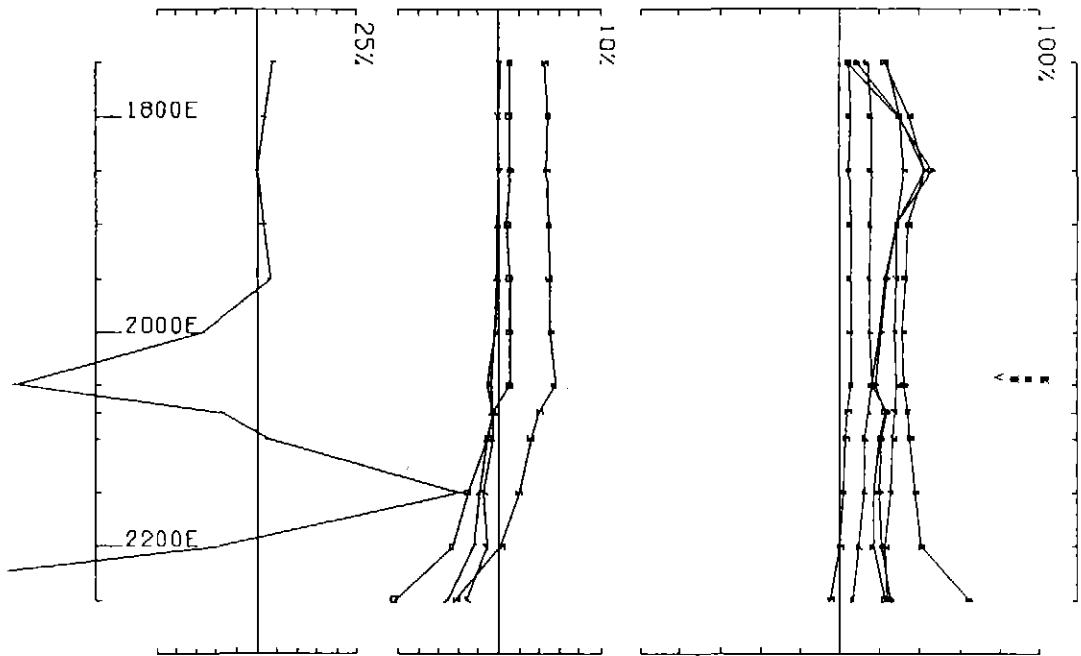
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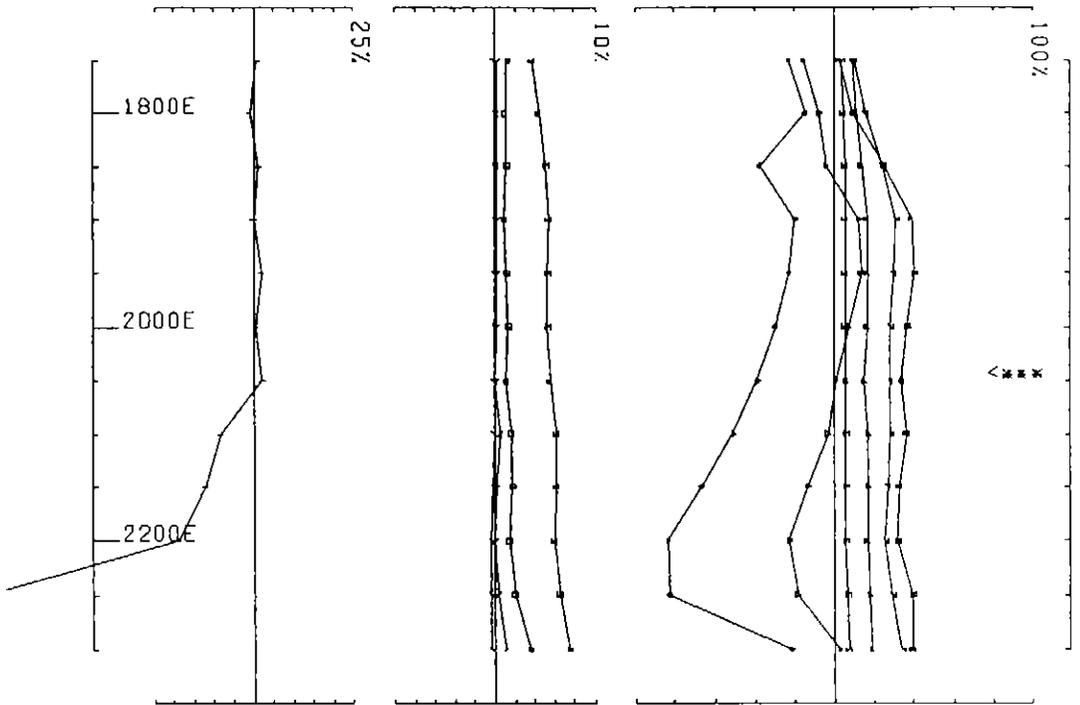
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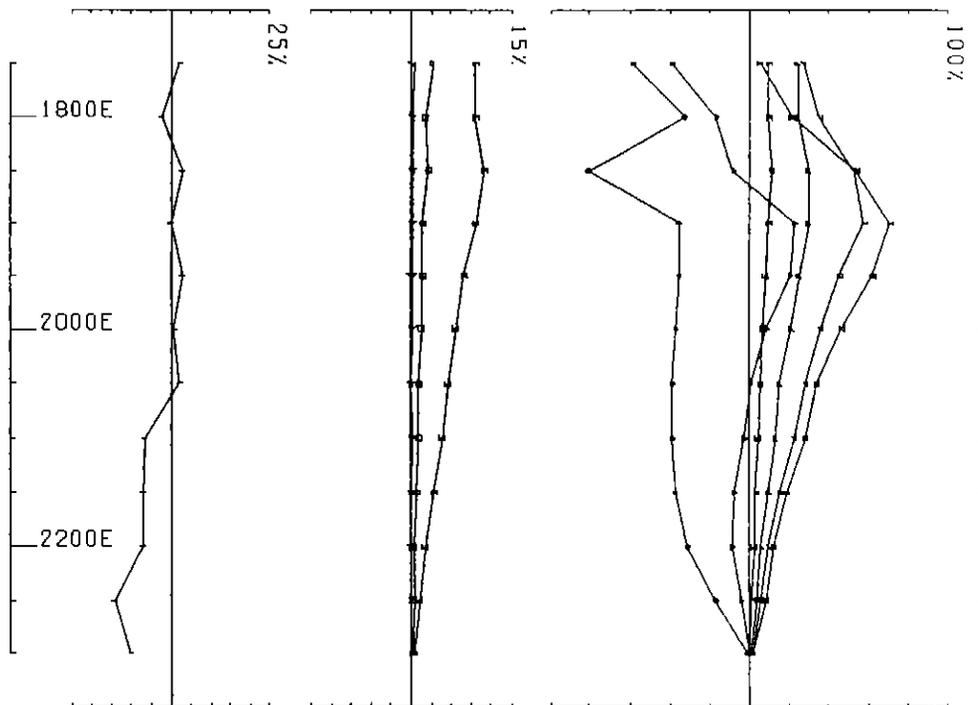
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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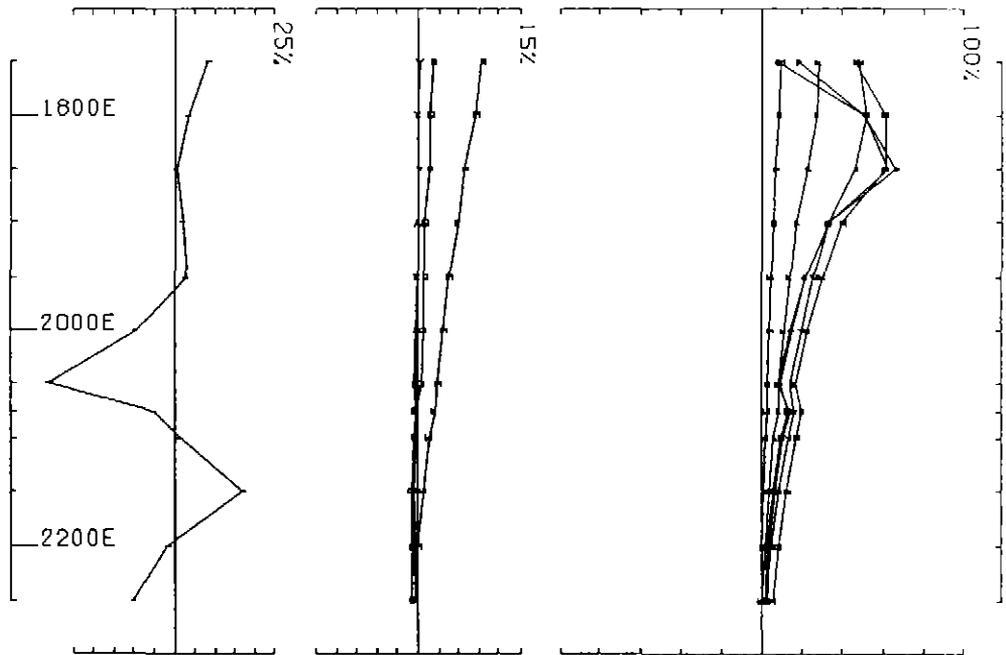
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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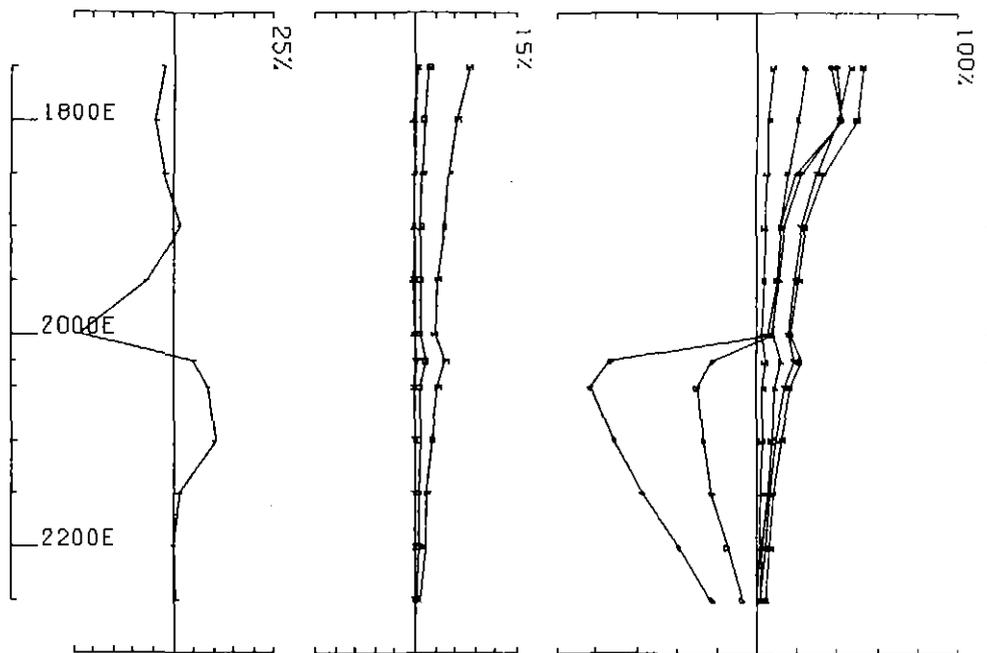
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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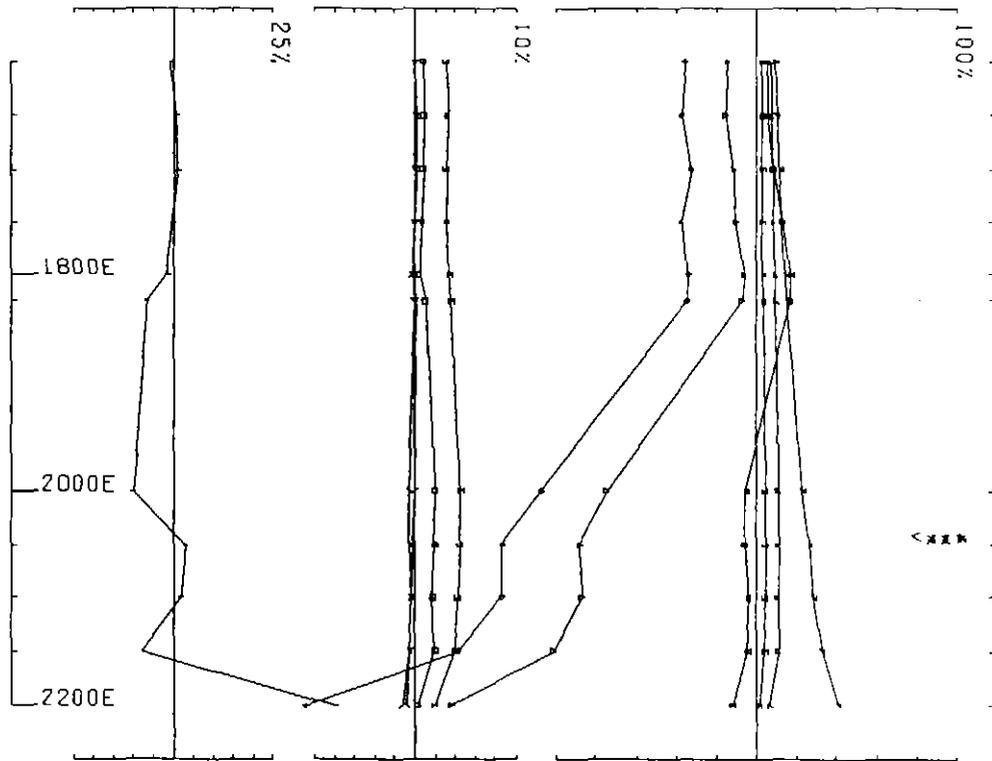
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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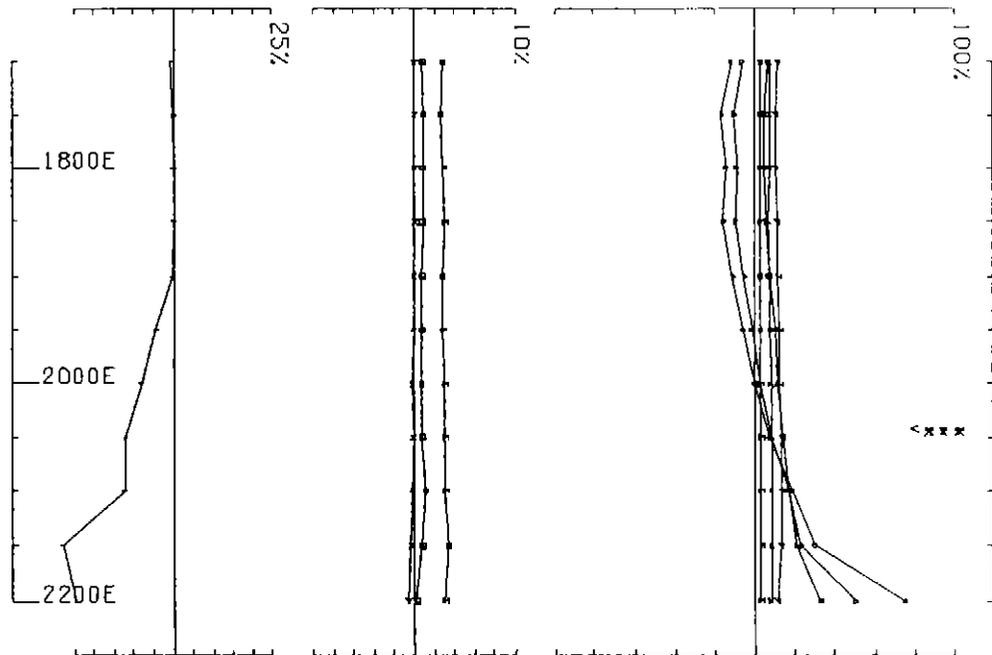
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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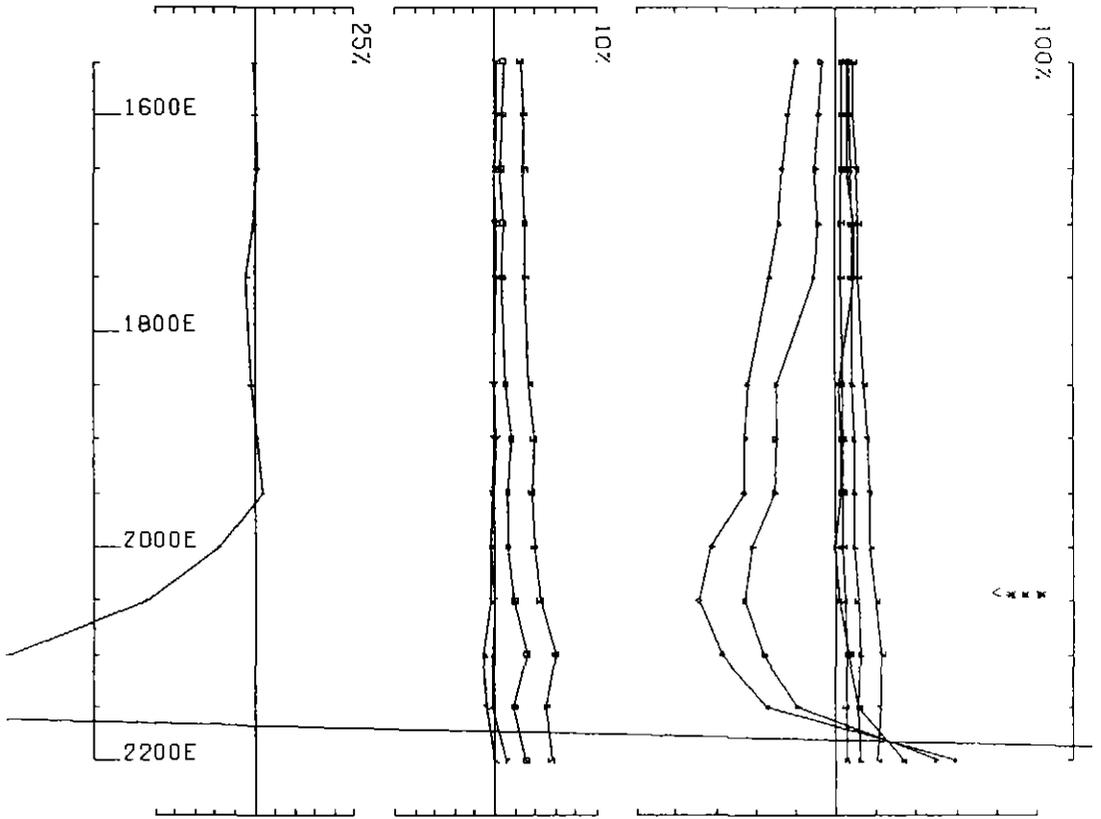
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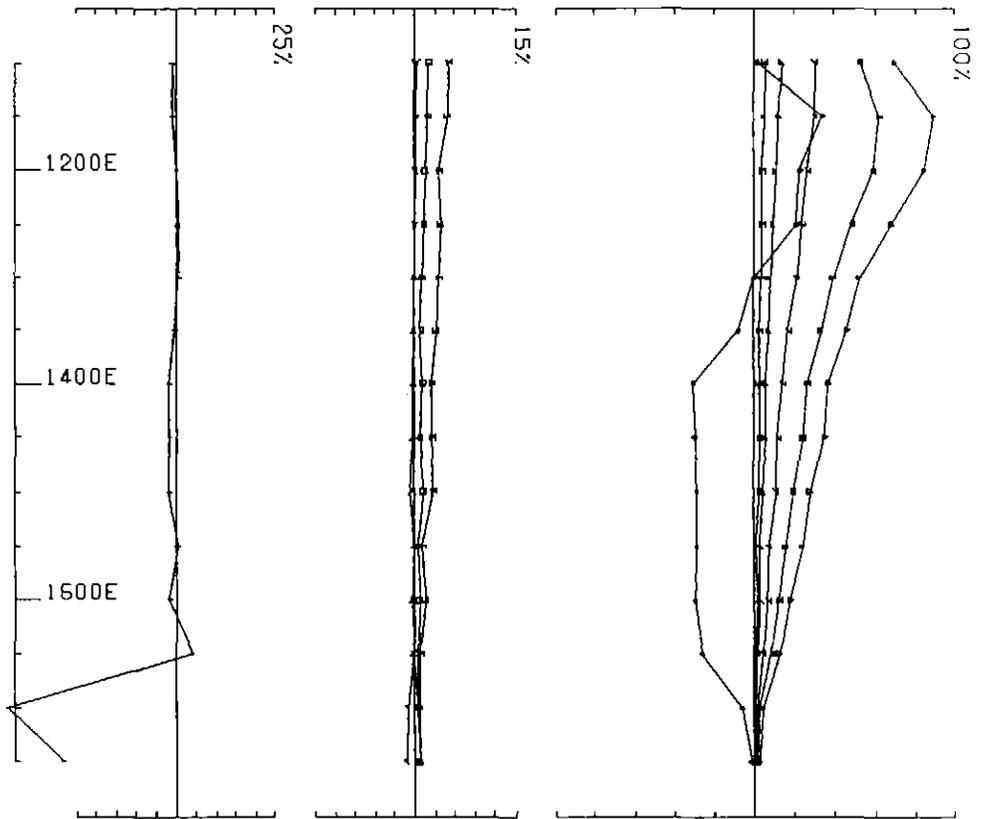
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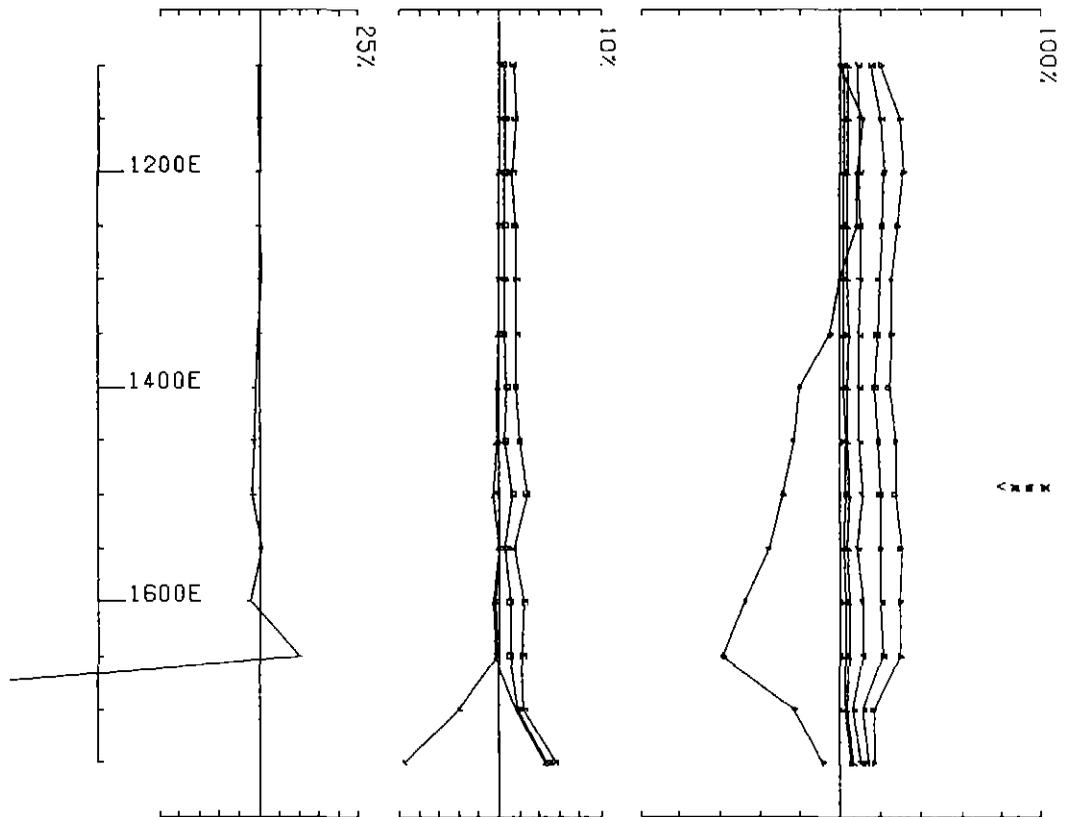
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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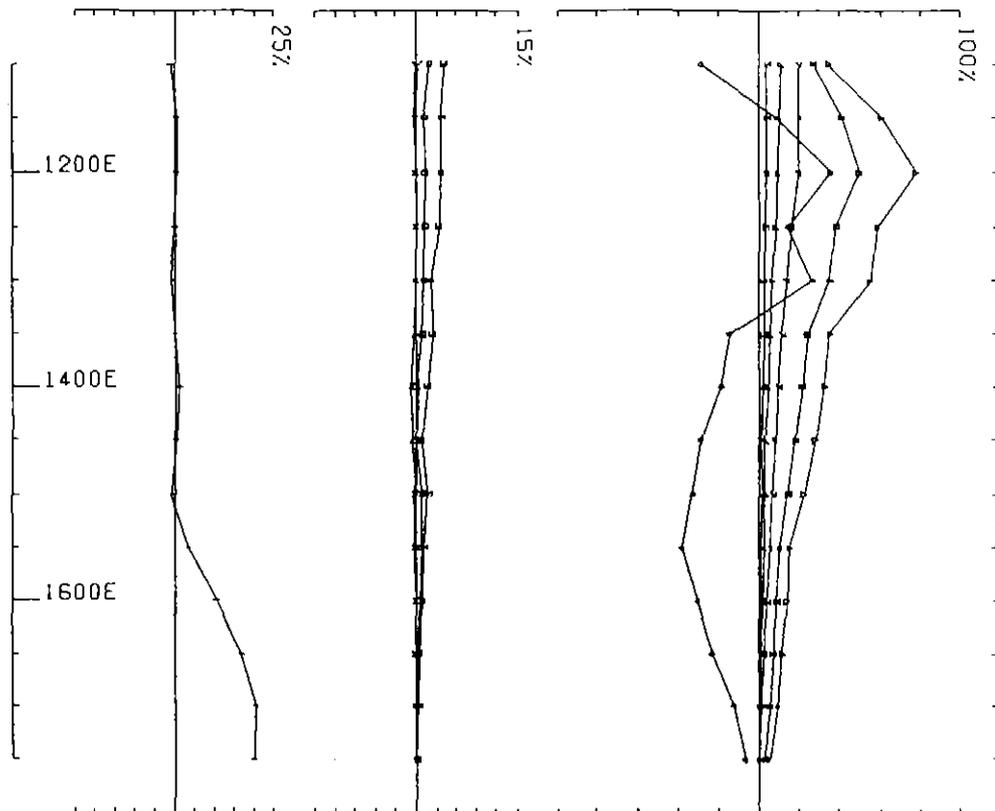
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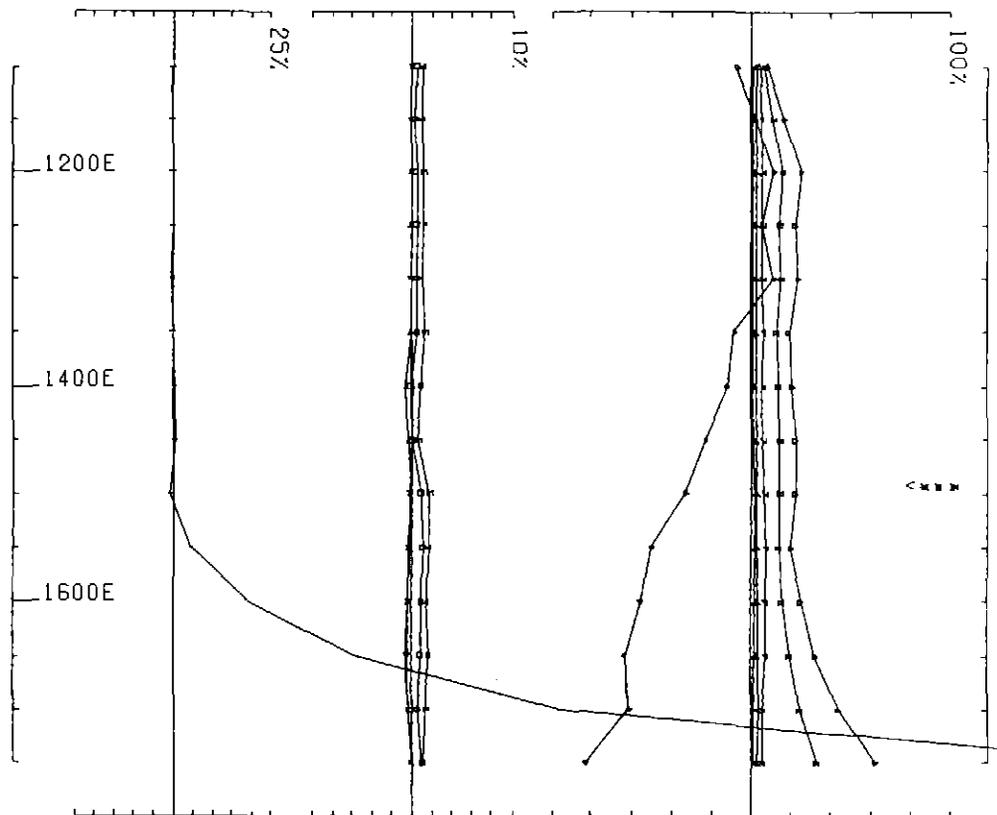
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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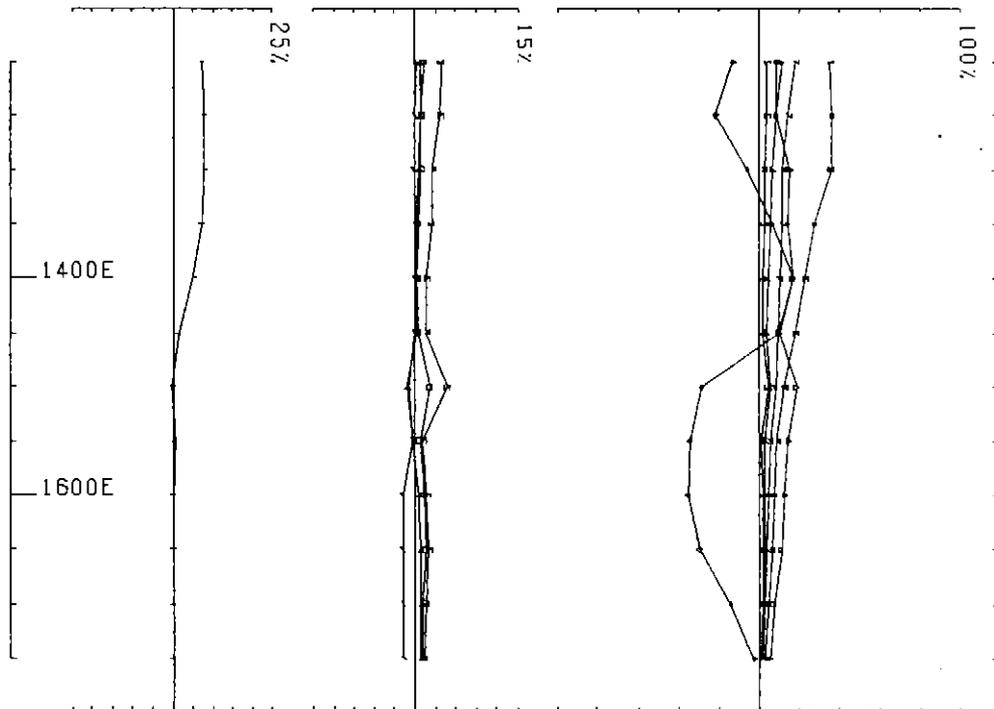
UTEM SURVEY AT CARFIELD FOR BHP-UTAH NOVEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26.23
LOOP NO 13 LINE 1600 N COMPONENT HZ SECONDARY FIELD CH1 POINT NDRM.



UTEM SURVEY AT CARFIELD FOR BHP-UTAH NOVEMBER 1990
CONDUCTED BY LAMONFAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26-23
LOOP NO 13 LINE 1800 N COMPONENT HZ SECONDARY FIELD CHI CONTIN. NORM.



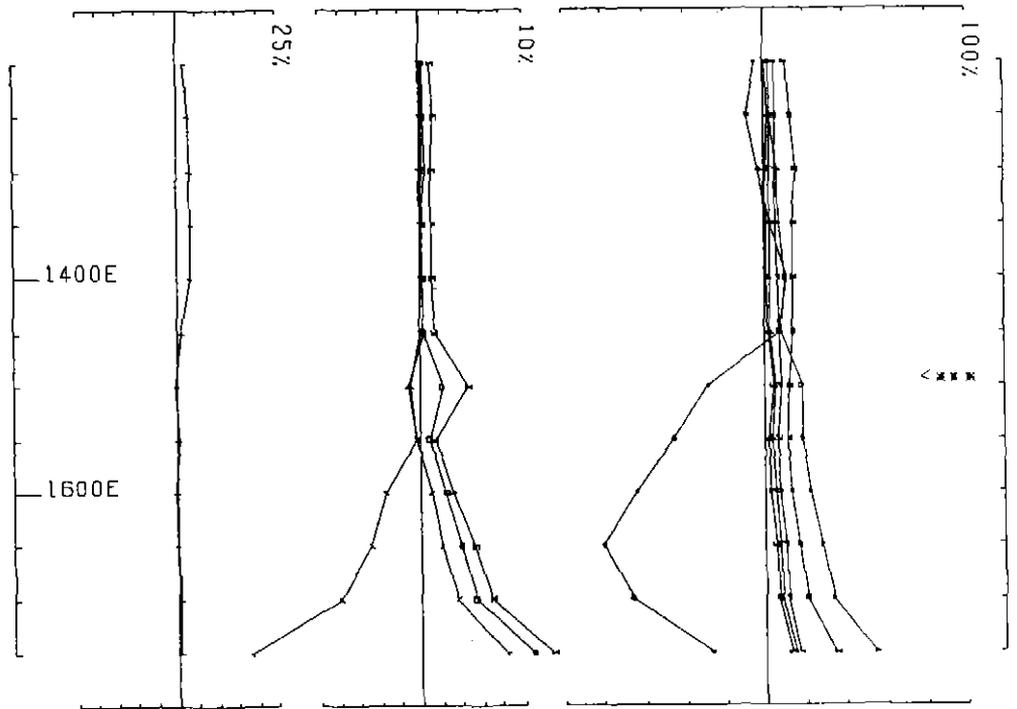
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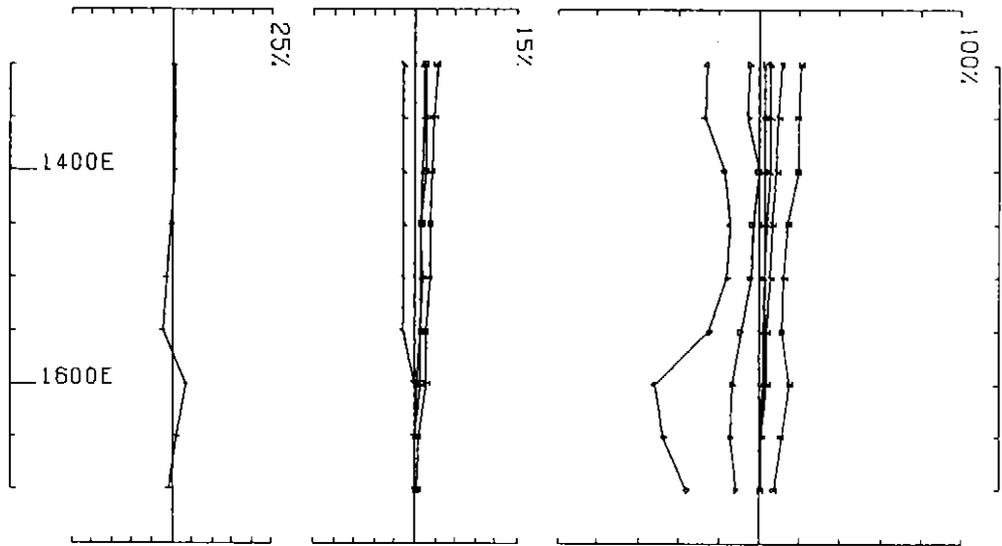
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0215

374262



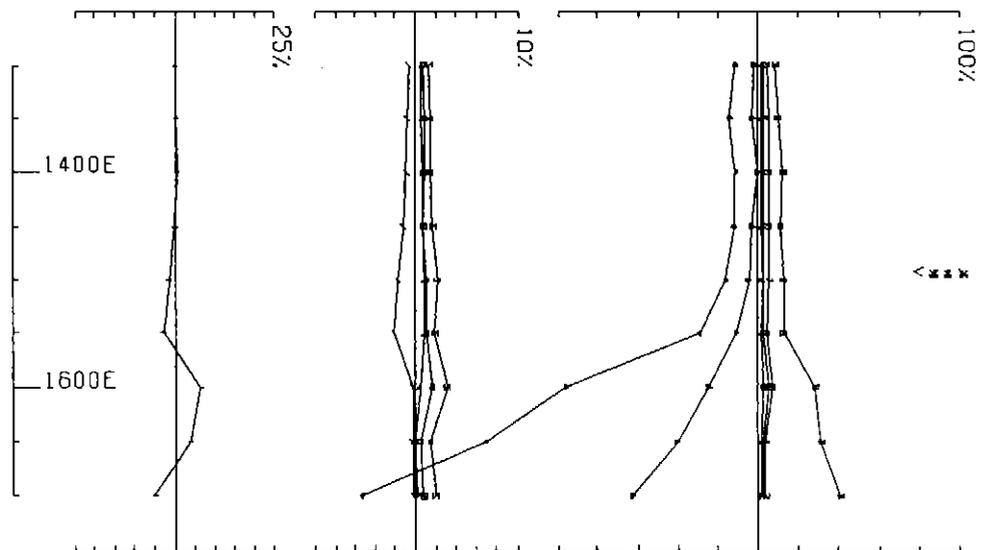
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UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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0217

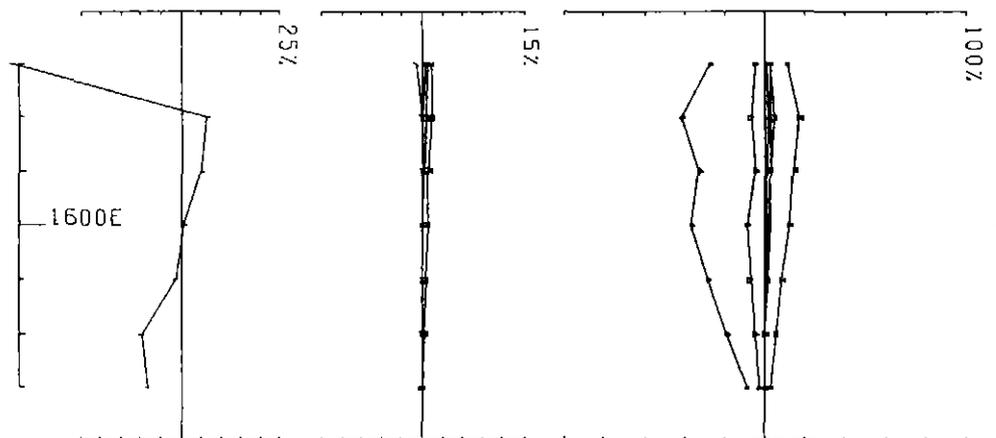
374264



UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
CONDUCTED BY LANONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26.23
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0218

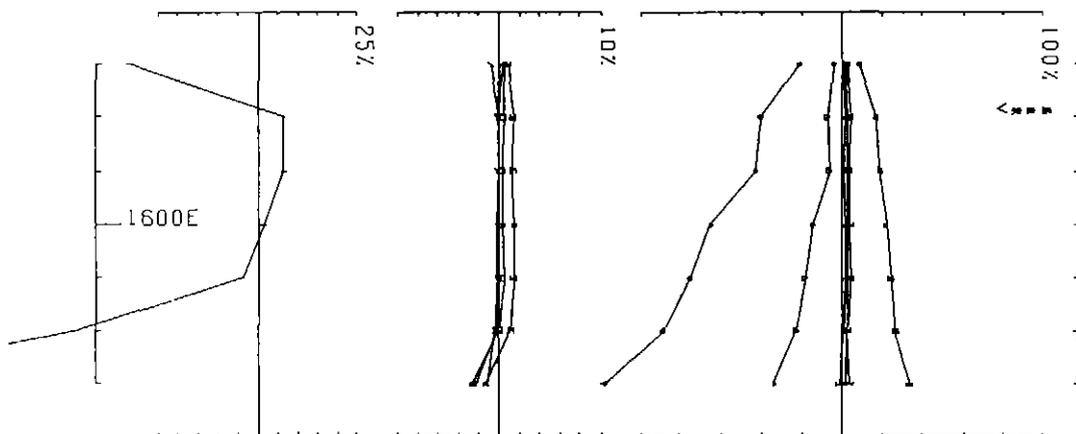
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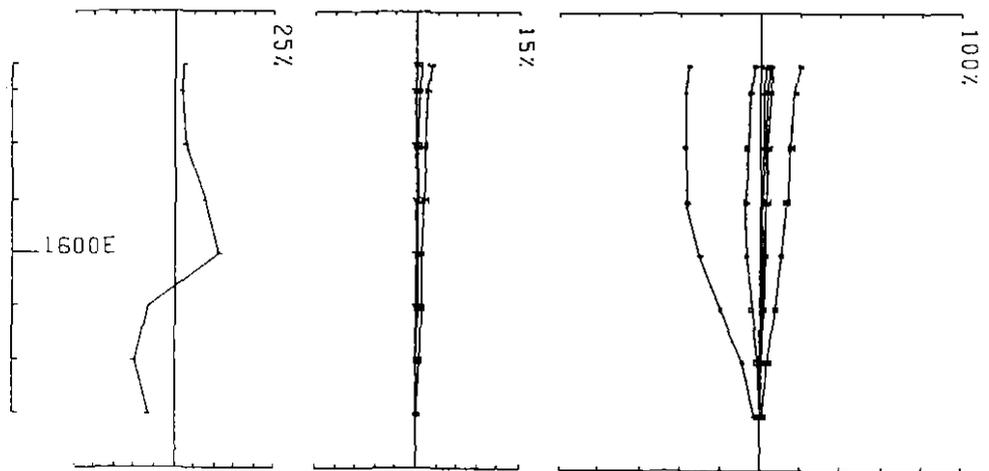
UTEM SURVEY AT GARFIELD FOR BHP-UGRAH NOVEMBER 1990
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0219

374266



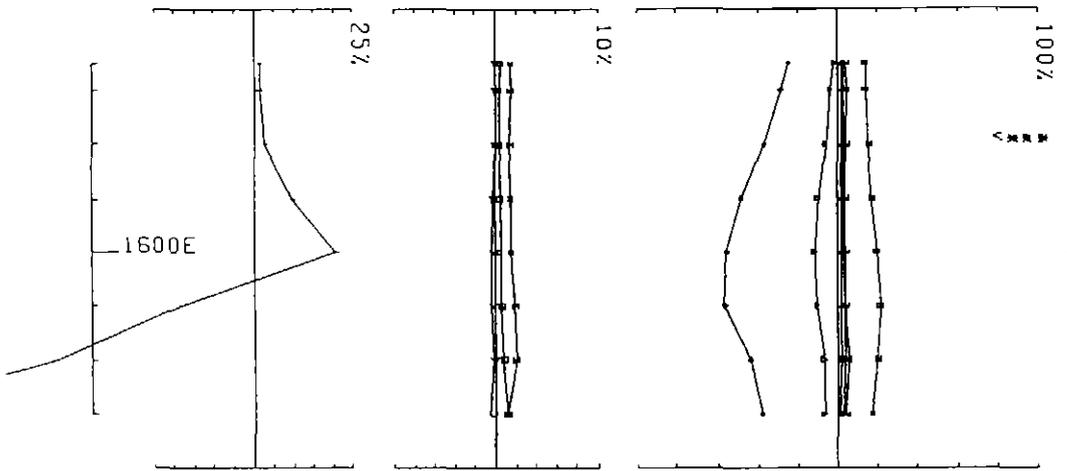
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UTEM SURVEY AT CARFIELD FOR BHP-UTAH NOVEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26.23
LOOP NO 13 LINE 2600 N COMPONENT HZ SECONDARY FIELD CHI CONTIN. NORM.

0221

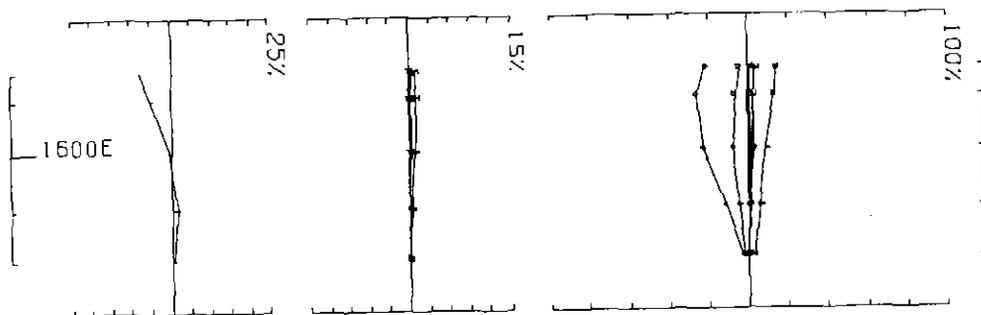
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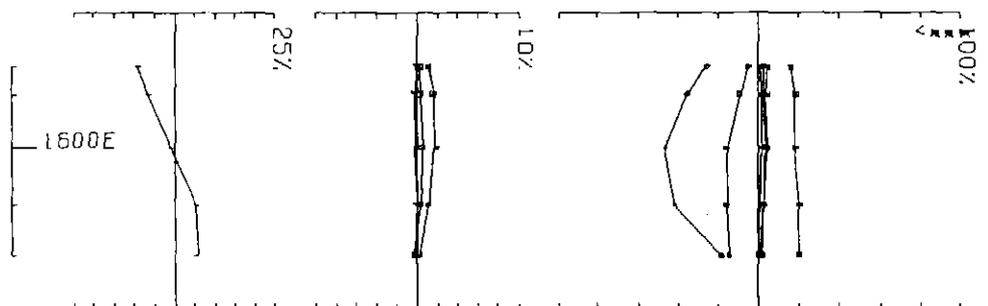
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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0222

374269



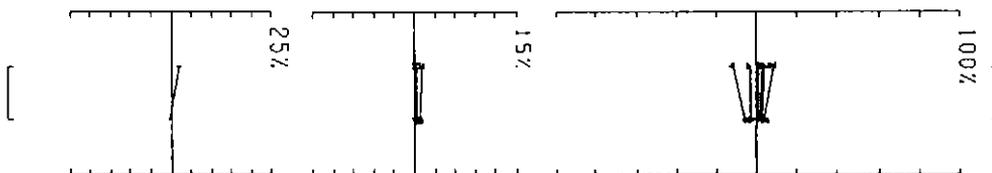
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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LOOP NO 13 LINE 2800 N COMPONENT HZ SECONDARY FIELD CH1 CONTIN. NORM.



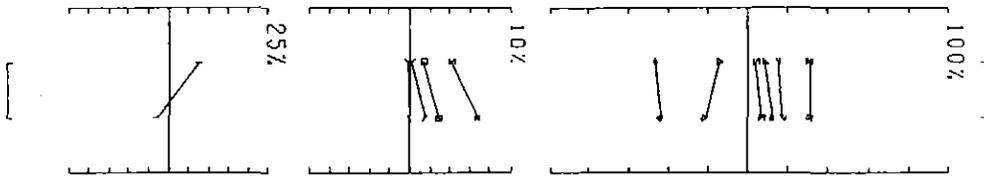
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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0224

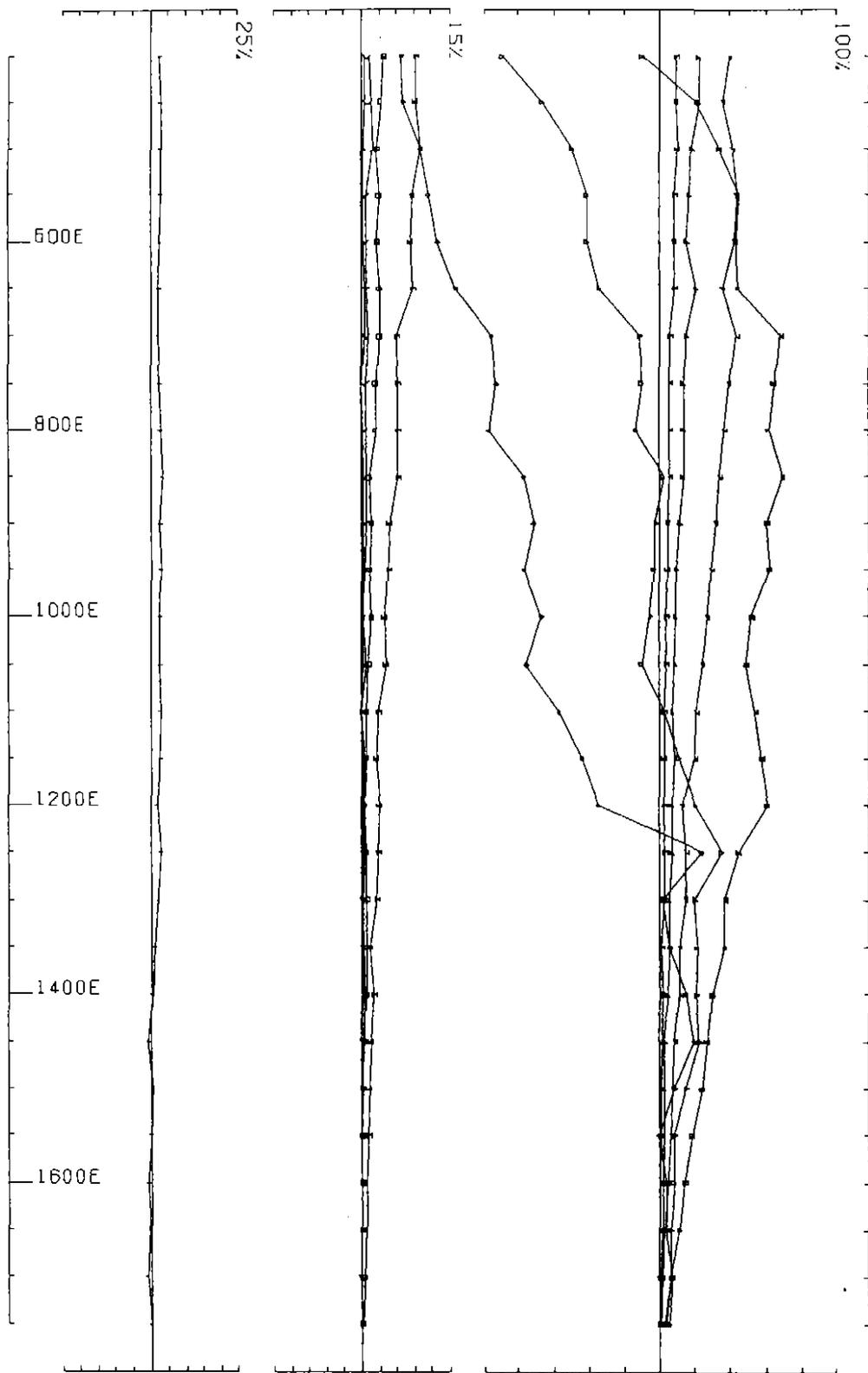
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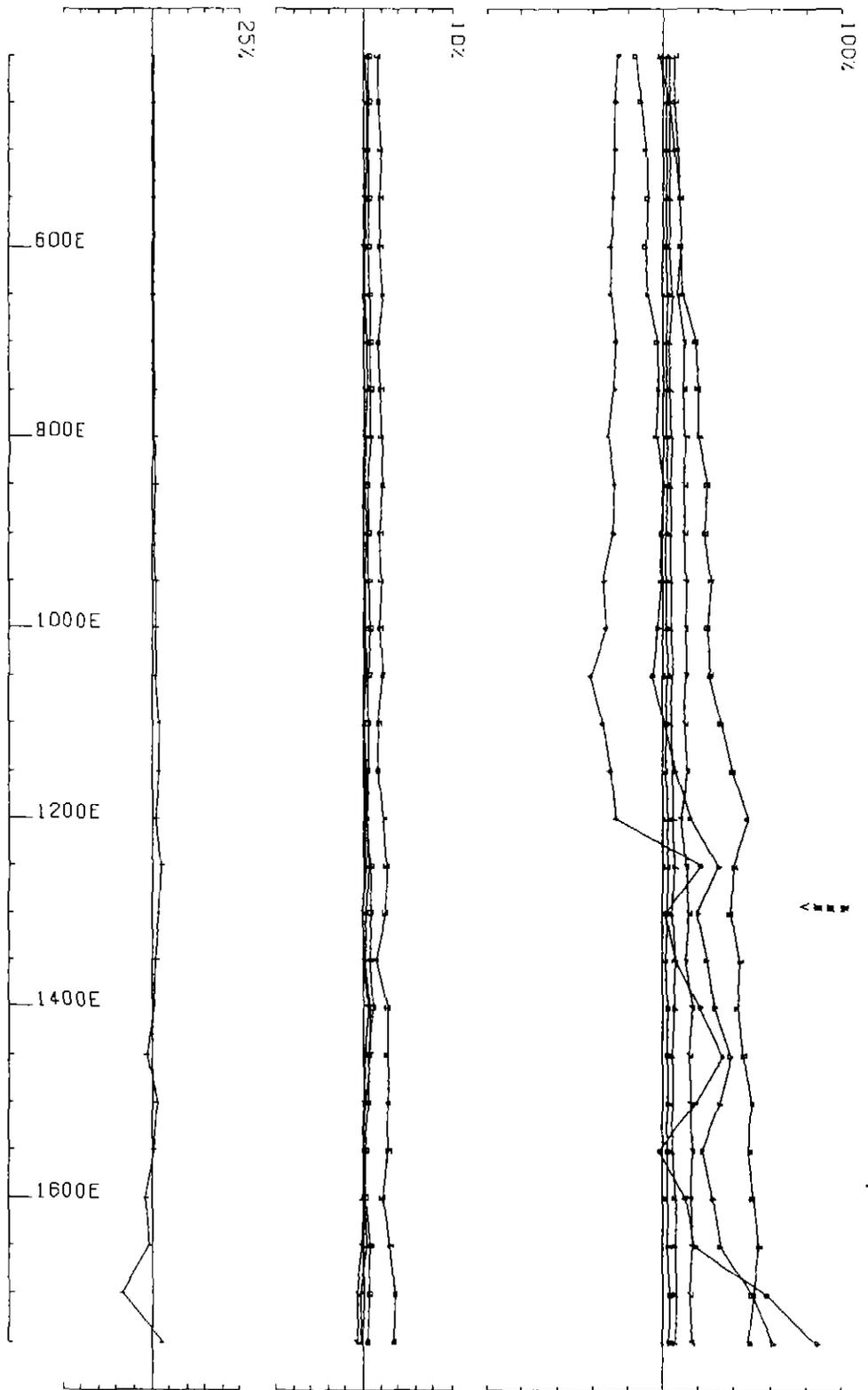
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LOOP NO 13 LINE 3000 N COMPONENT HZ SECONDARY FIELD CHI CONTIN. NORM.



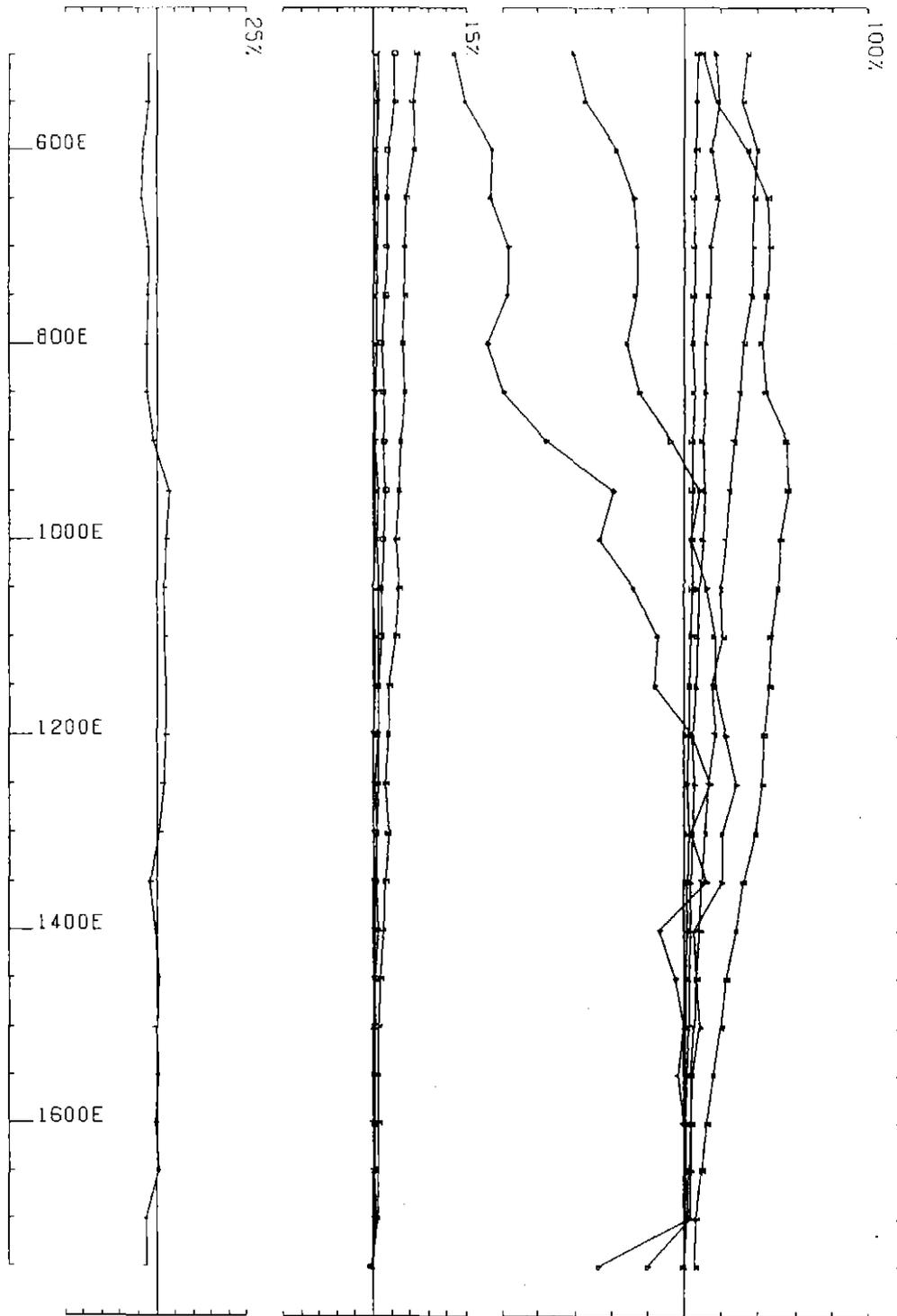
UTM SURVEY AT CARFIELD FOR BHP-UTAH NOVEMBER 1990
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LOOP NO 13 LINE 3000 N COMPONENT HZ SECONDARY FIELD CH1 POINT NDRM.



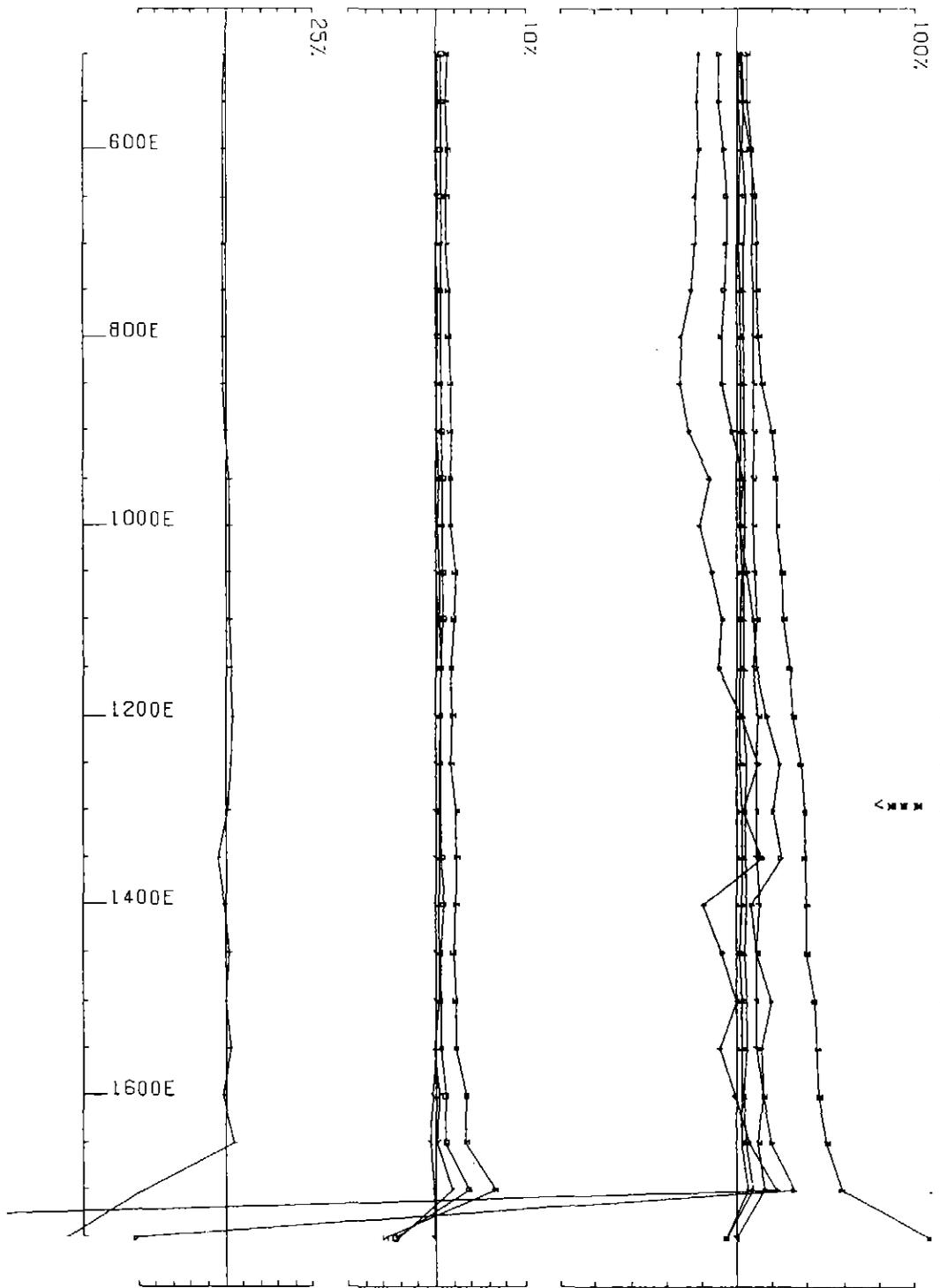
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26.25
LOOP NO 14 LINE 0 N COMPONENT HZ SECONDARY FIELD CH1 CONTIN. NORM.



UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26.23
LOOP NO 14 LINE 0 N COMPONENT HZ SECONDARY FIELD CH: POINT NORM.



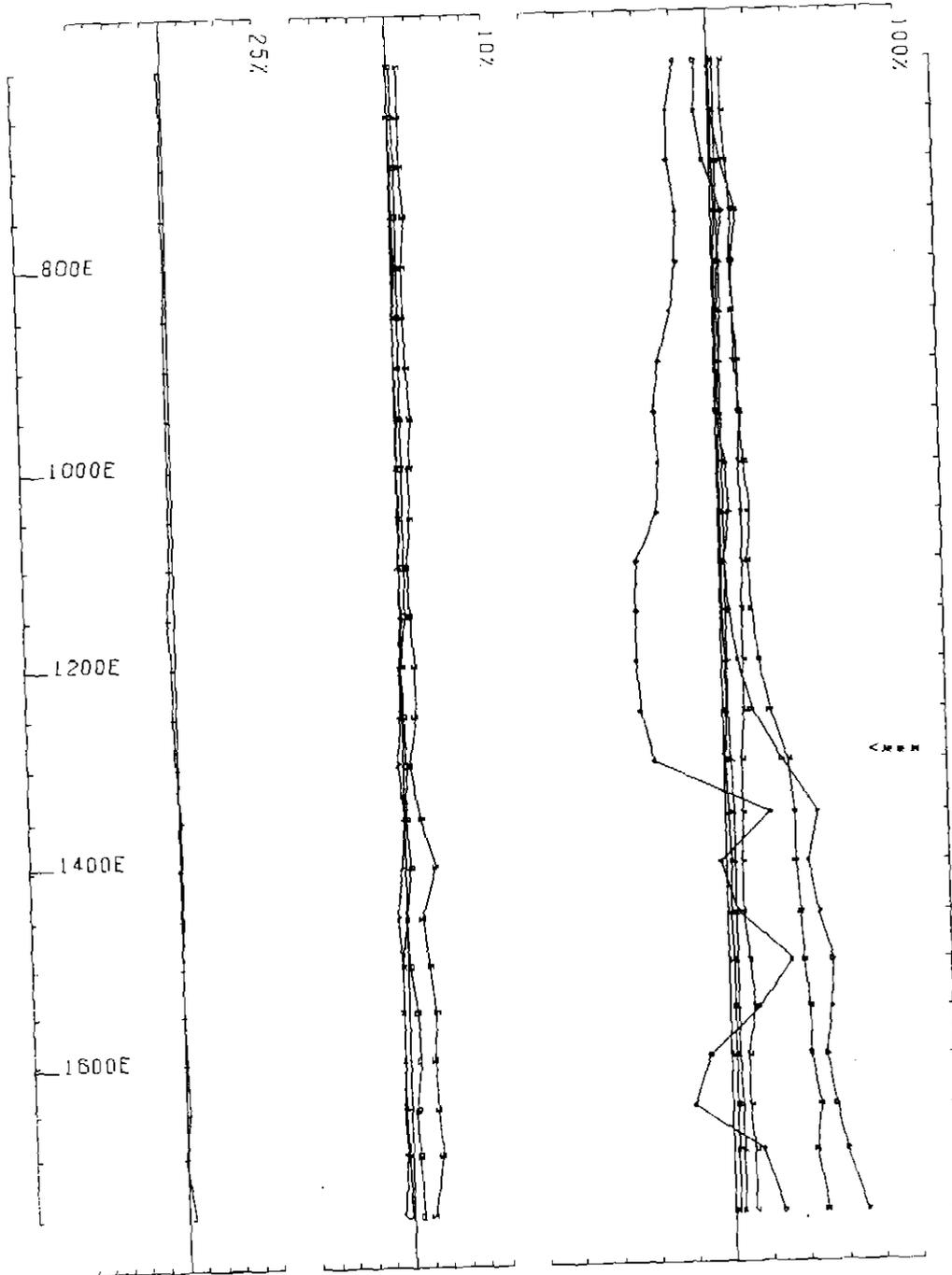
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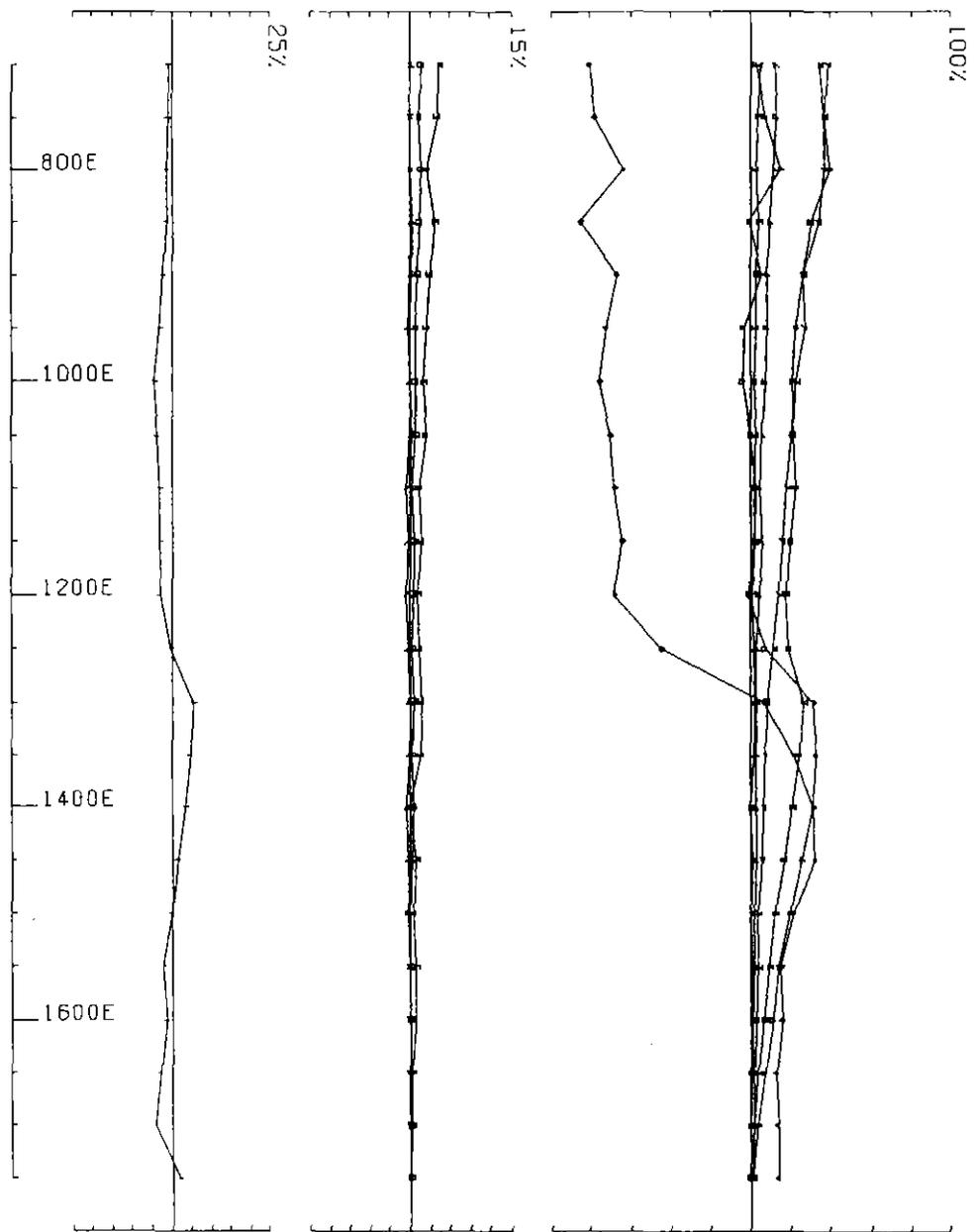
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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0230

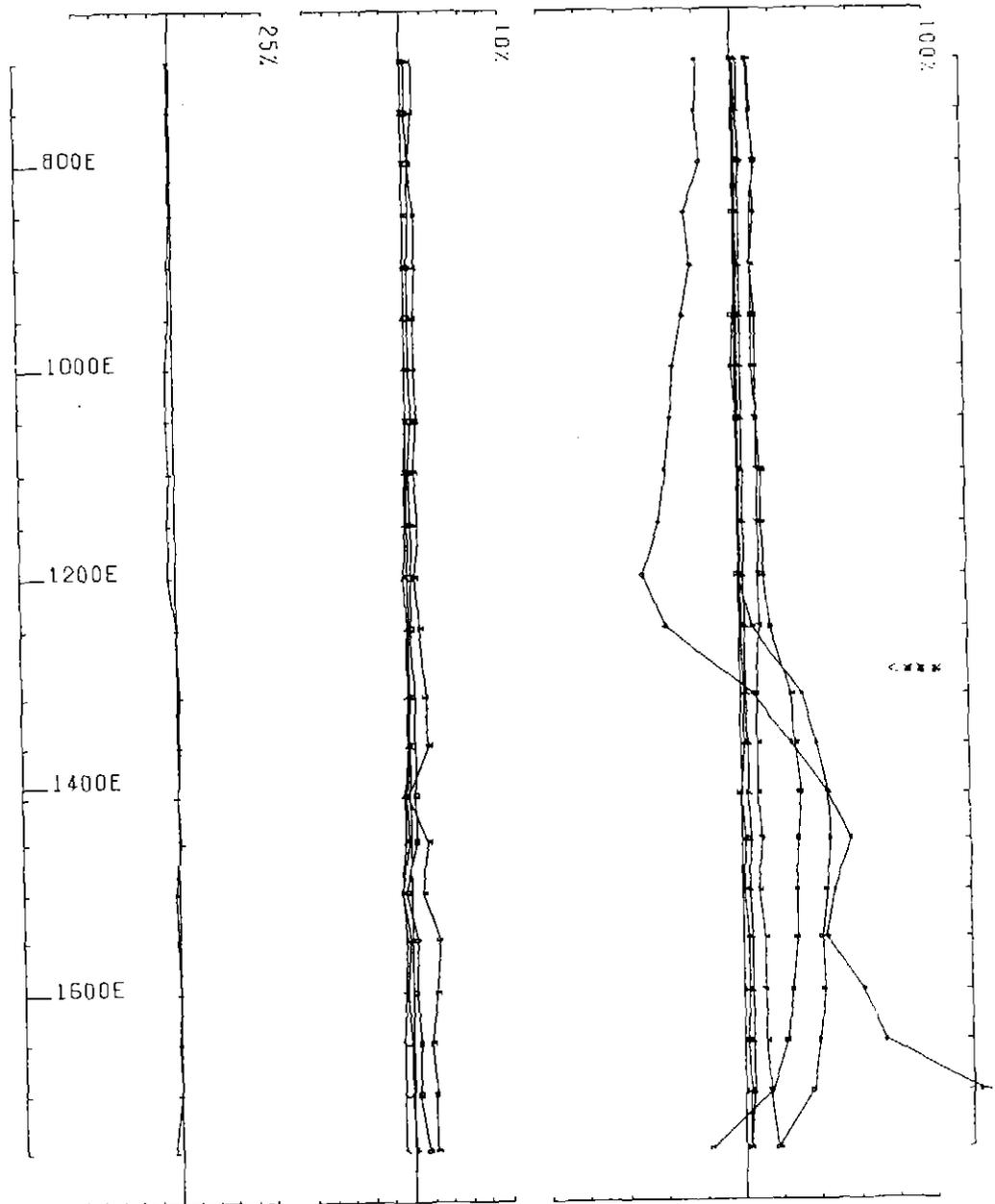
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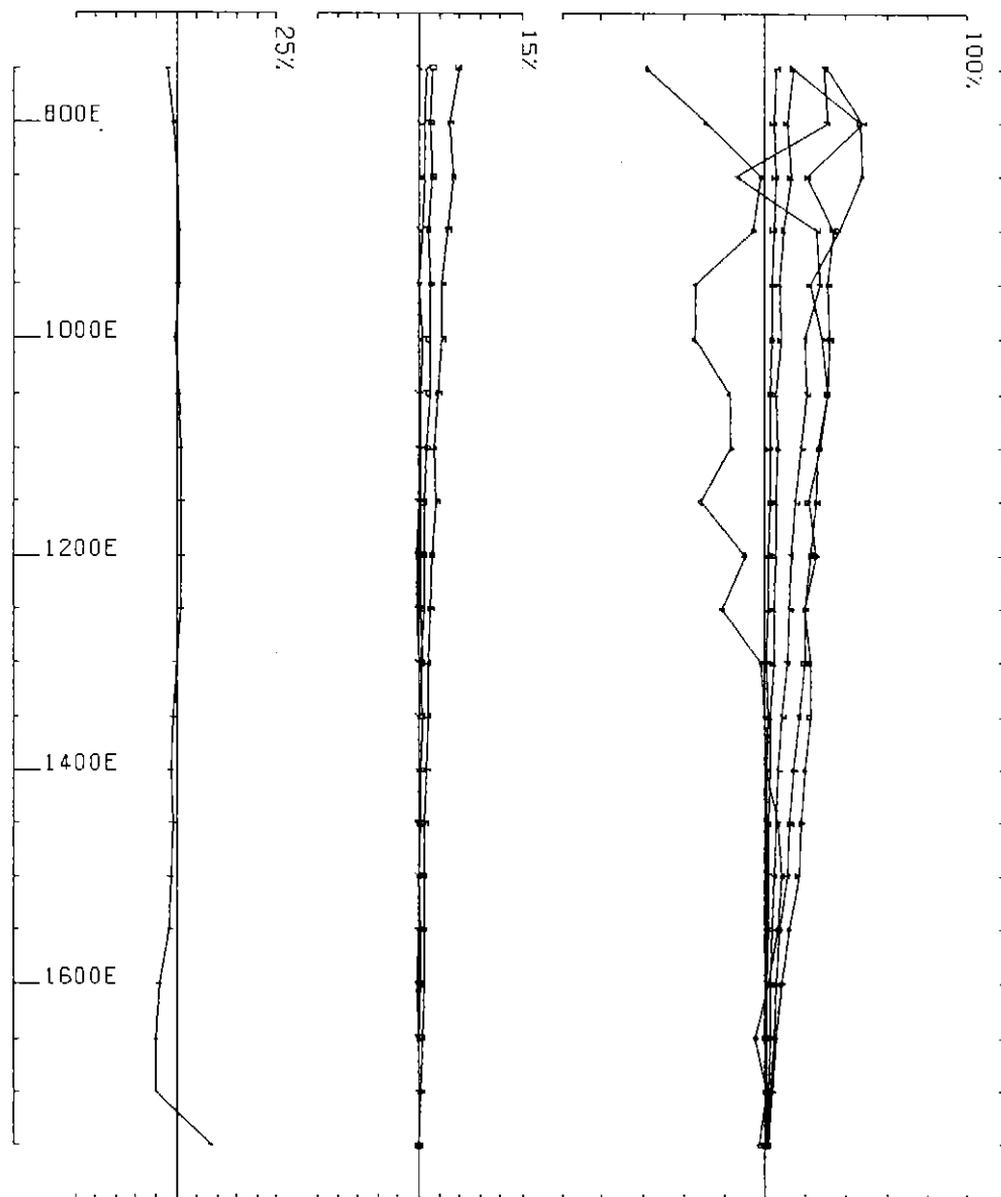
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LOOP NO 14 LINE 400 N COMPONENT HZ SECONDARY FIELD CH1 POINT NORM.



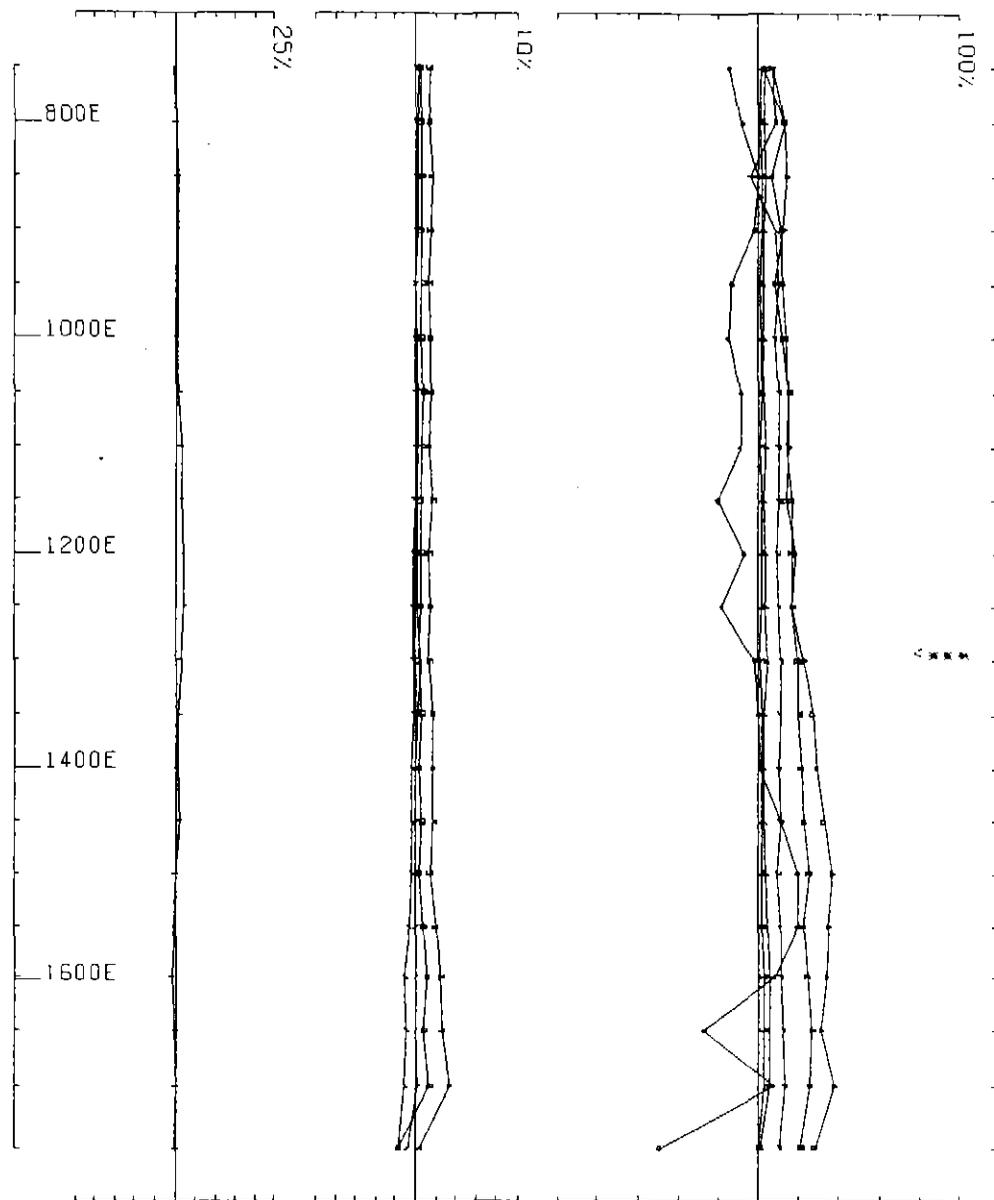
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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LOOP NO 14 LINE 600 N COMPONENT HZ SECONDARY FIELD CH1 CONTIN. NORM.



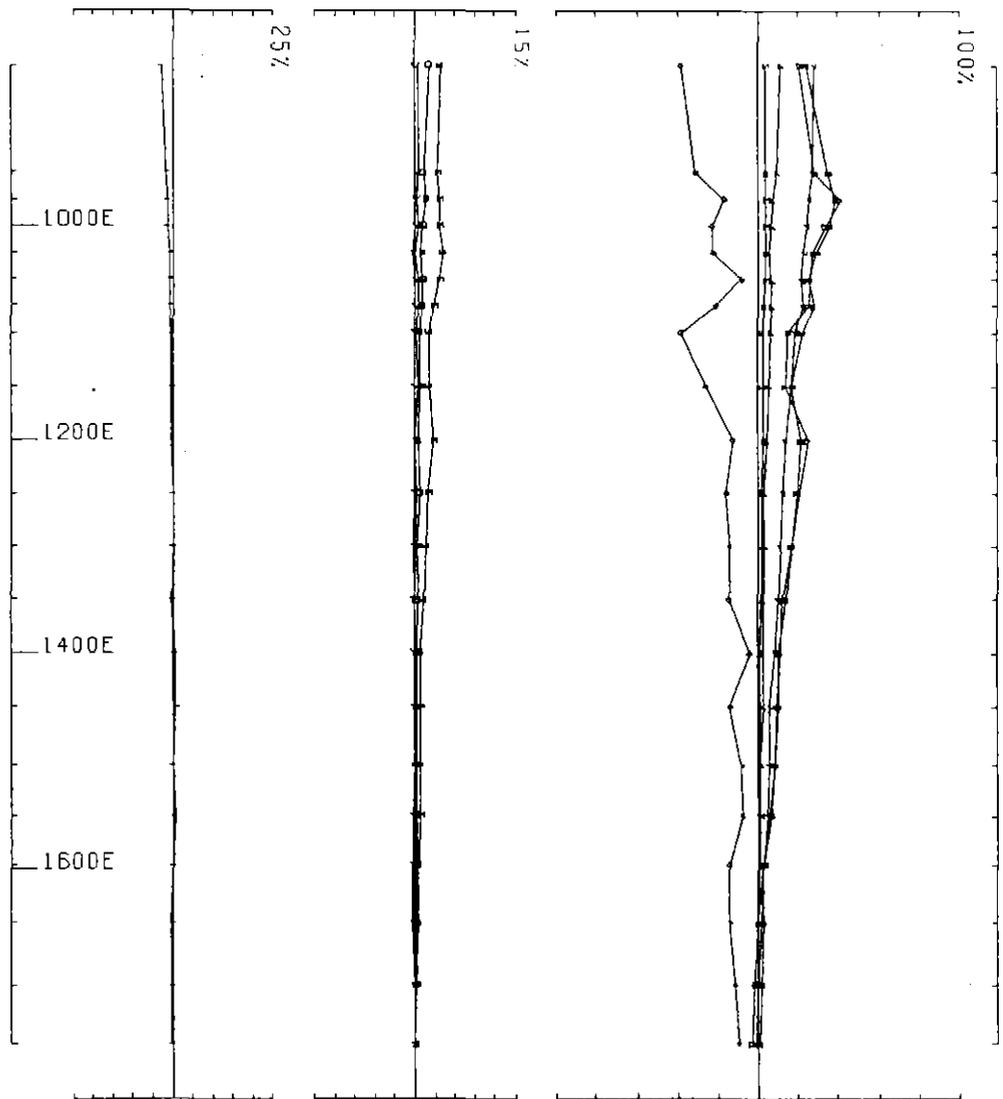
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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 LOOP NO 14 LINE 600 N COMPONENT HZ SECONDARY FIELD CHI POINT NORR.



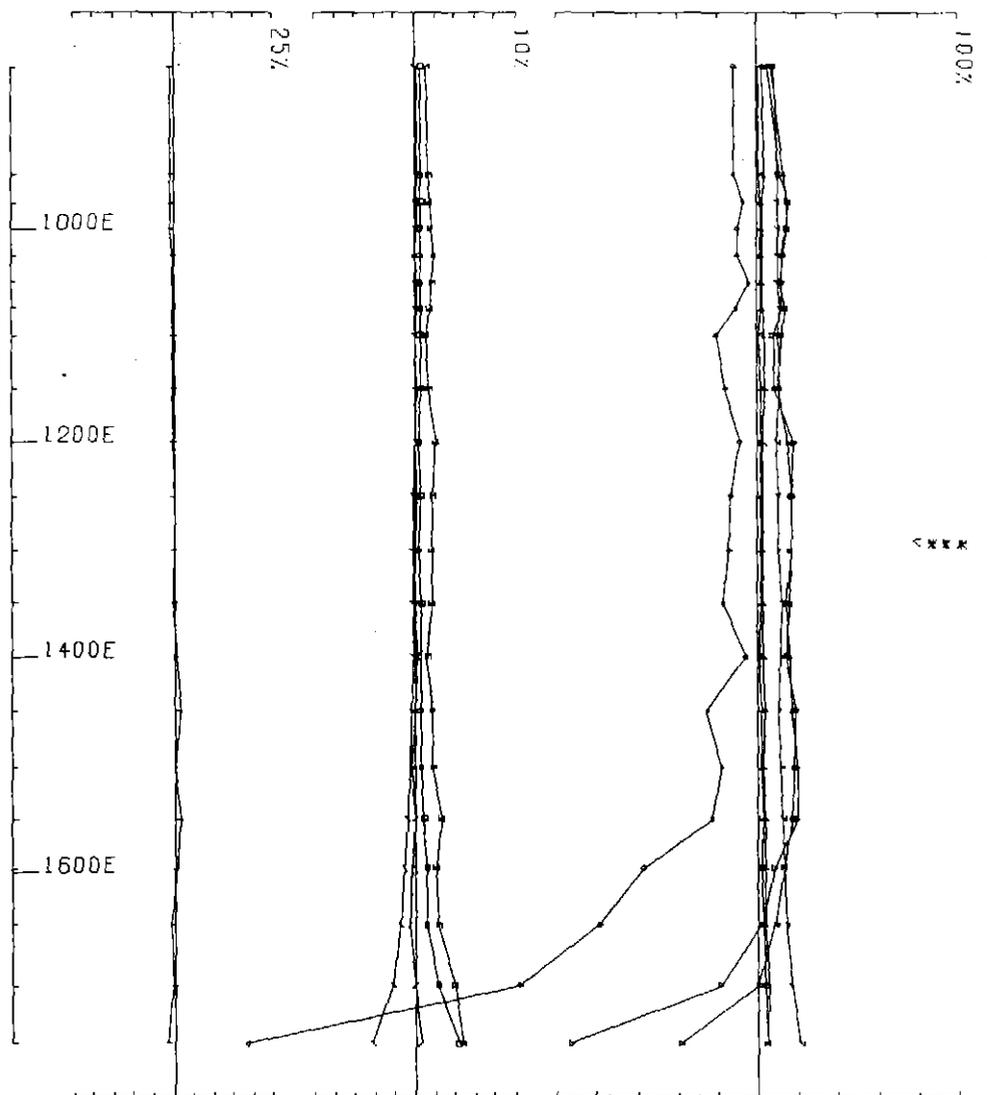
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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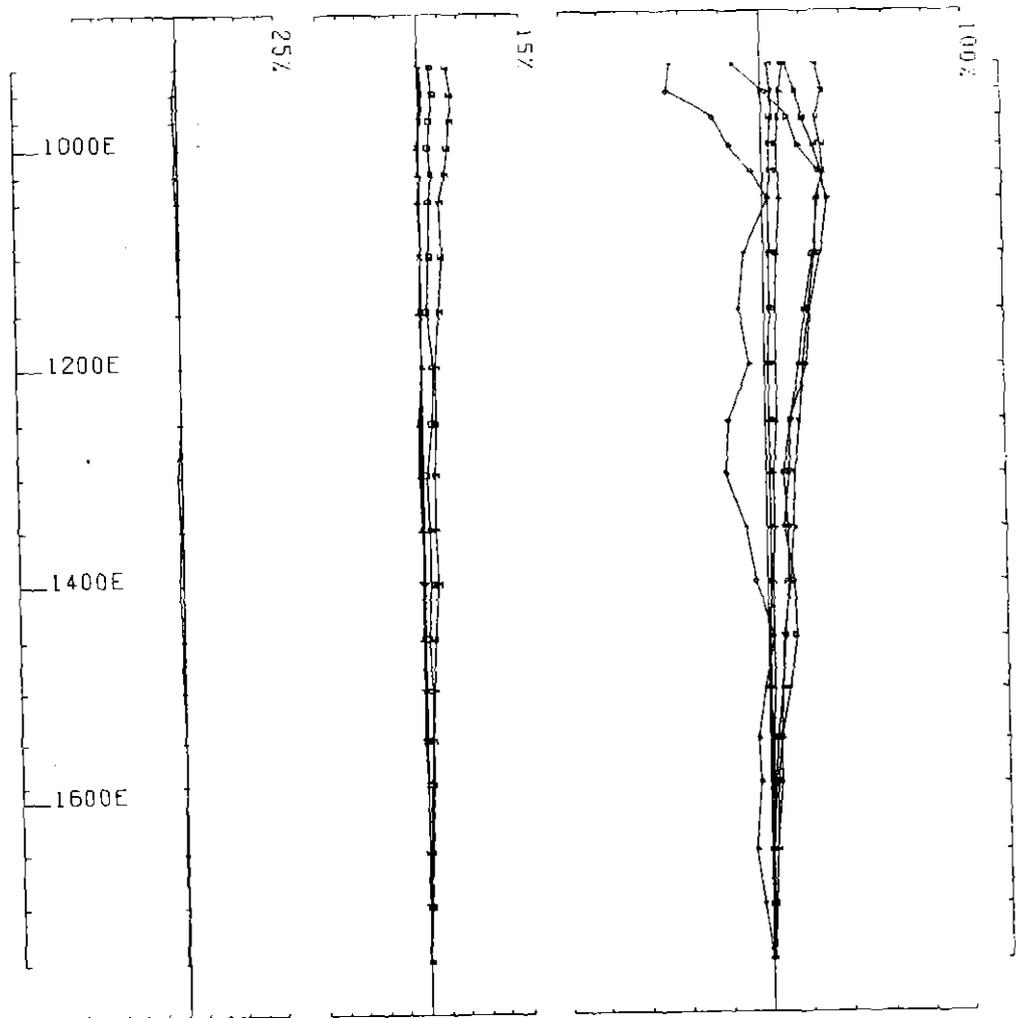
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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LOOP NO 14 LINE 800 N COMPONENT HZ SECONDARY FIELD CH1 POINT NORB.



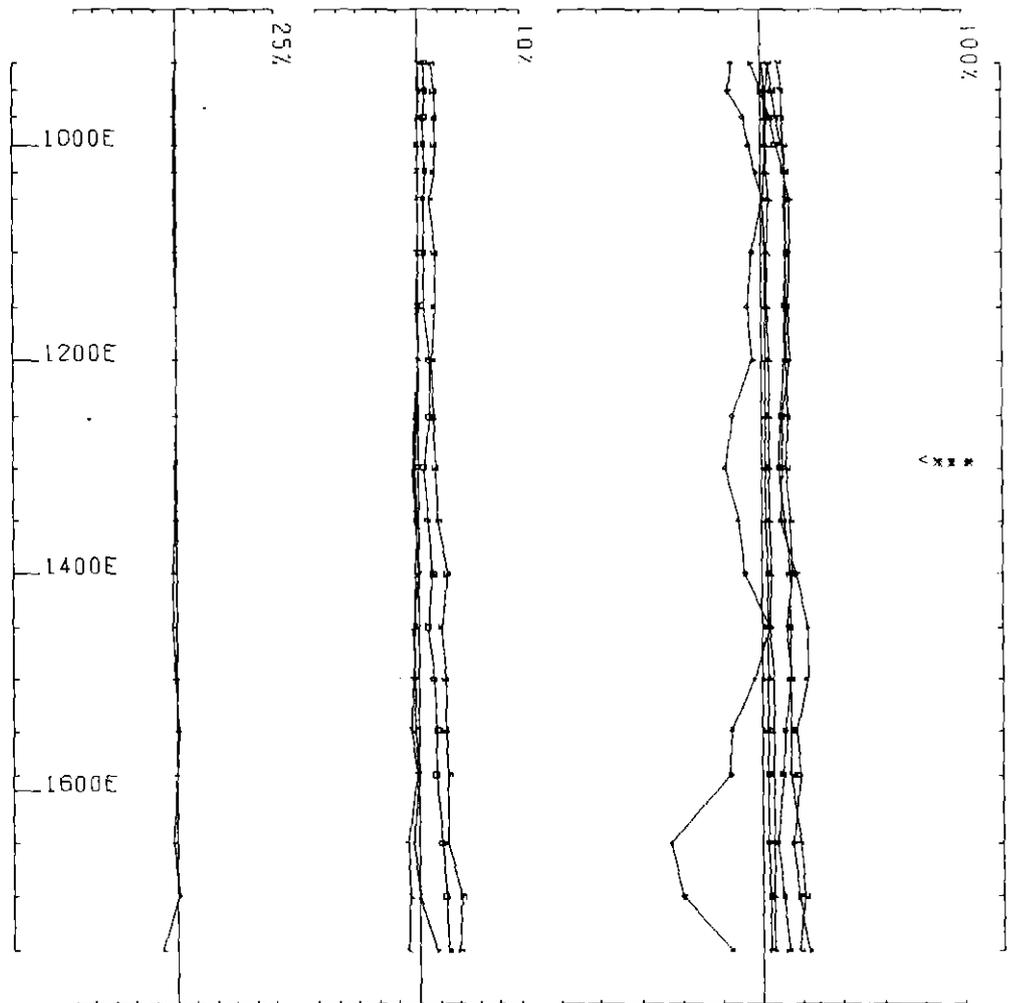
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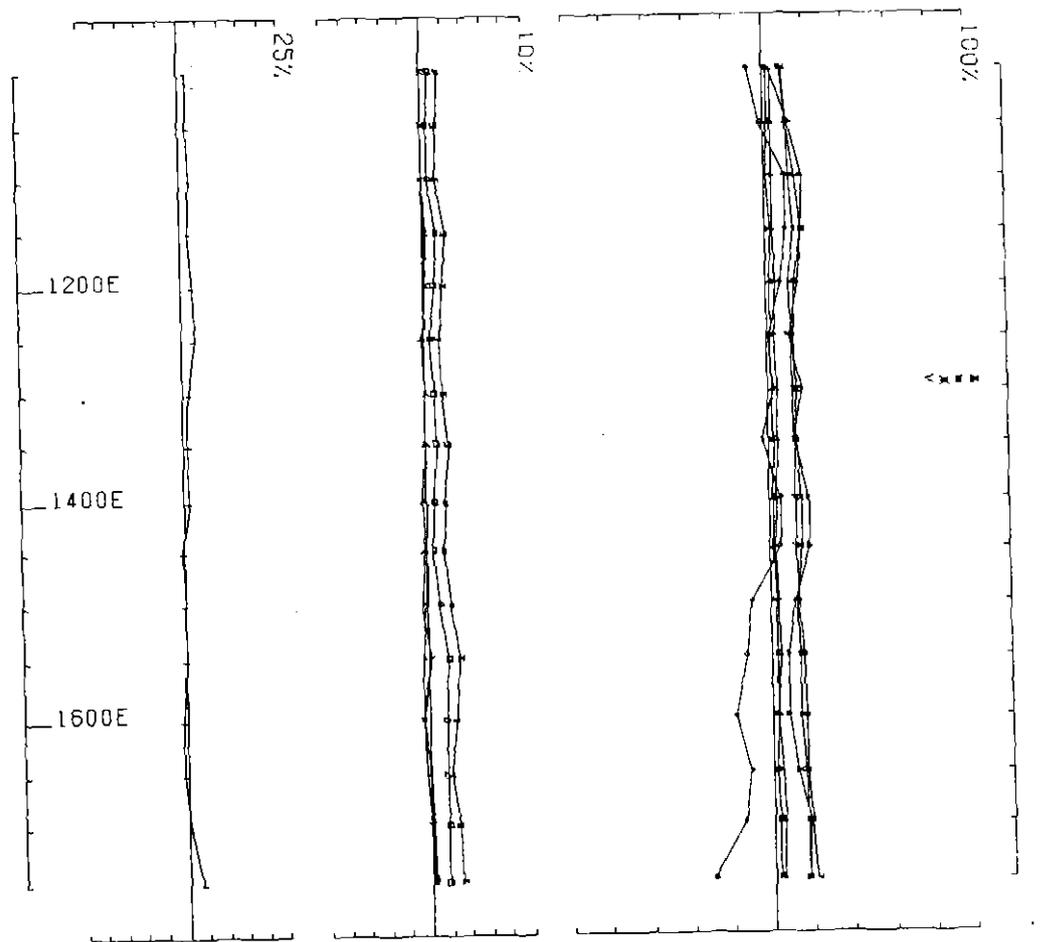
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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LOOP NO 14 LINE 1000 N COMPONENT HZ SECONDARY FIELD CH1 POINT NDRM.



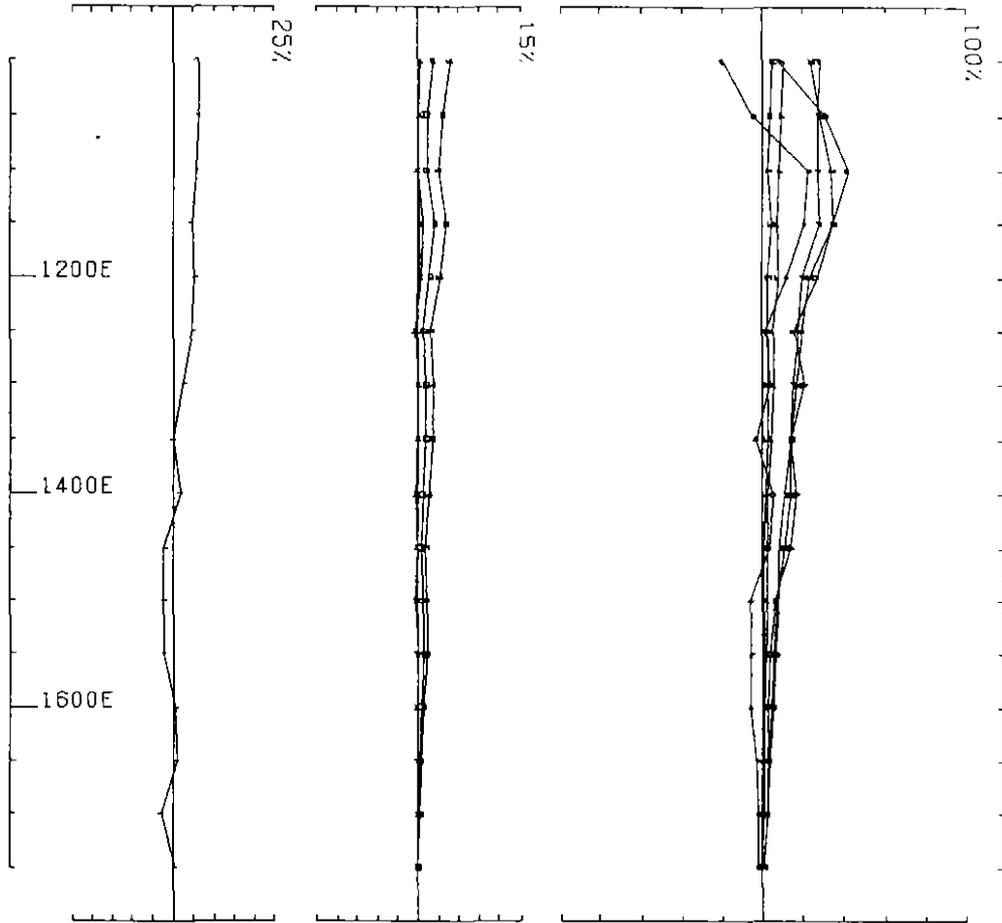
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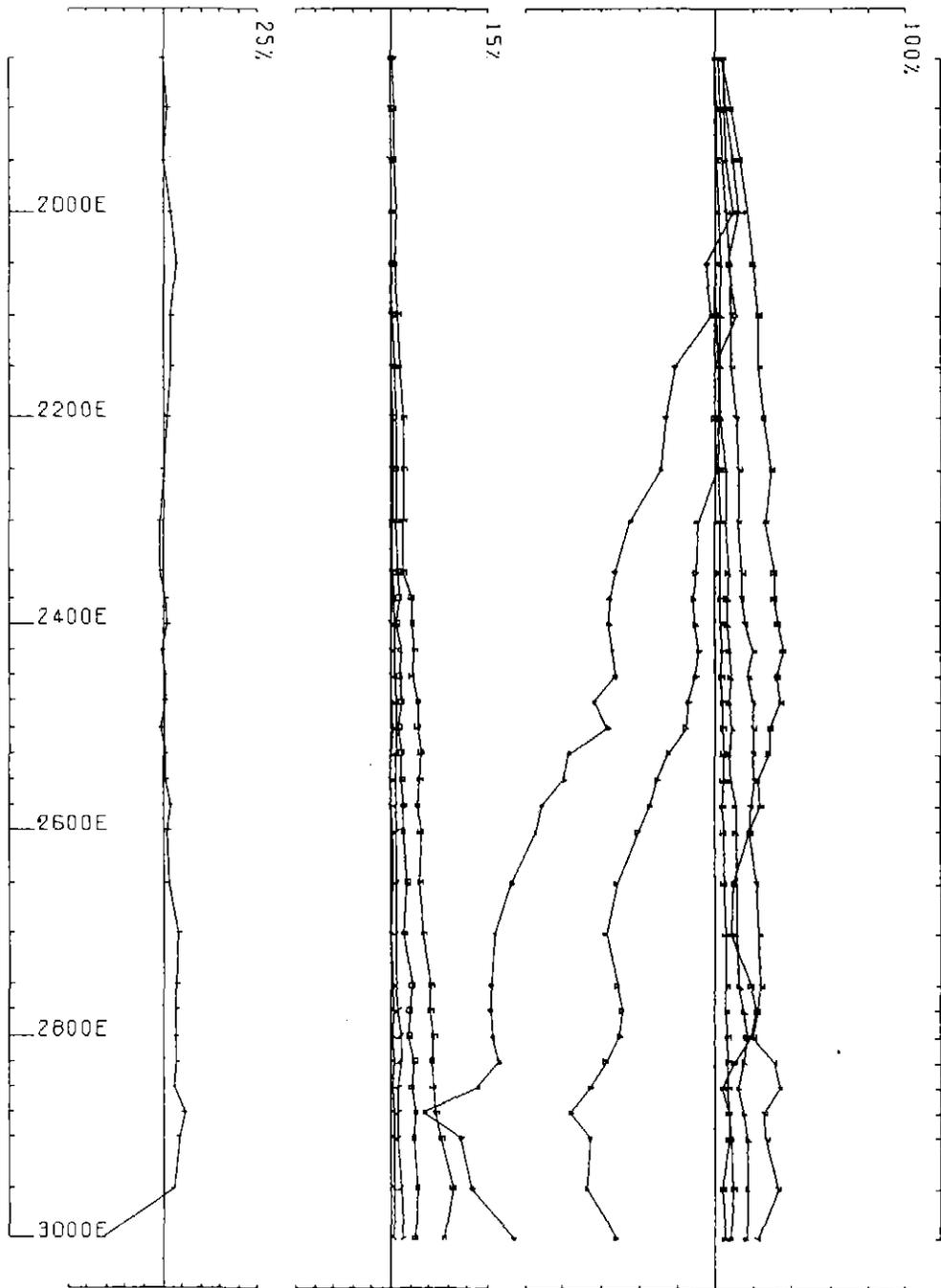
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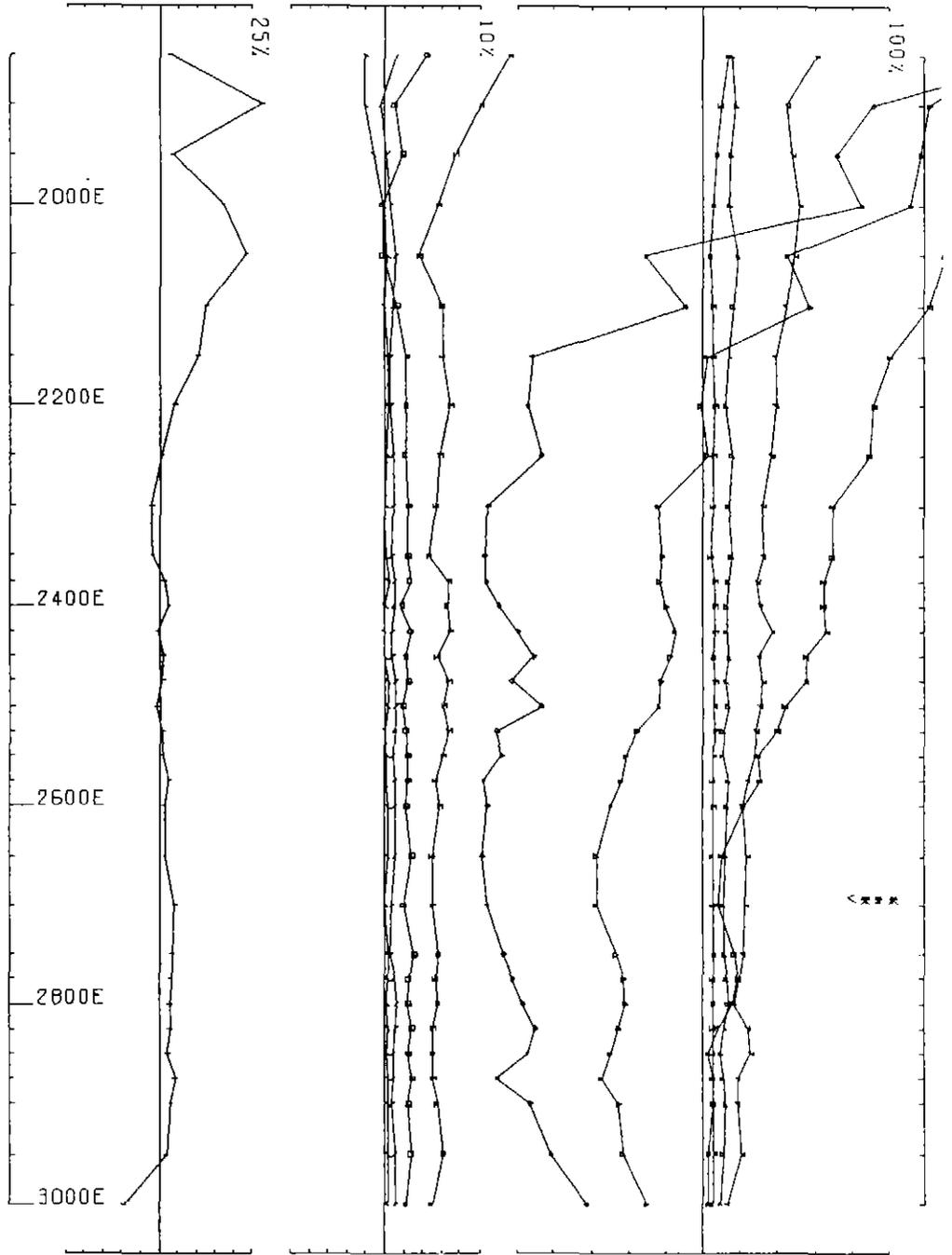
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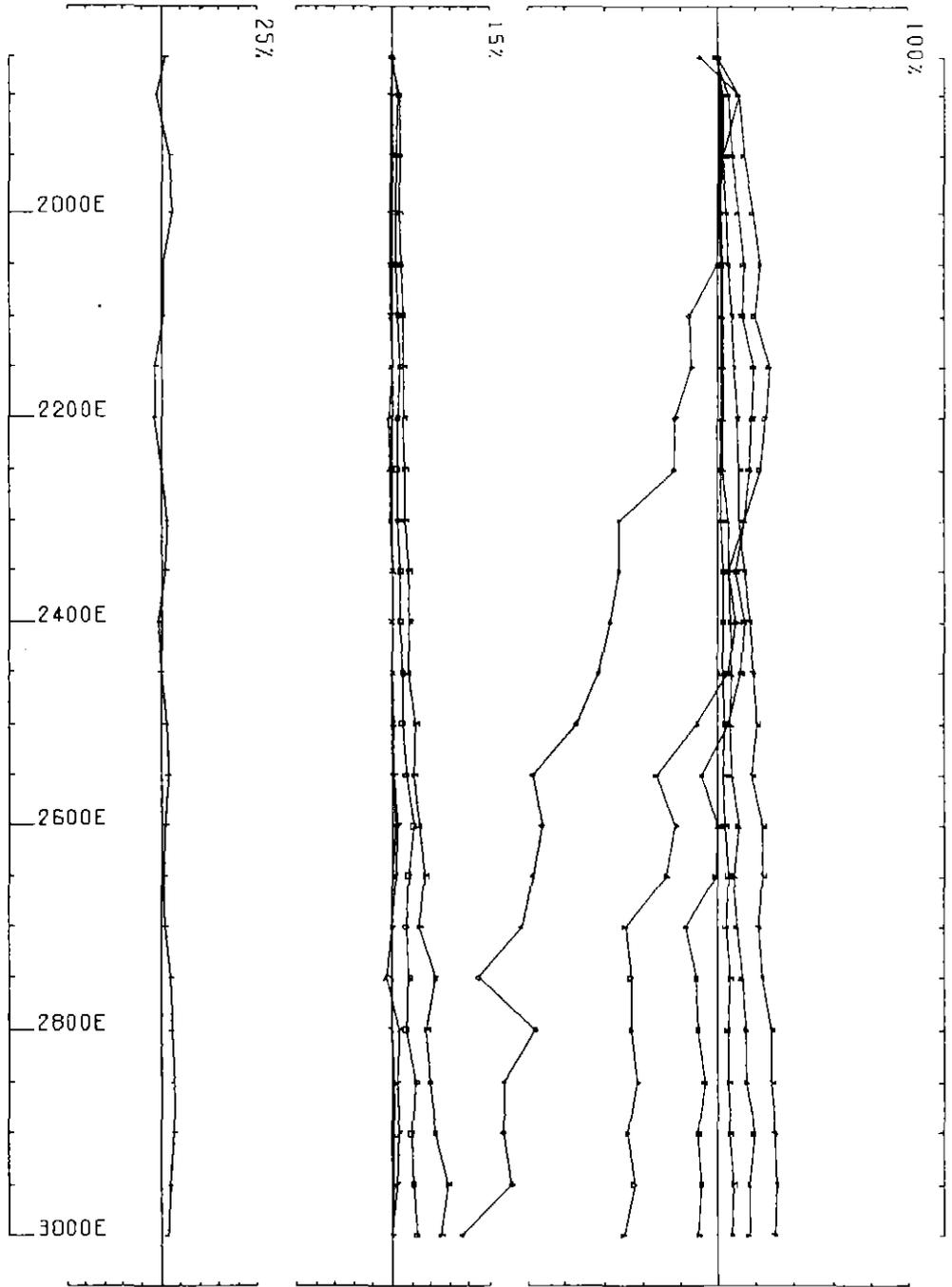
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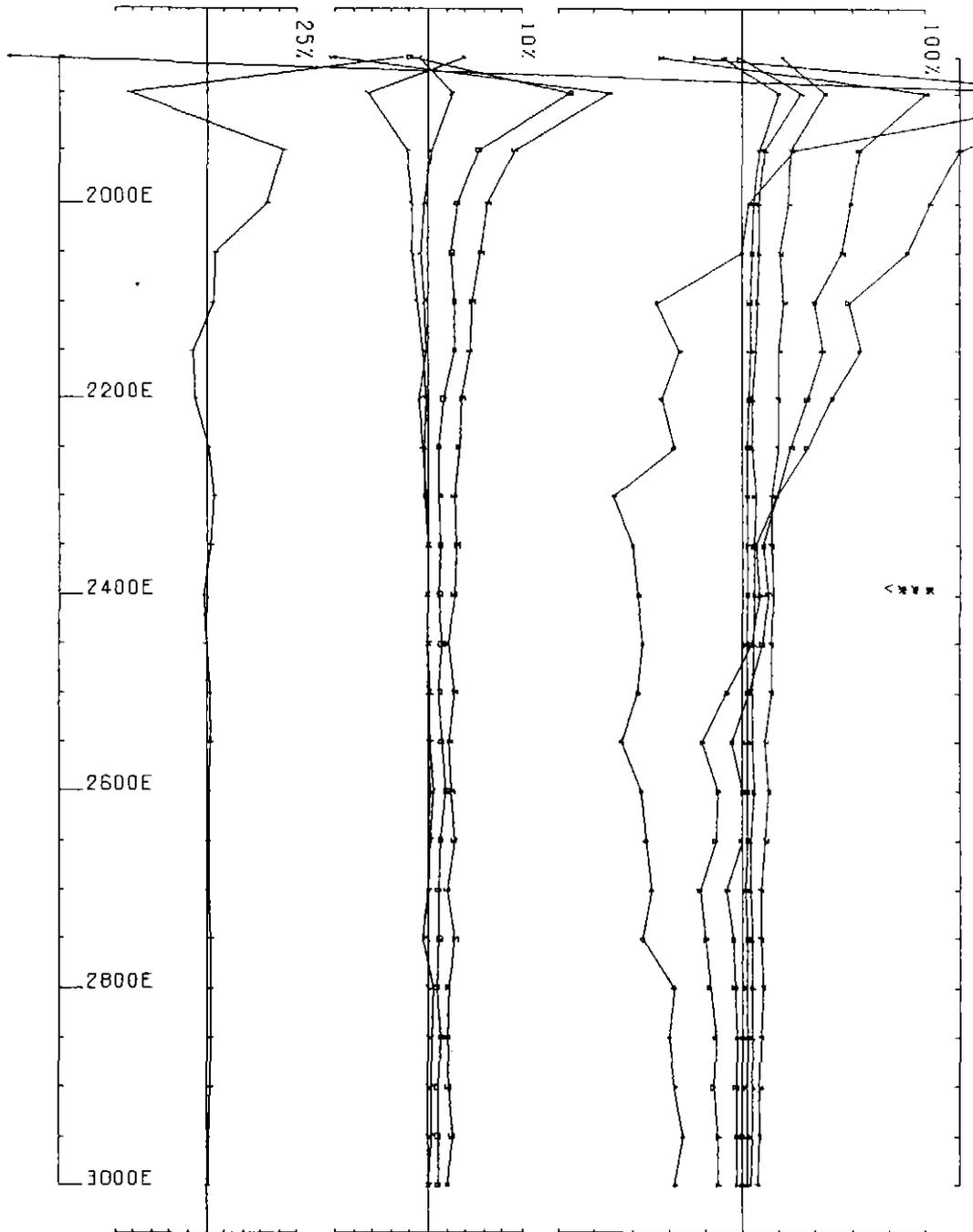
UTEM SURVEY AT GARFIELD FOR BAP-UTAH NOVEMBER 1990
 CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26.23
 LOOP NO 150 LINE 0 N COMPONENT HZ SECONDARY FIELD CH1 CONTIN. NDRM.
 (Outside)



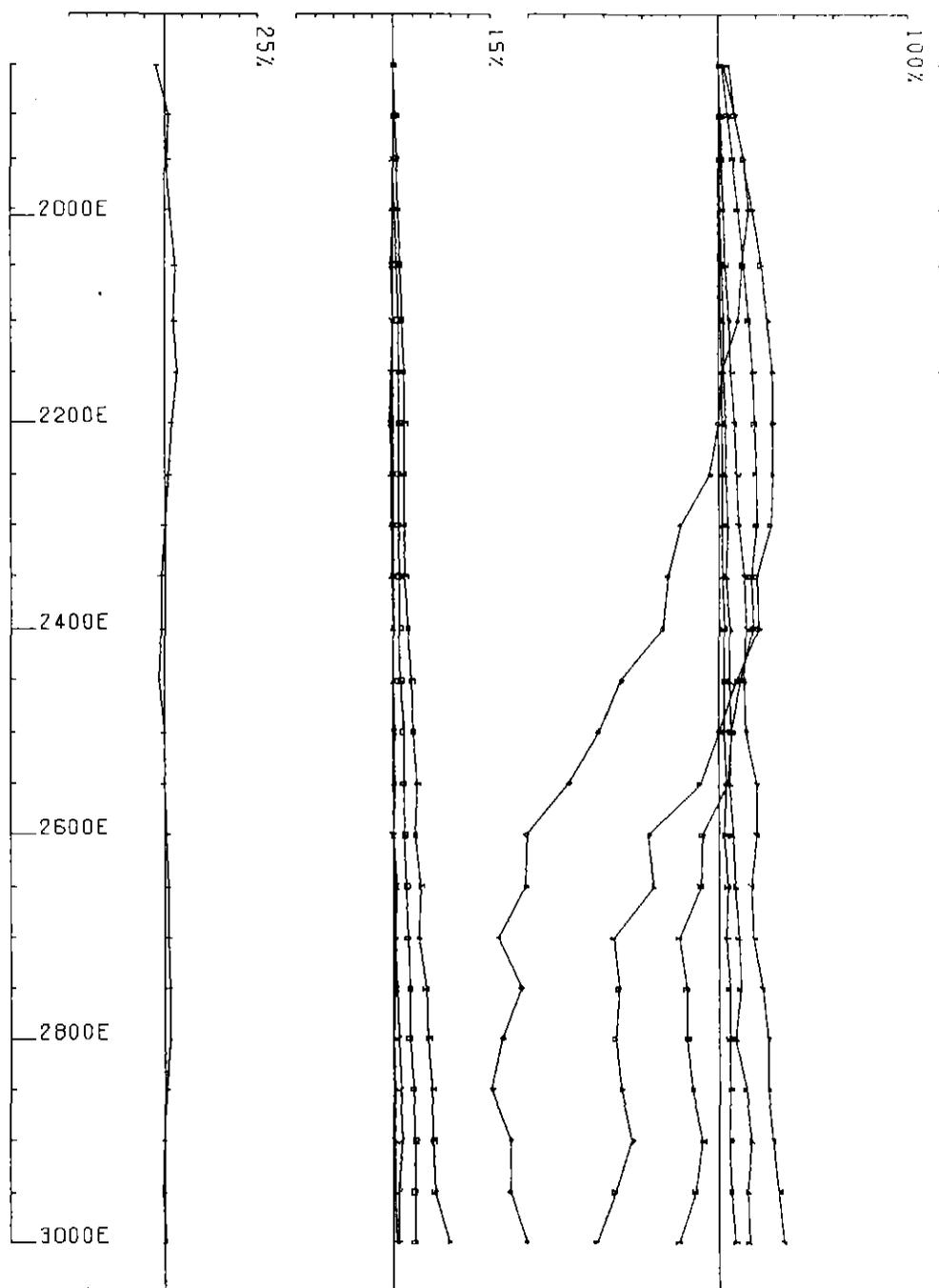
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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LOOP NO 150 LINE 0 N COMPONENT HZ SECONDARY FIELD CH POINT NORM.



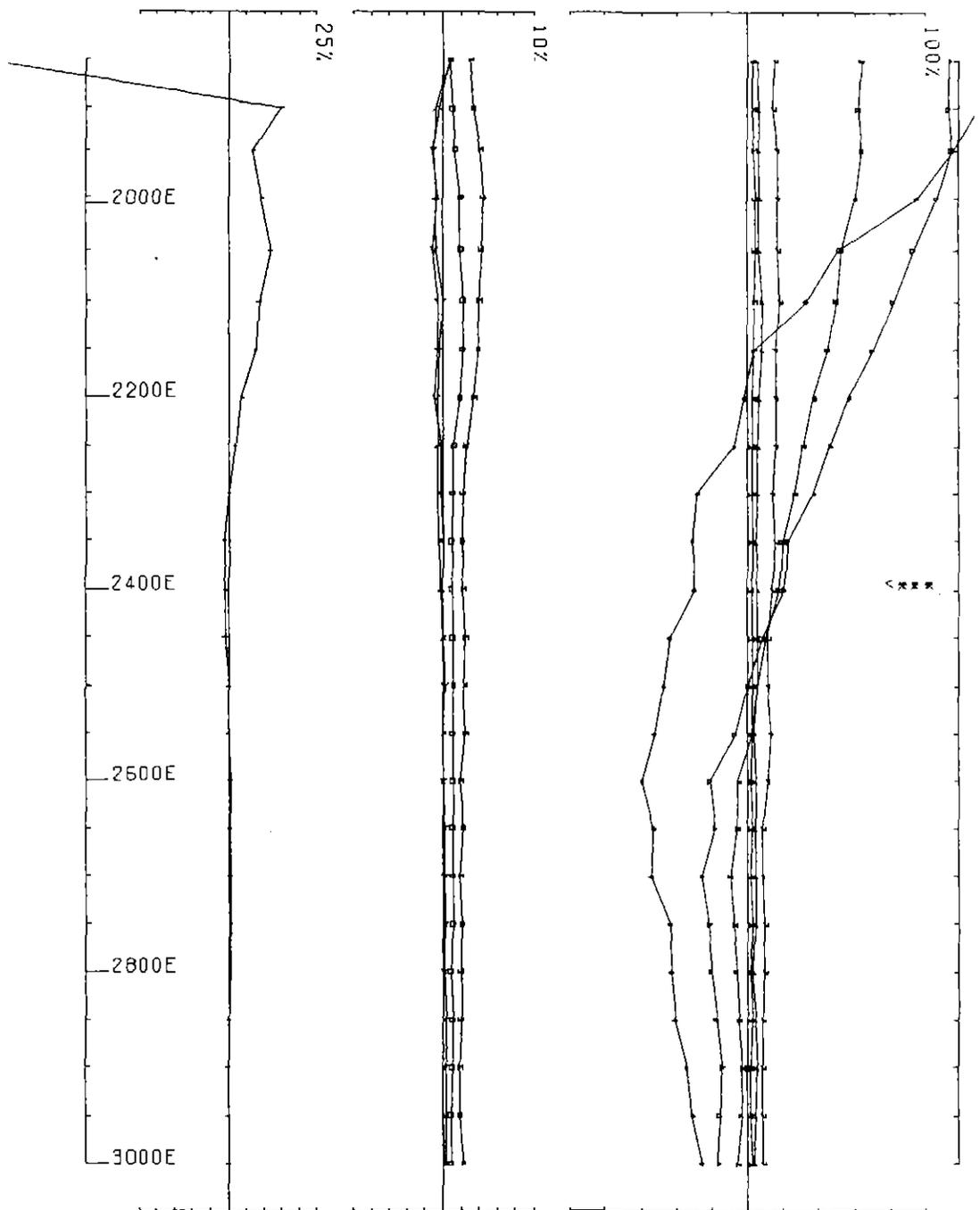
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CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 0090 BASE FREQ (HZ) 26.23
LOOP NO 150 LINE 200 N COMPONENT HZ SECONDARY FIELD CH1 CONTIN. NORM.



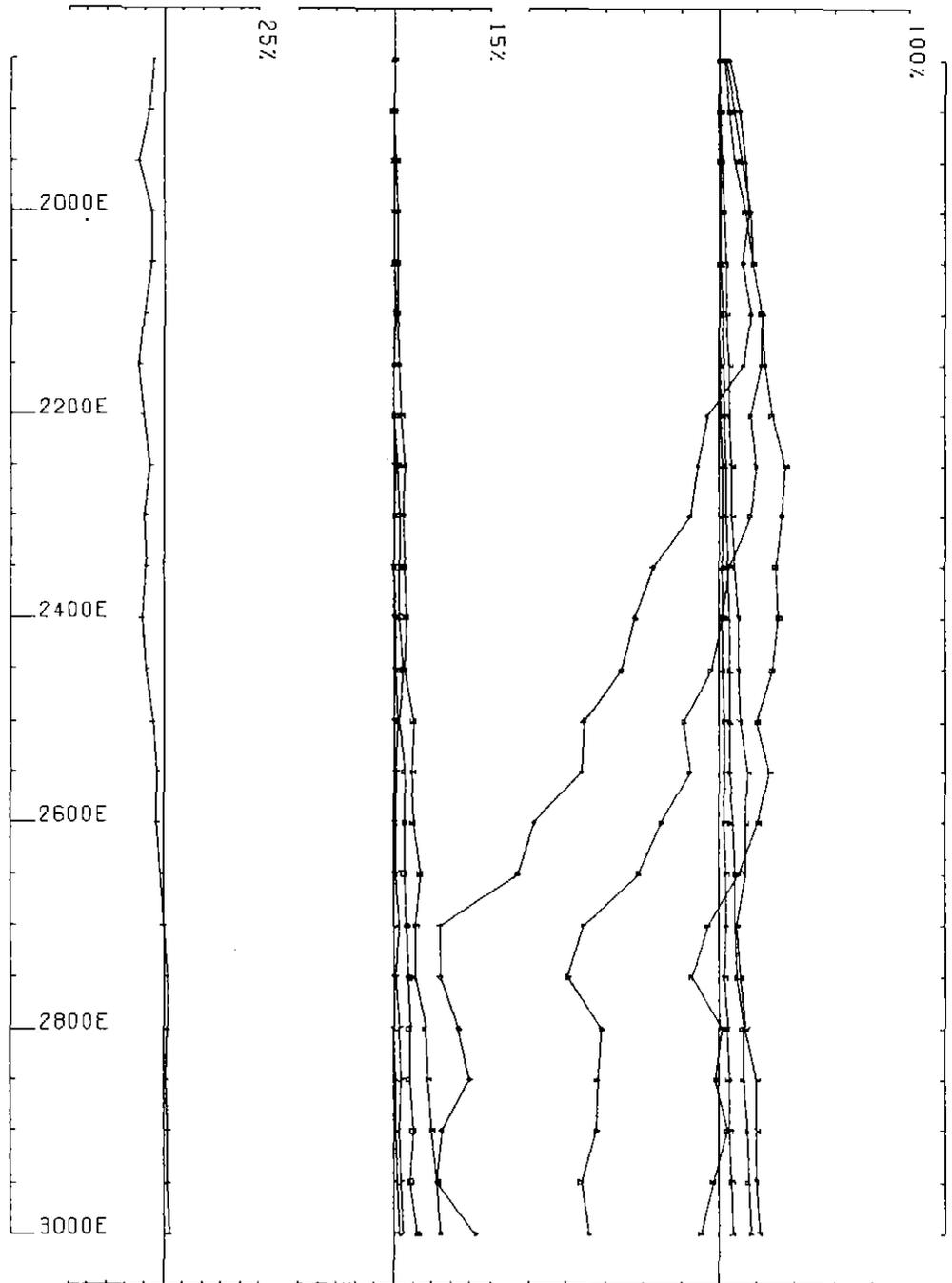
UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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UTEM SURVEY AT OARFIELD FOR BHP-UTAM NOVEMBER 1990
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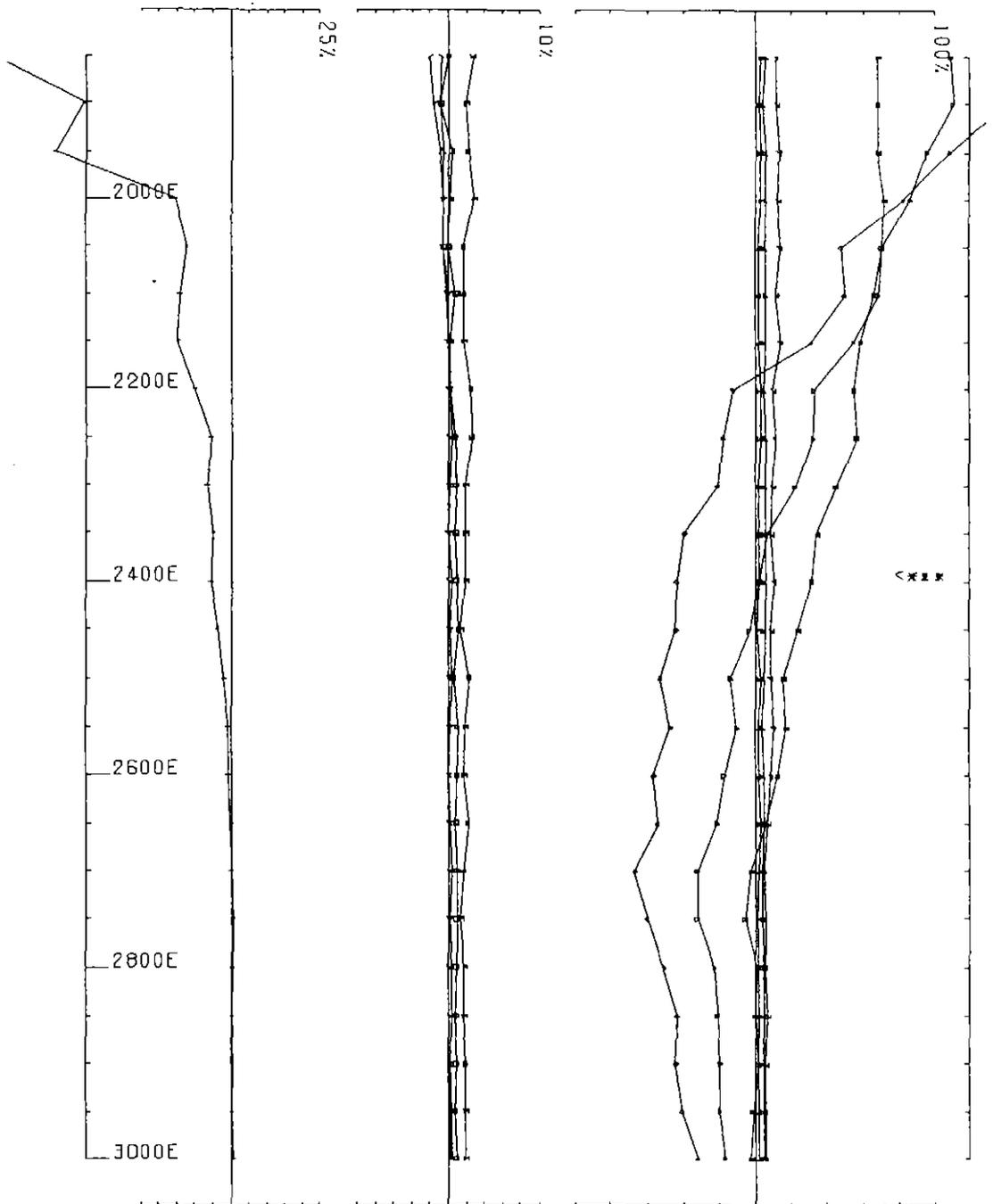
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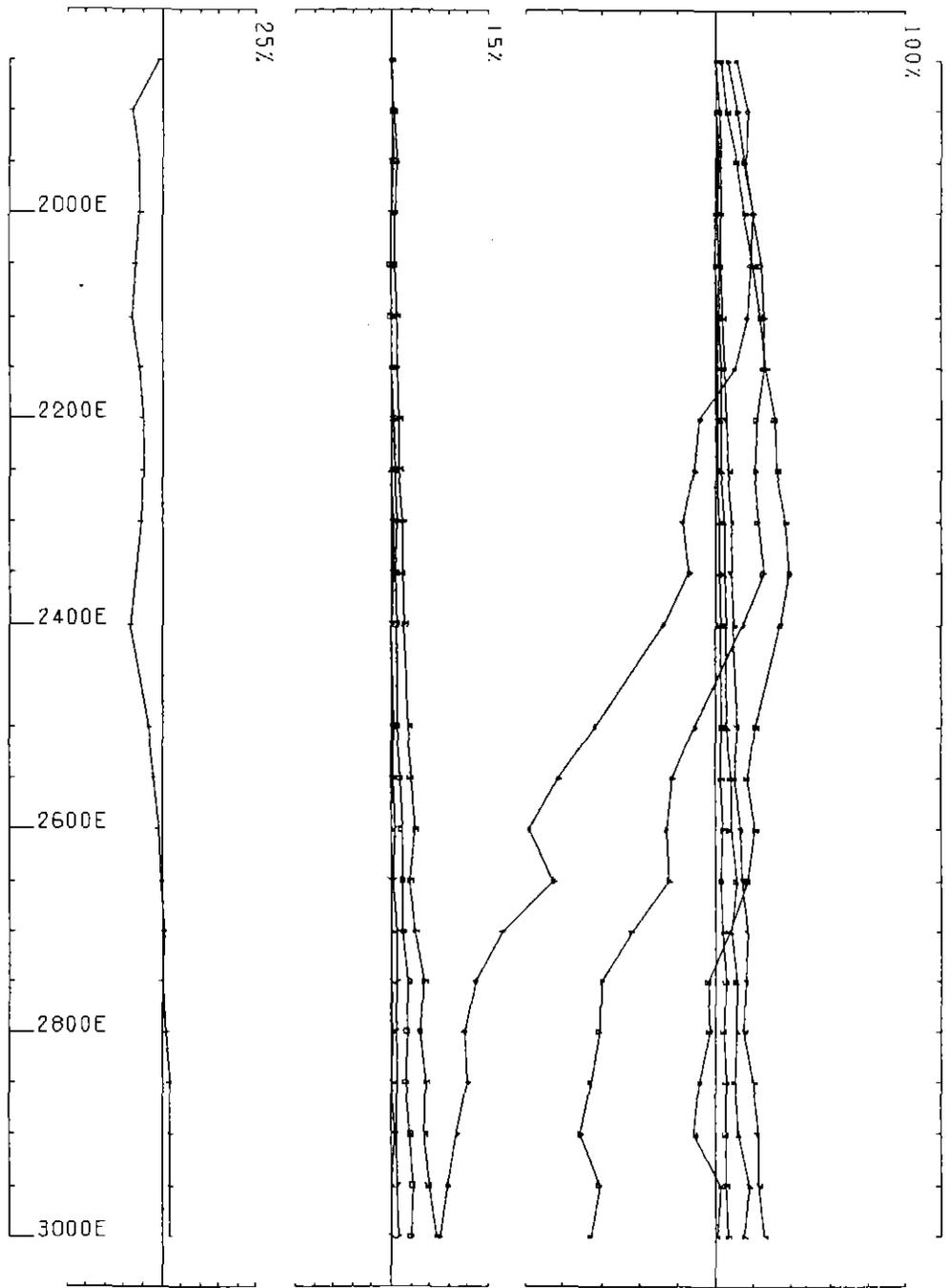
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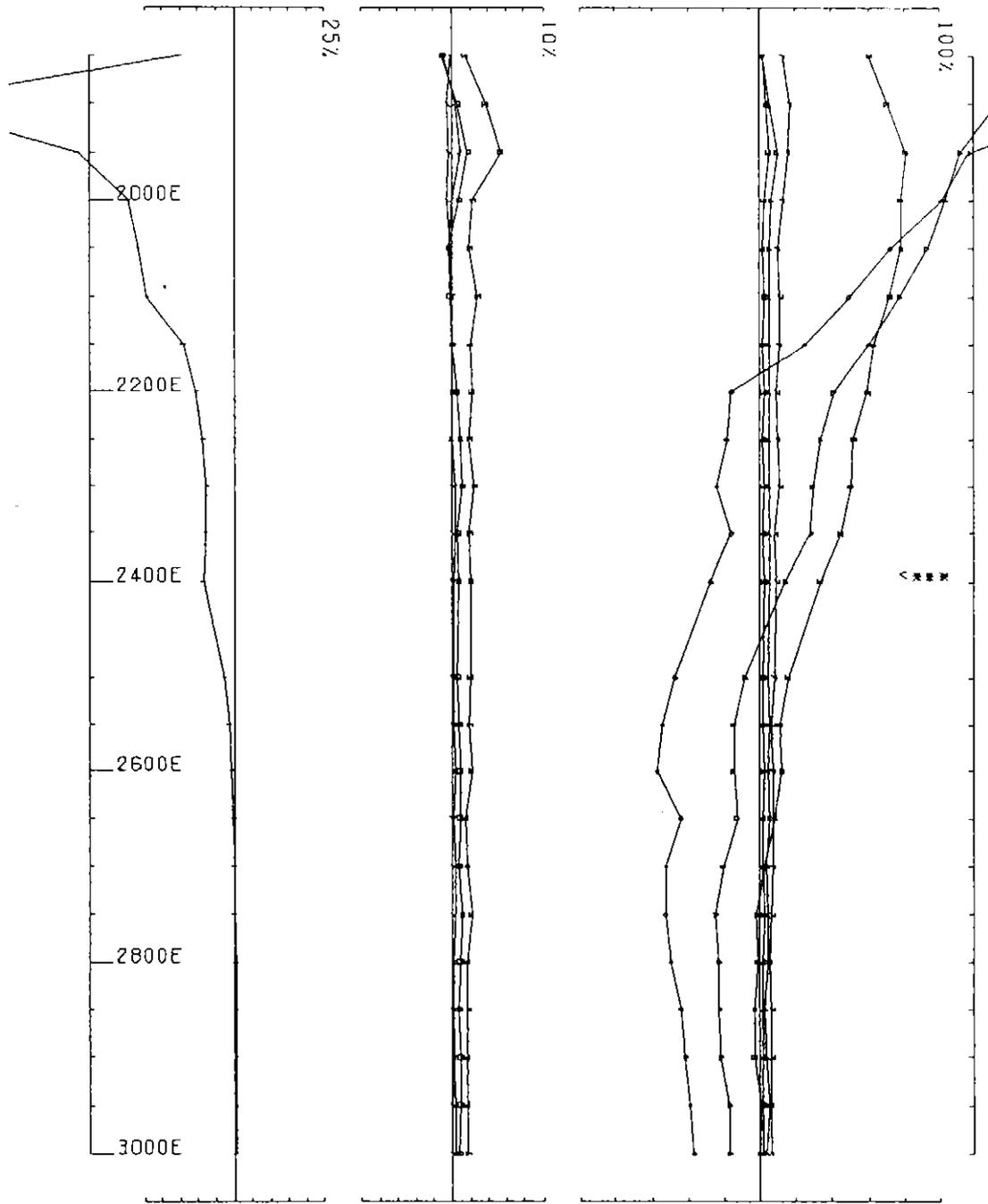
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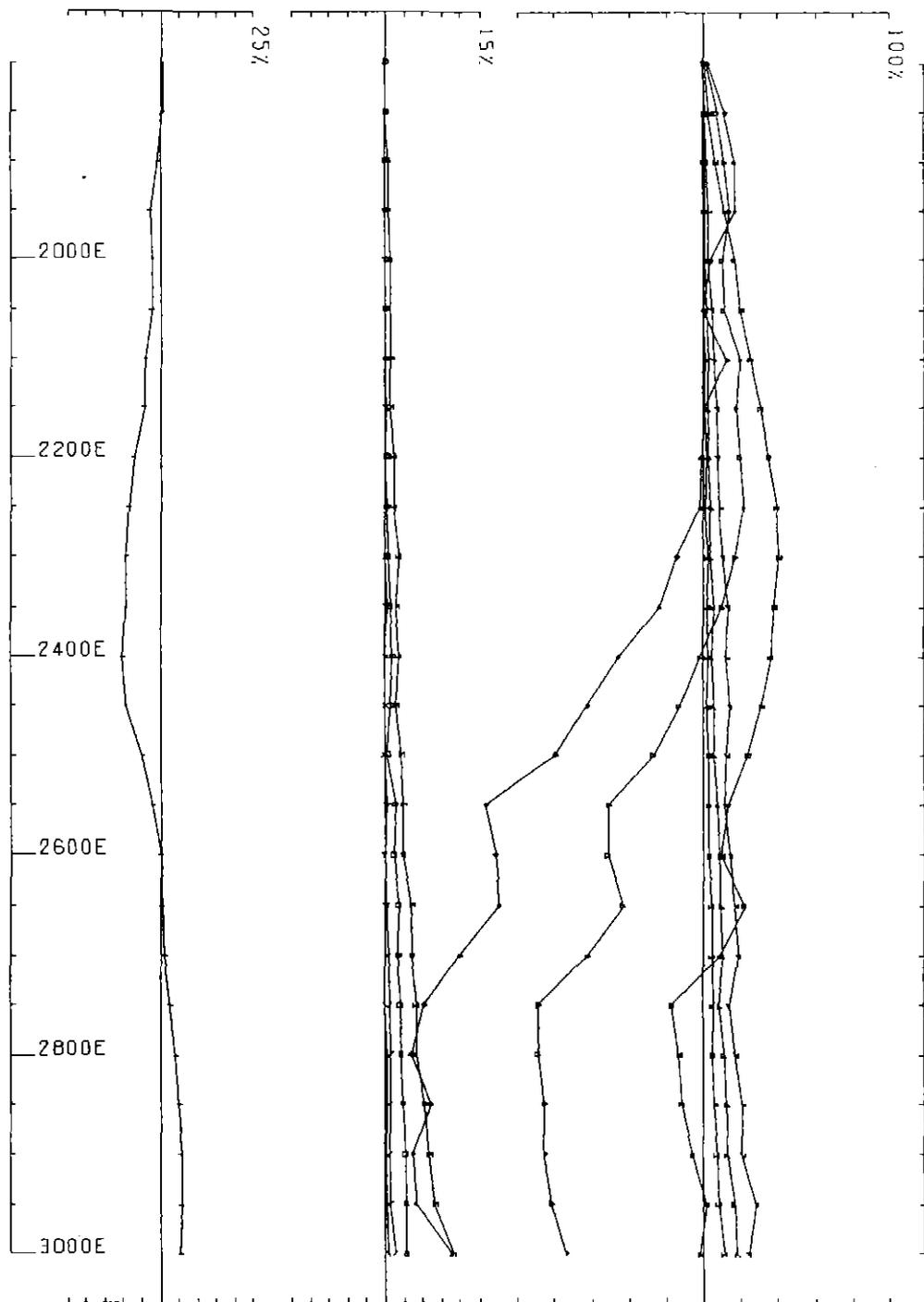
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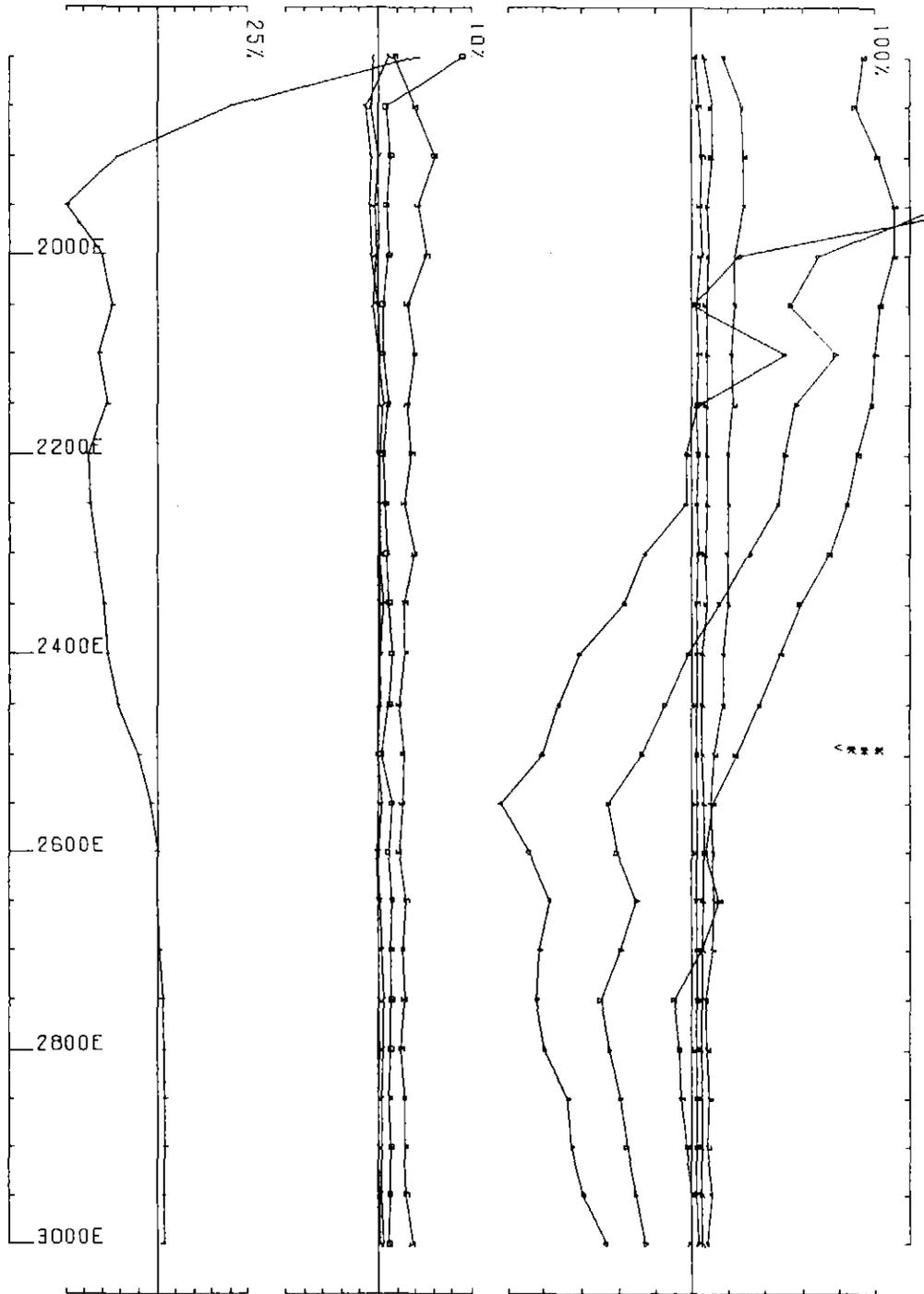
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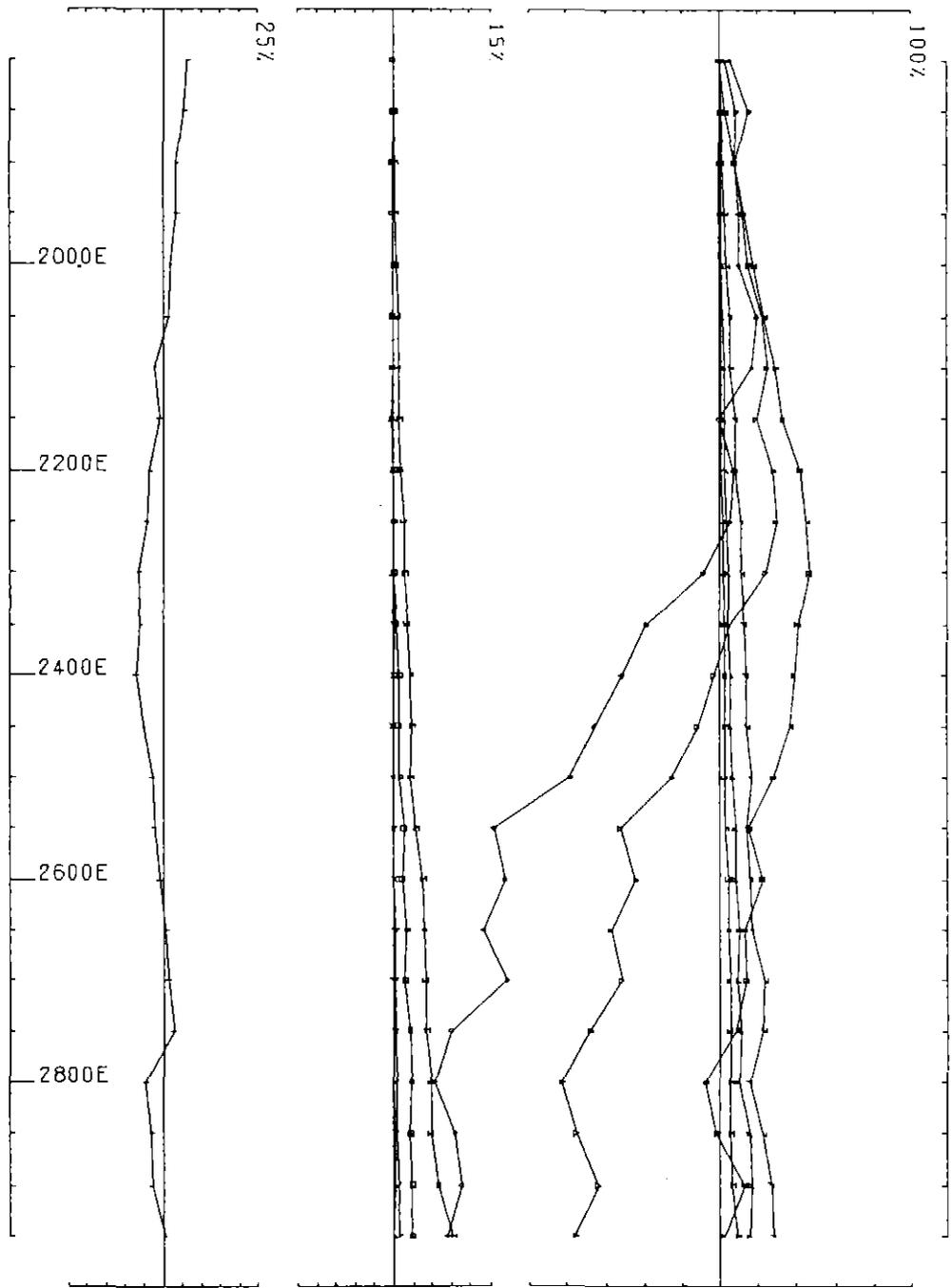
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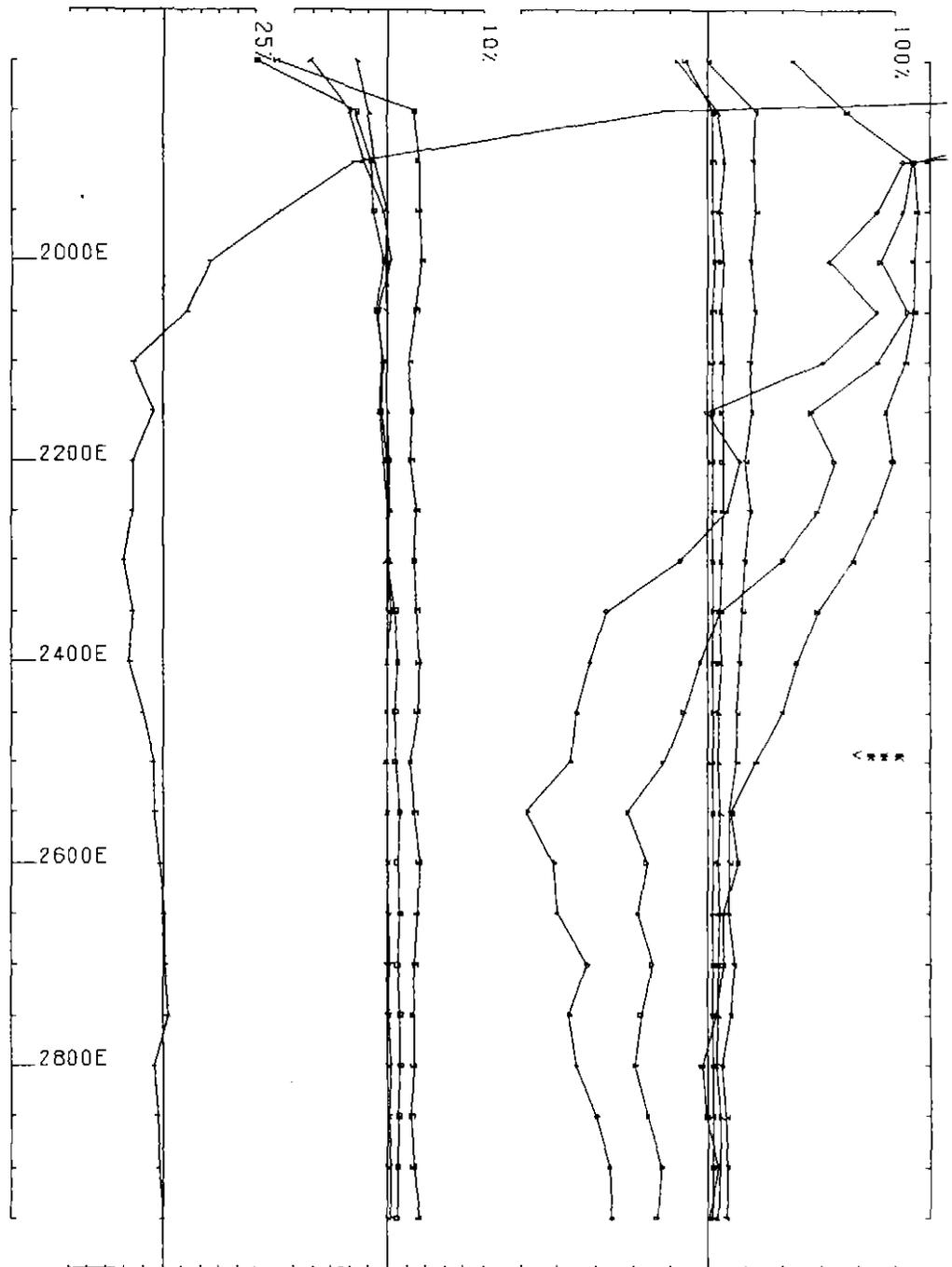
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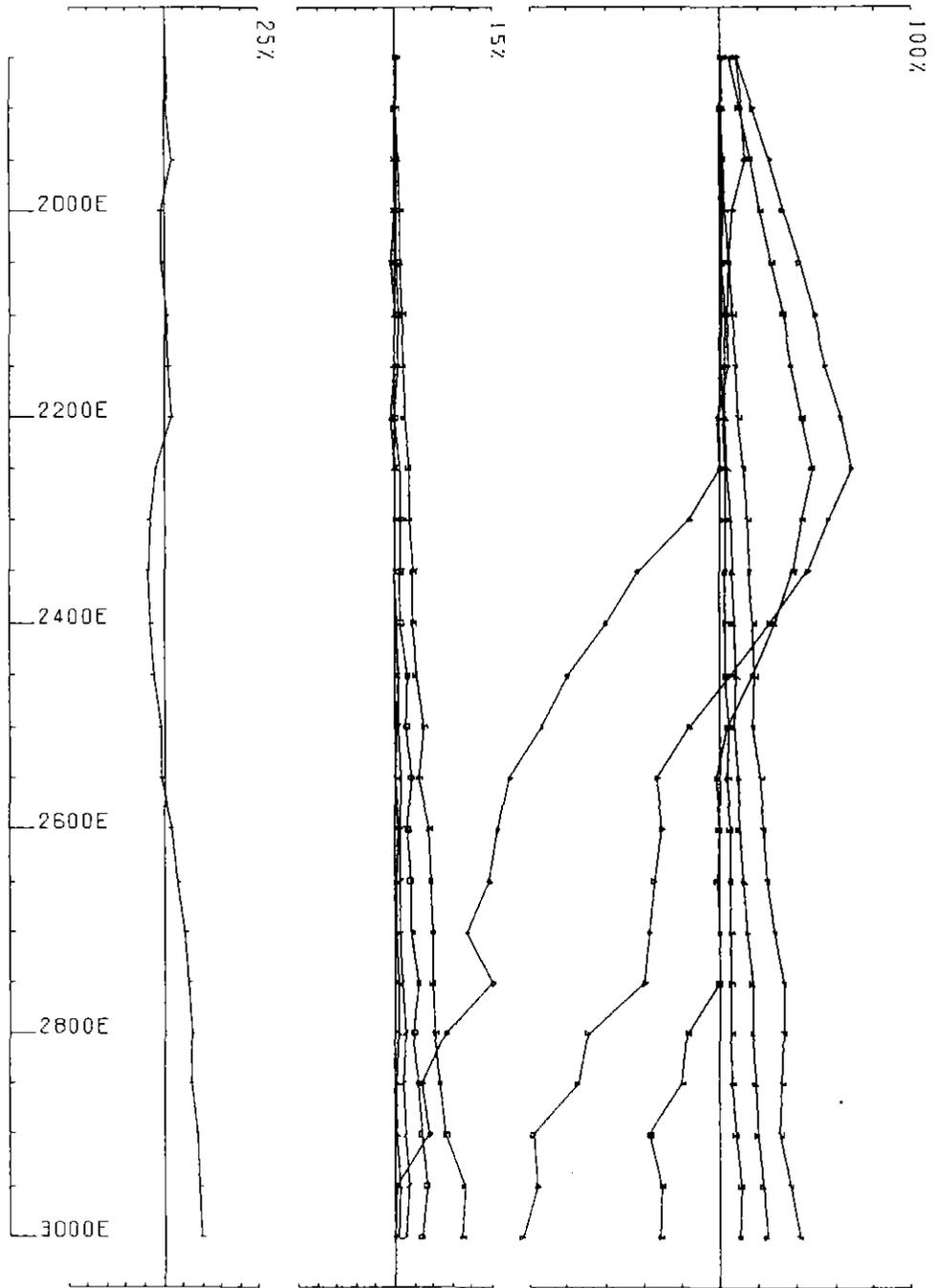
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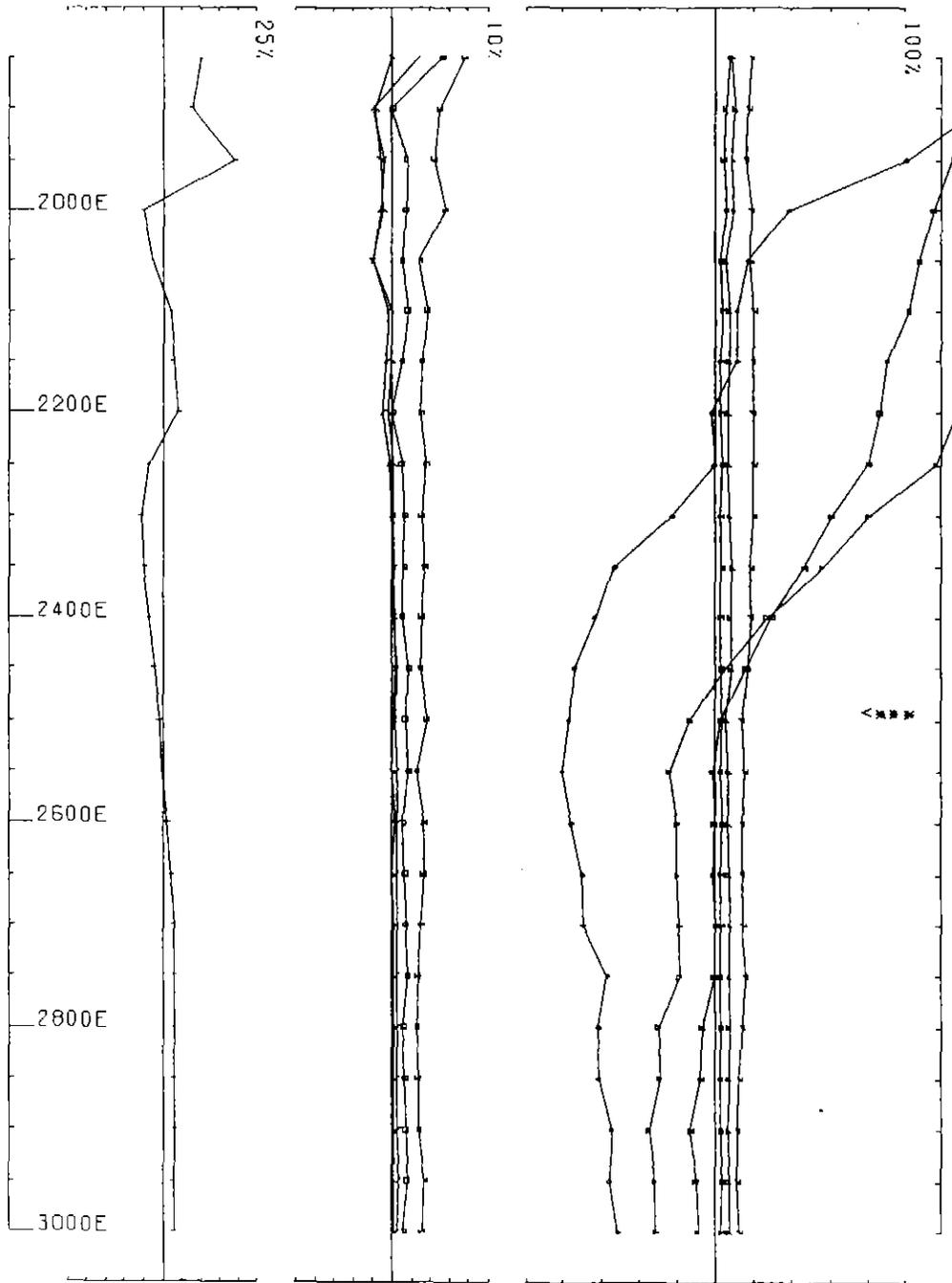
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UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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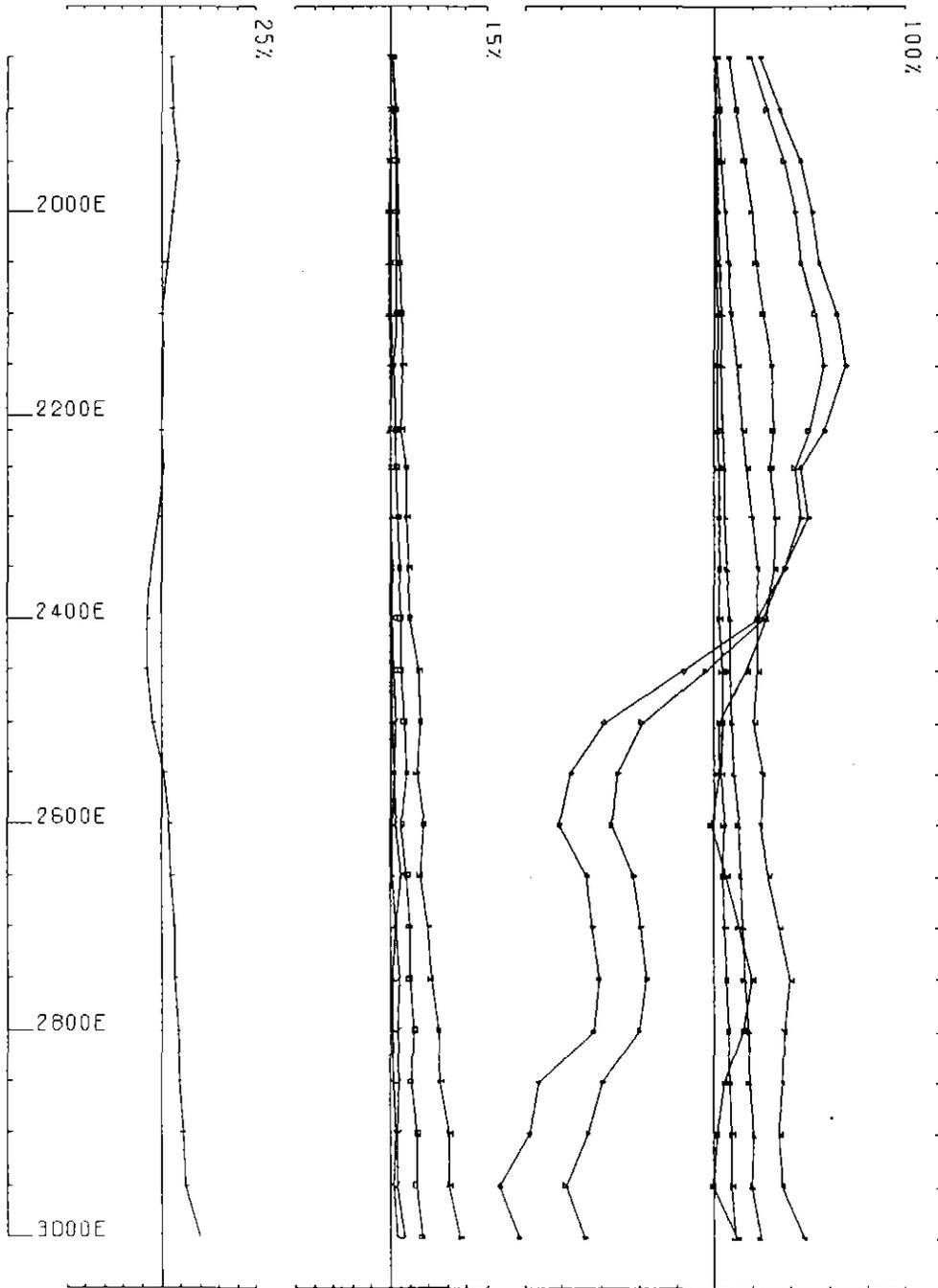


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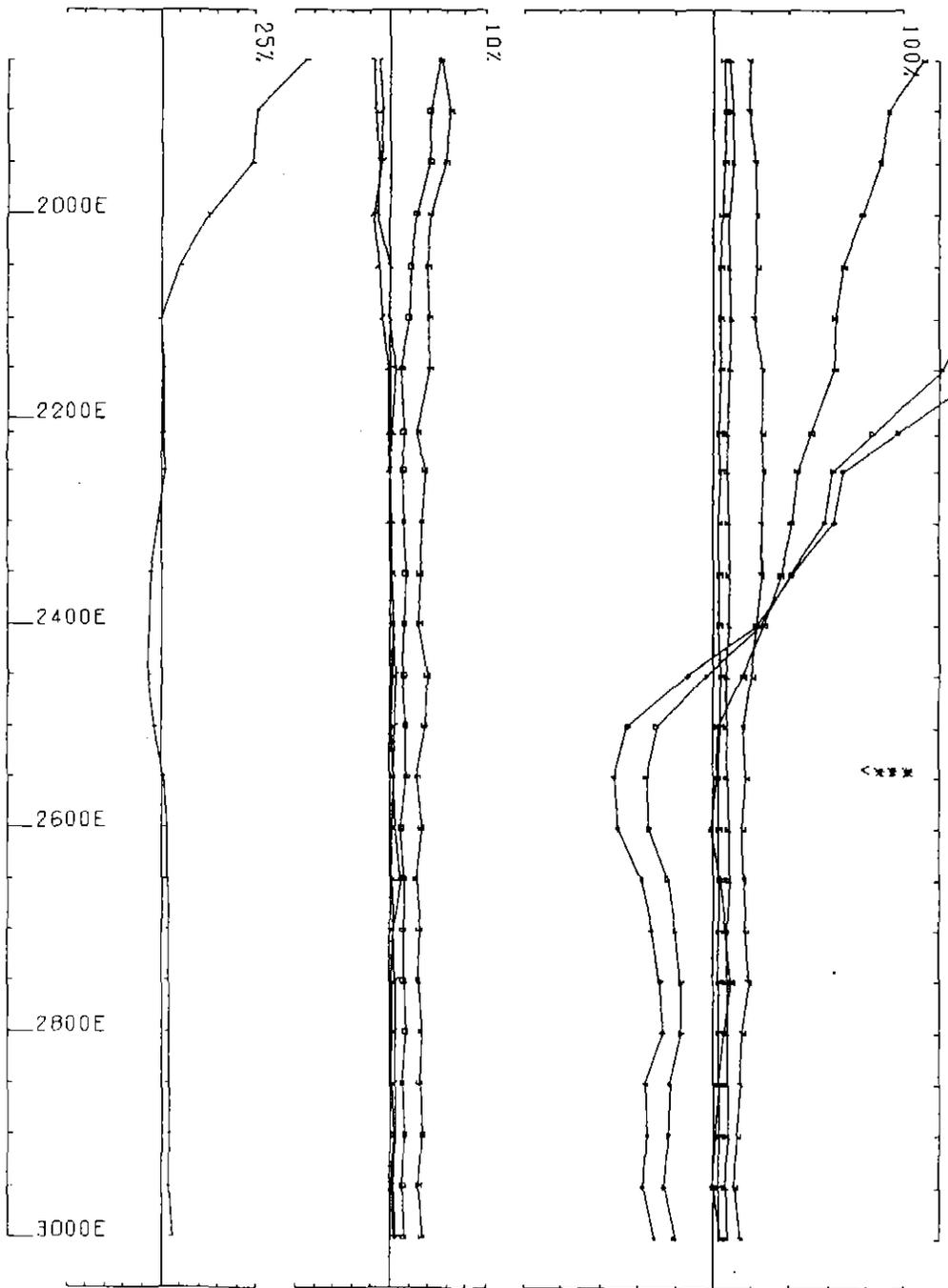


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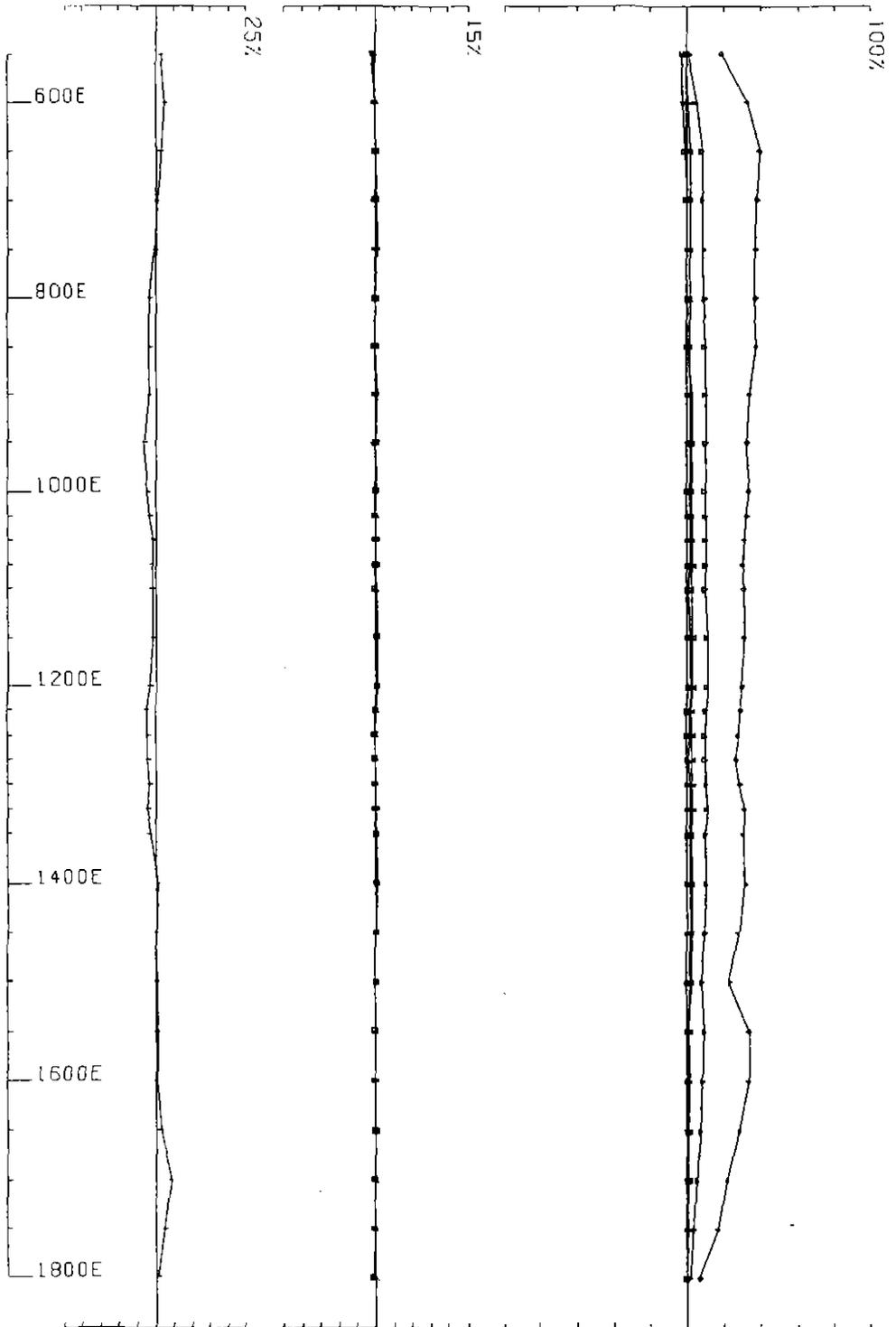
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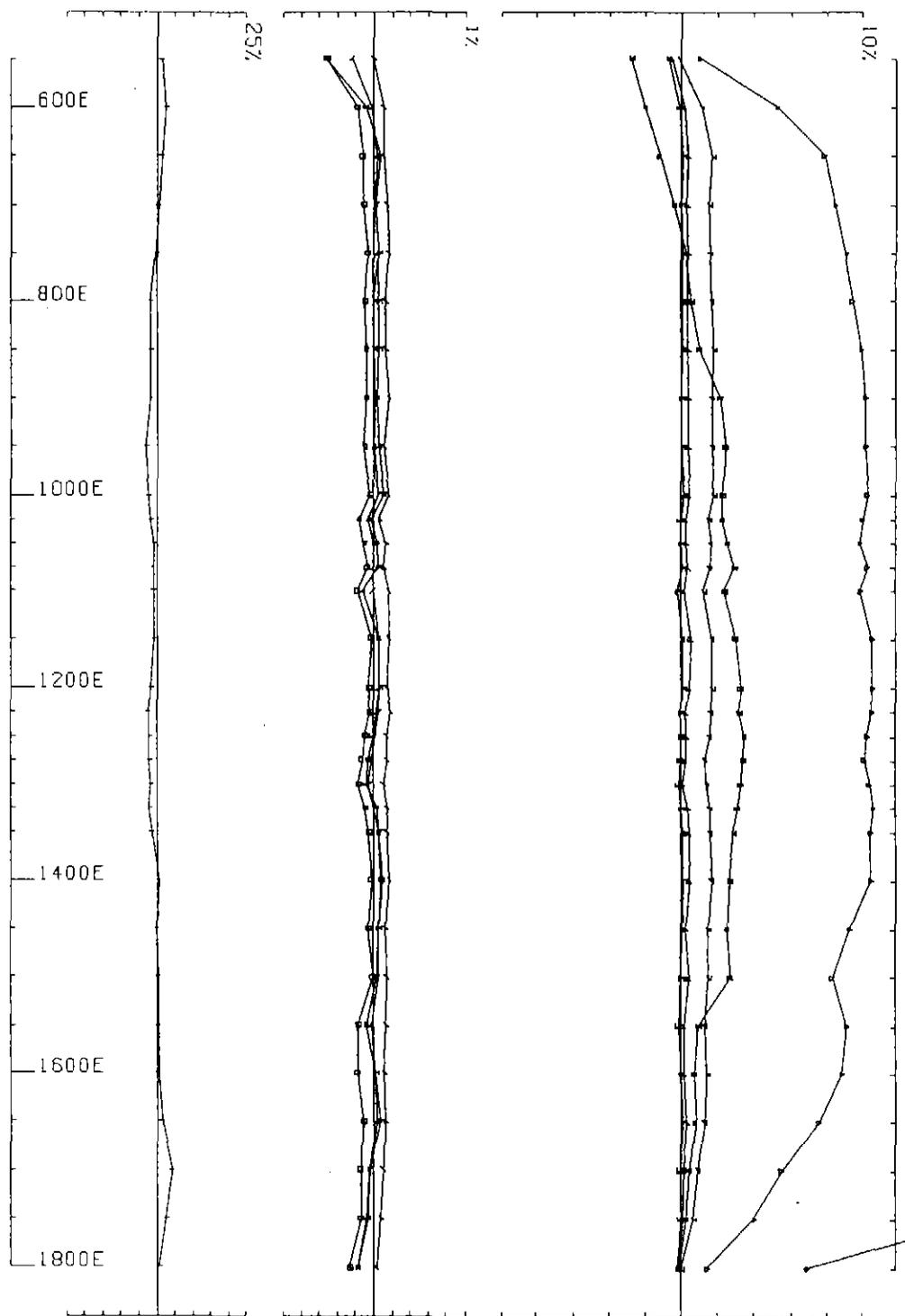
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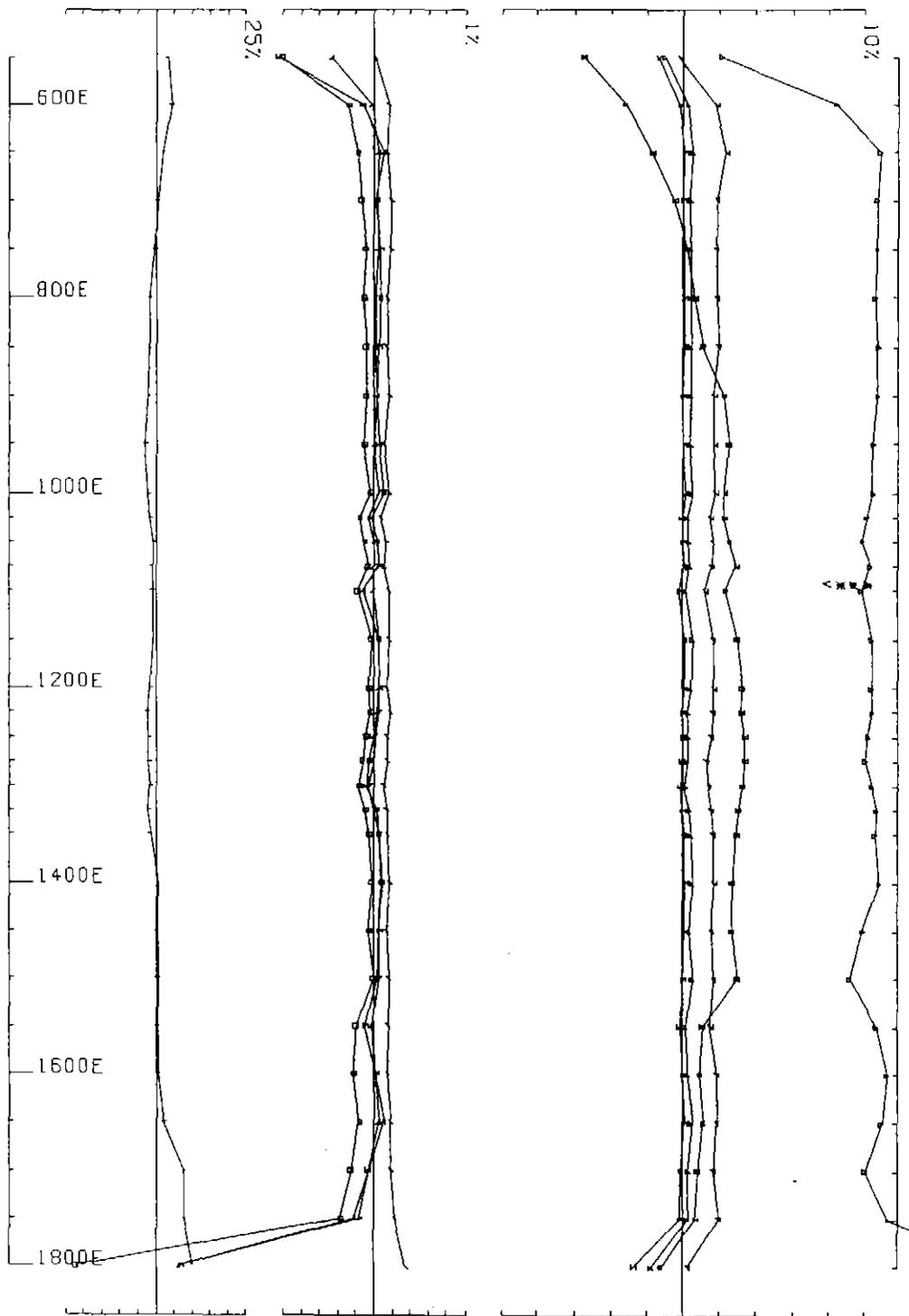
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UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26.23
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(INSIDE)



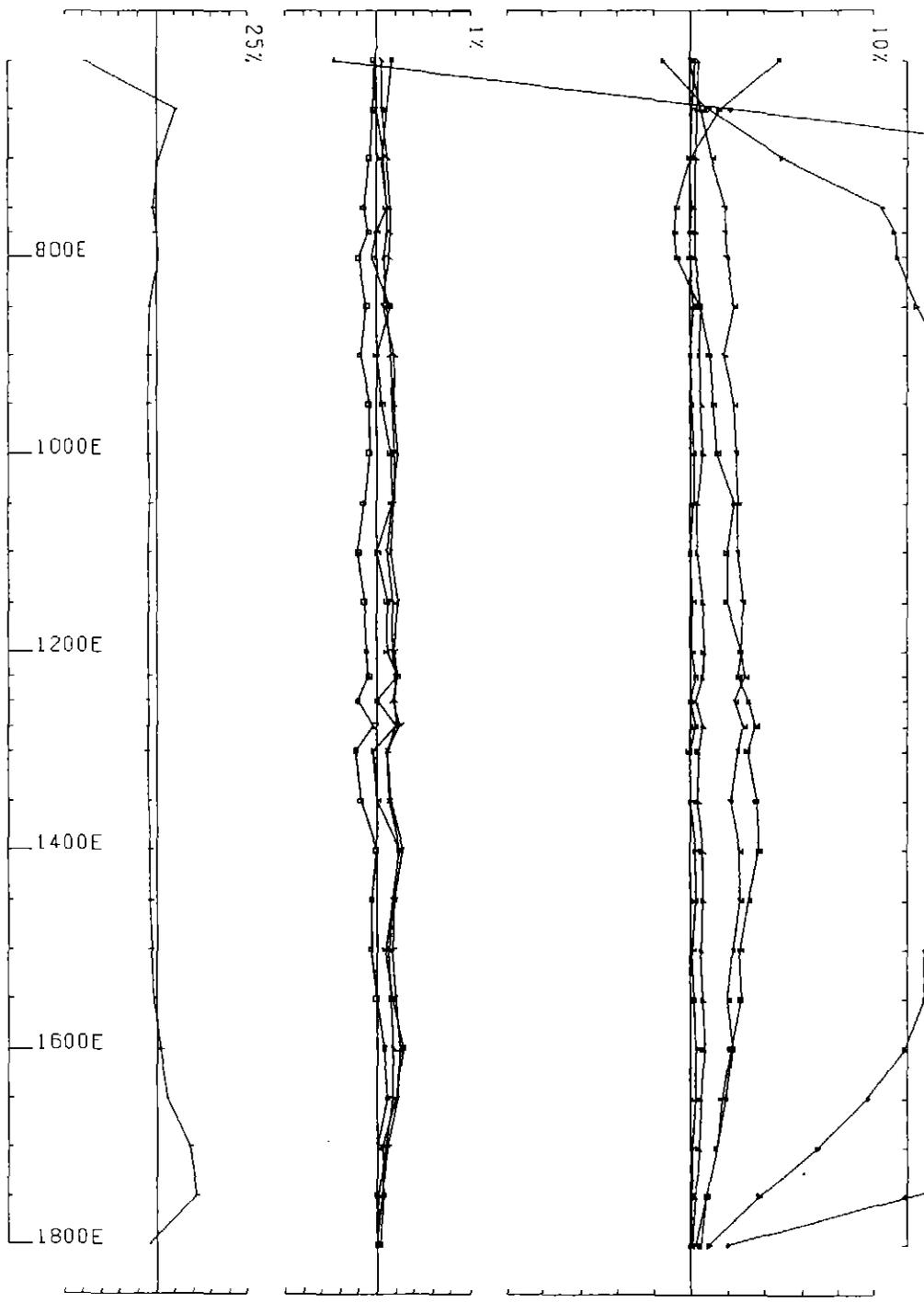
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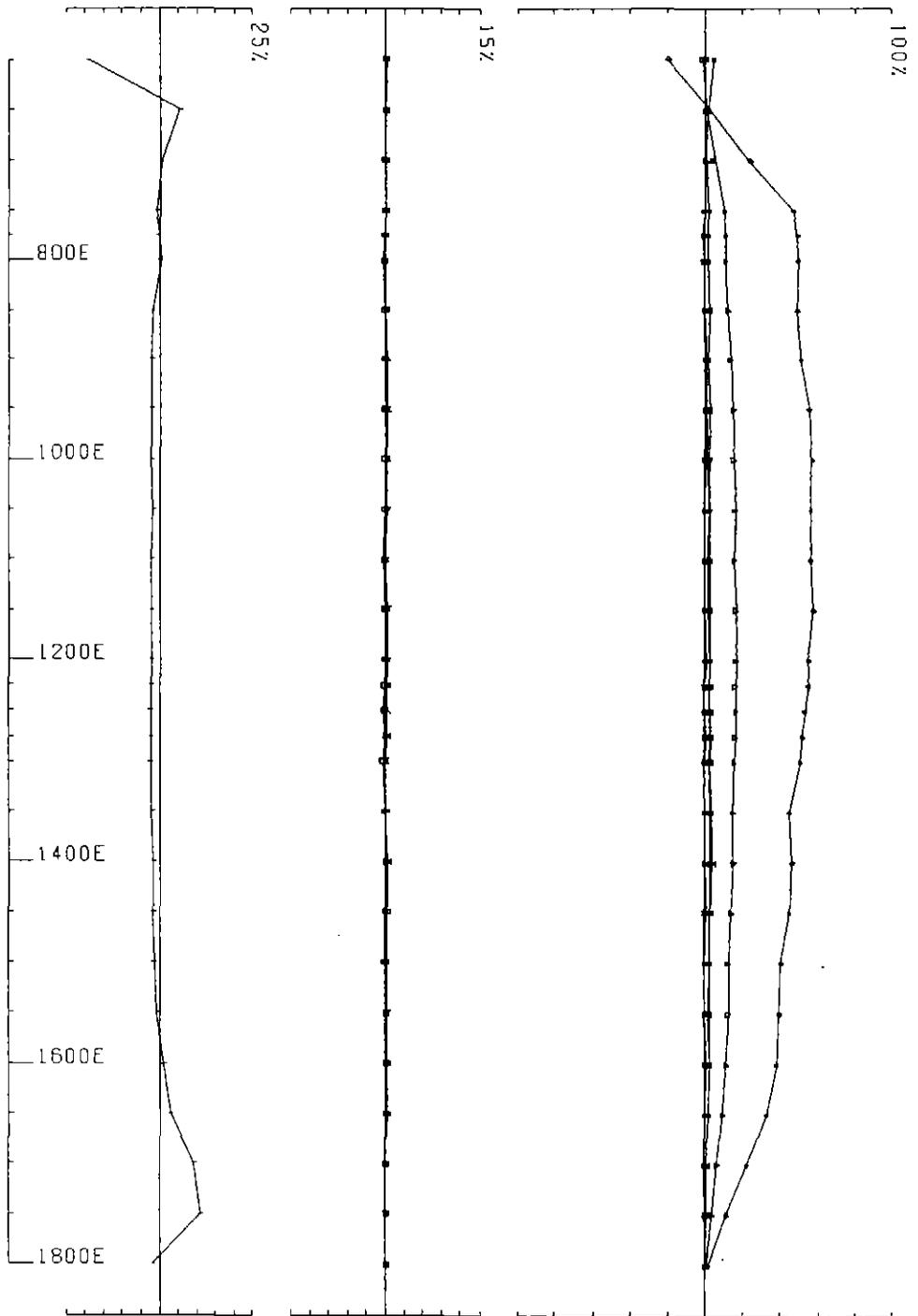
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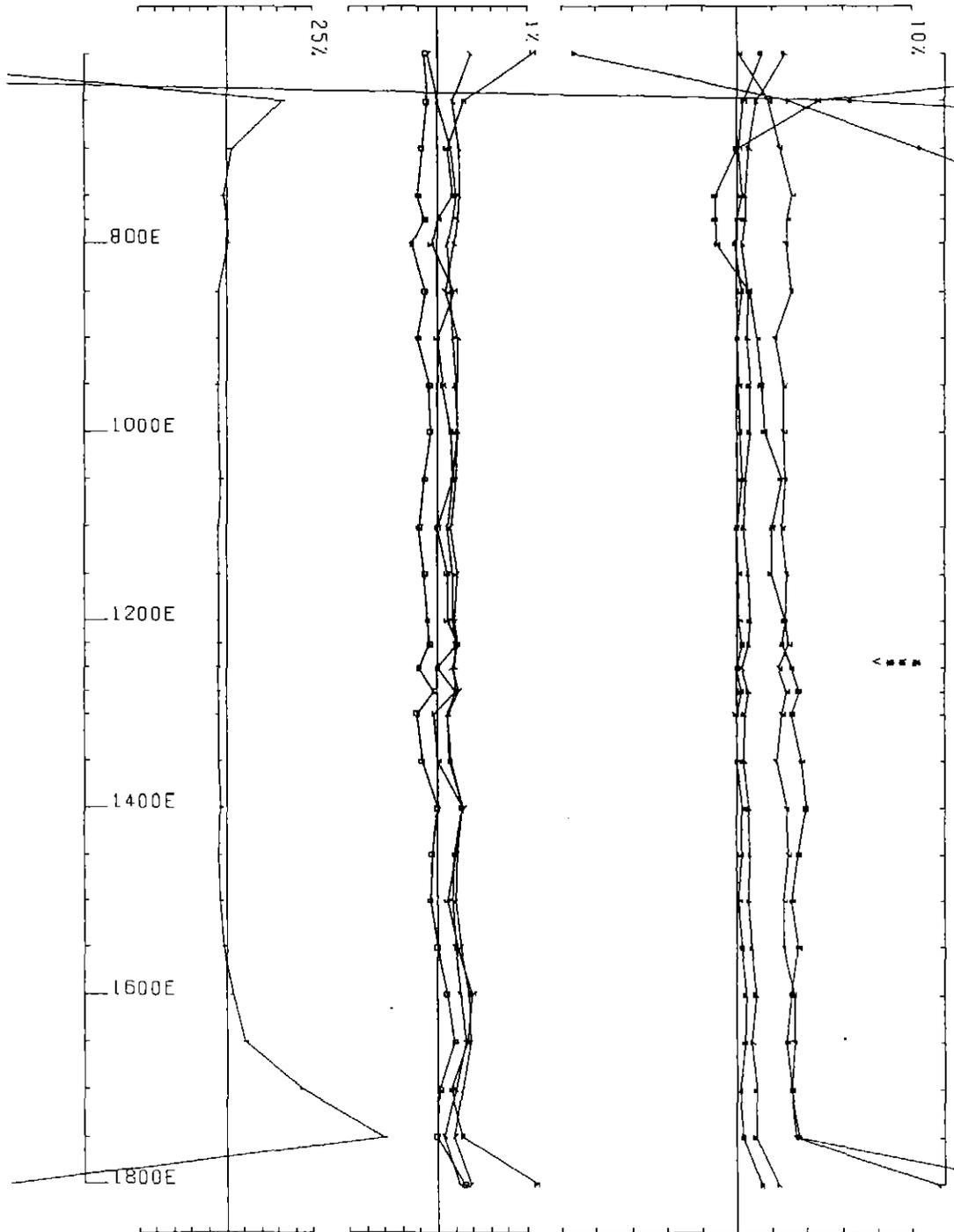
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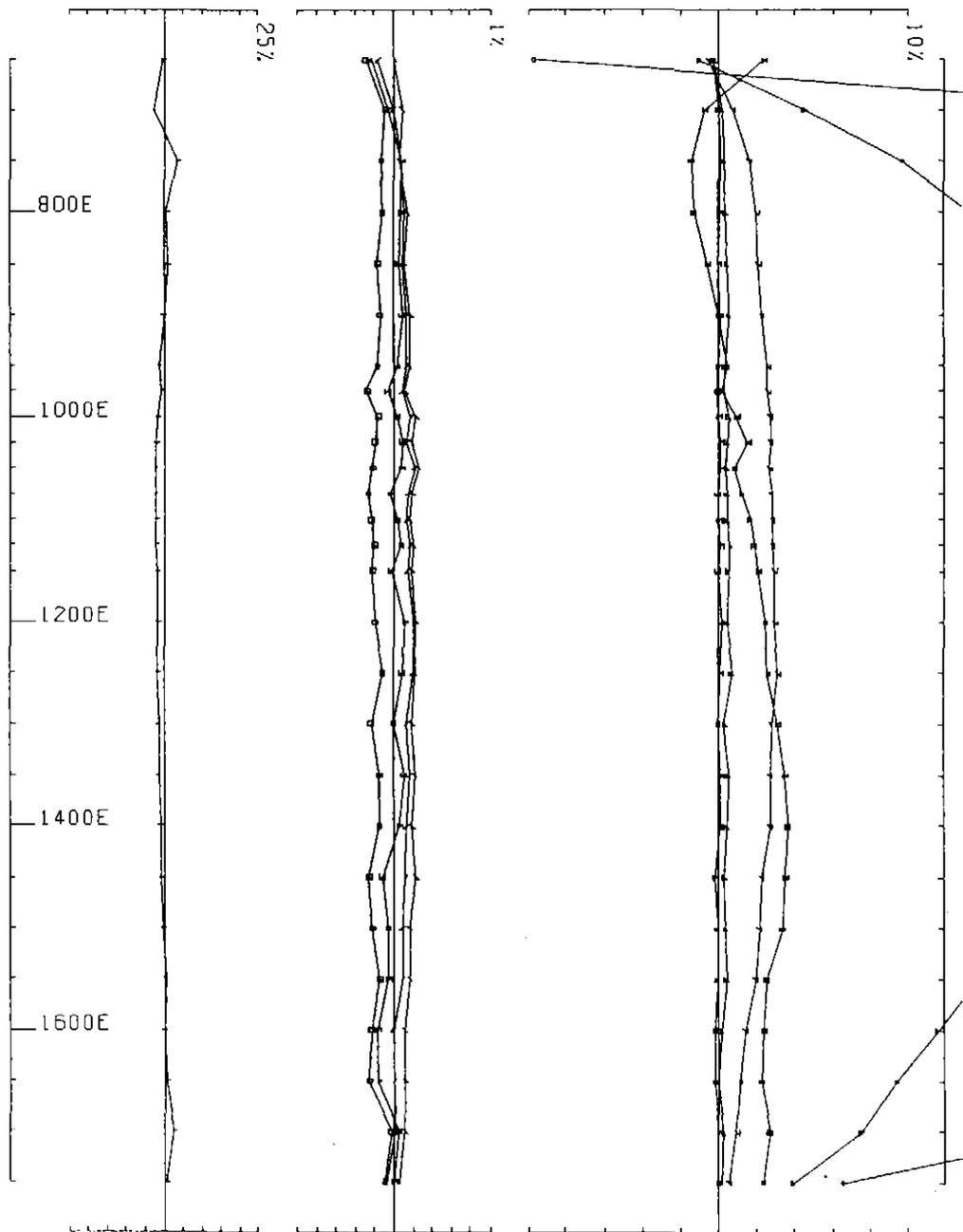
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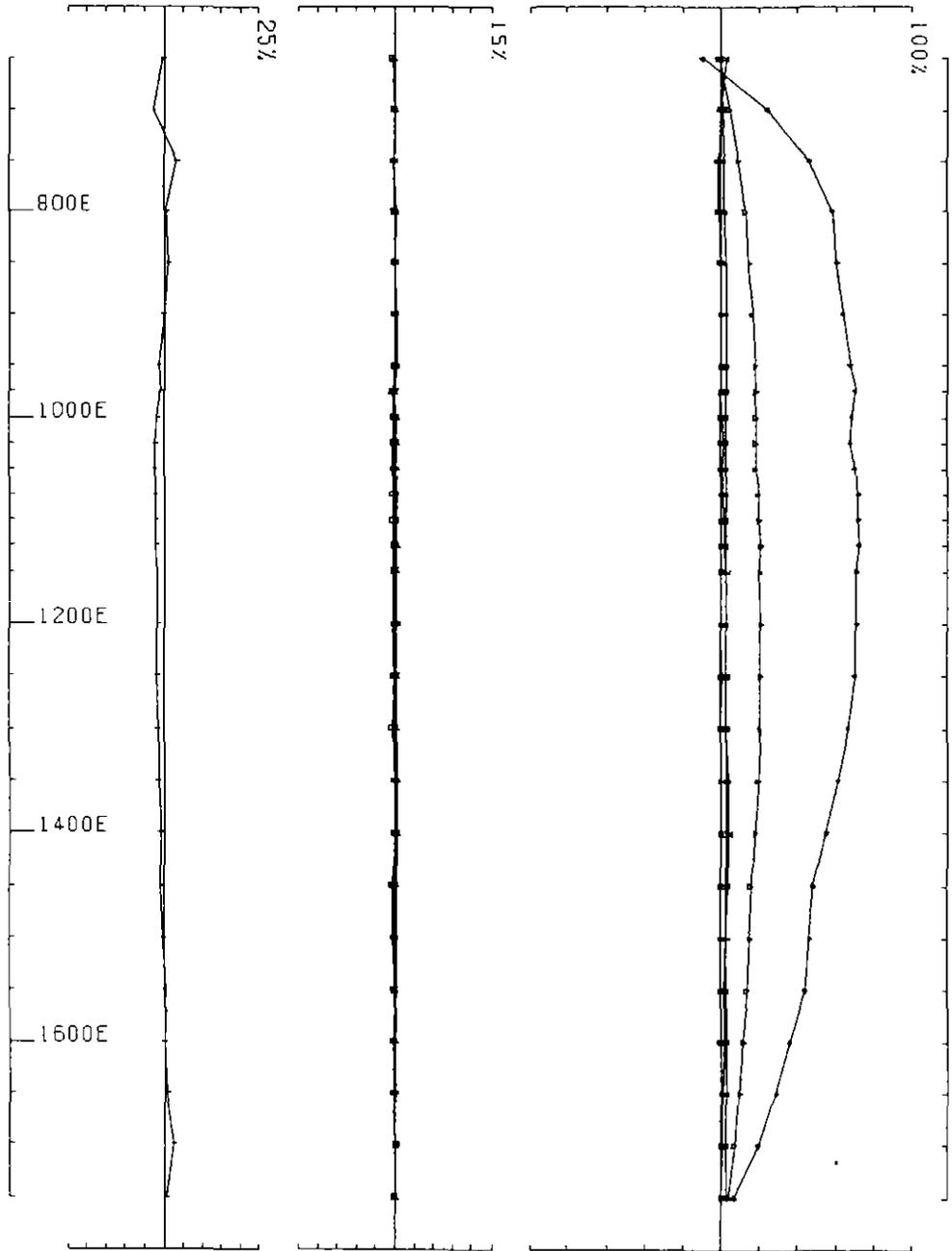
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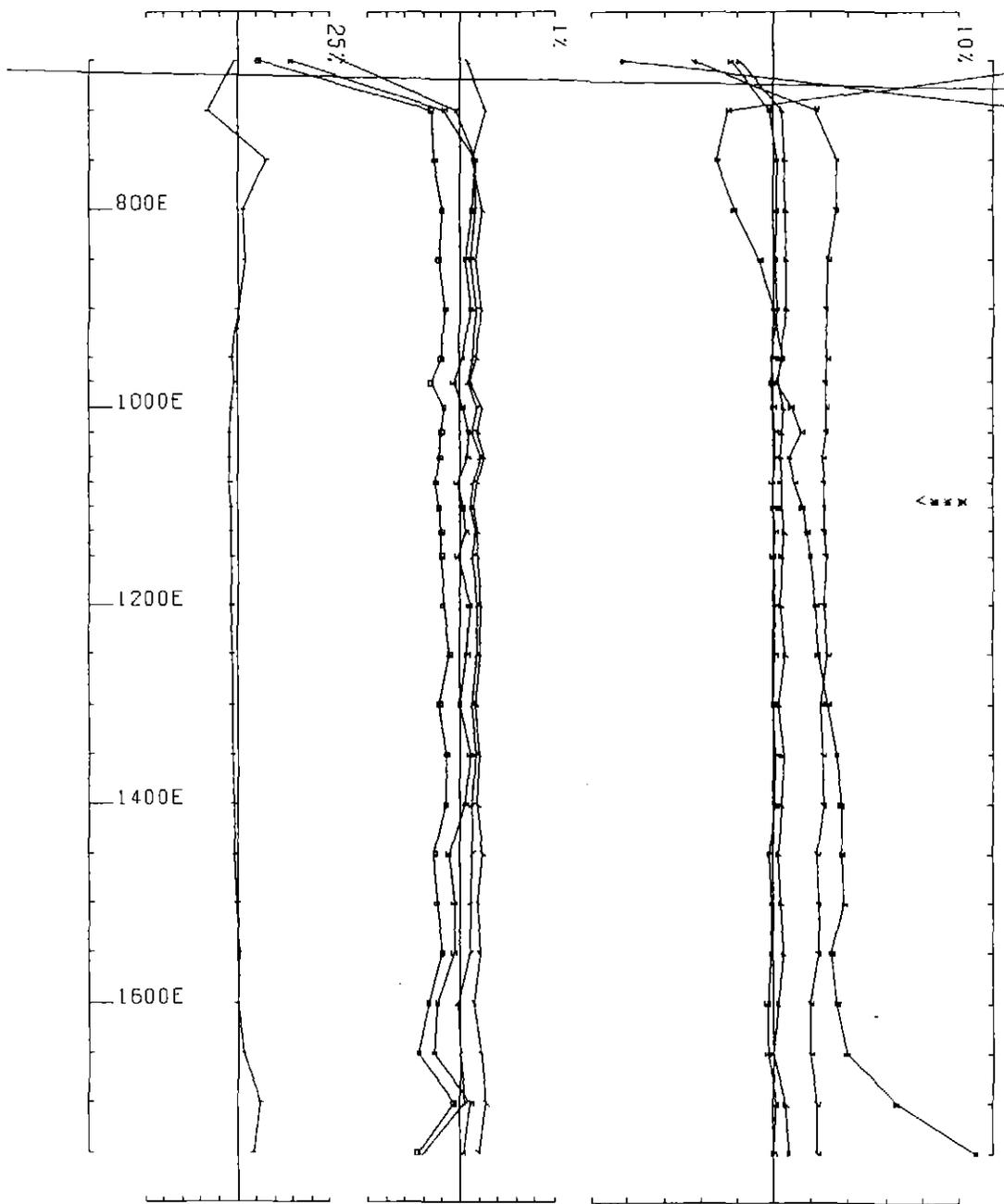
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UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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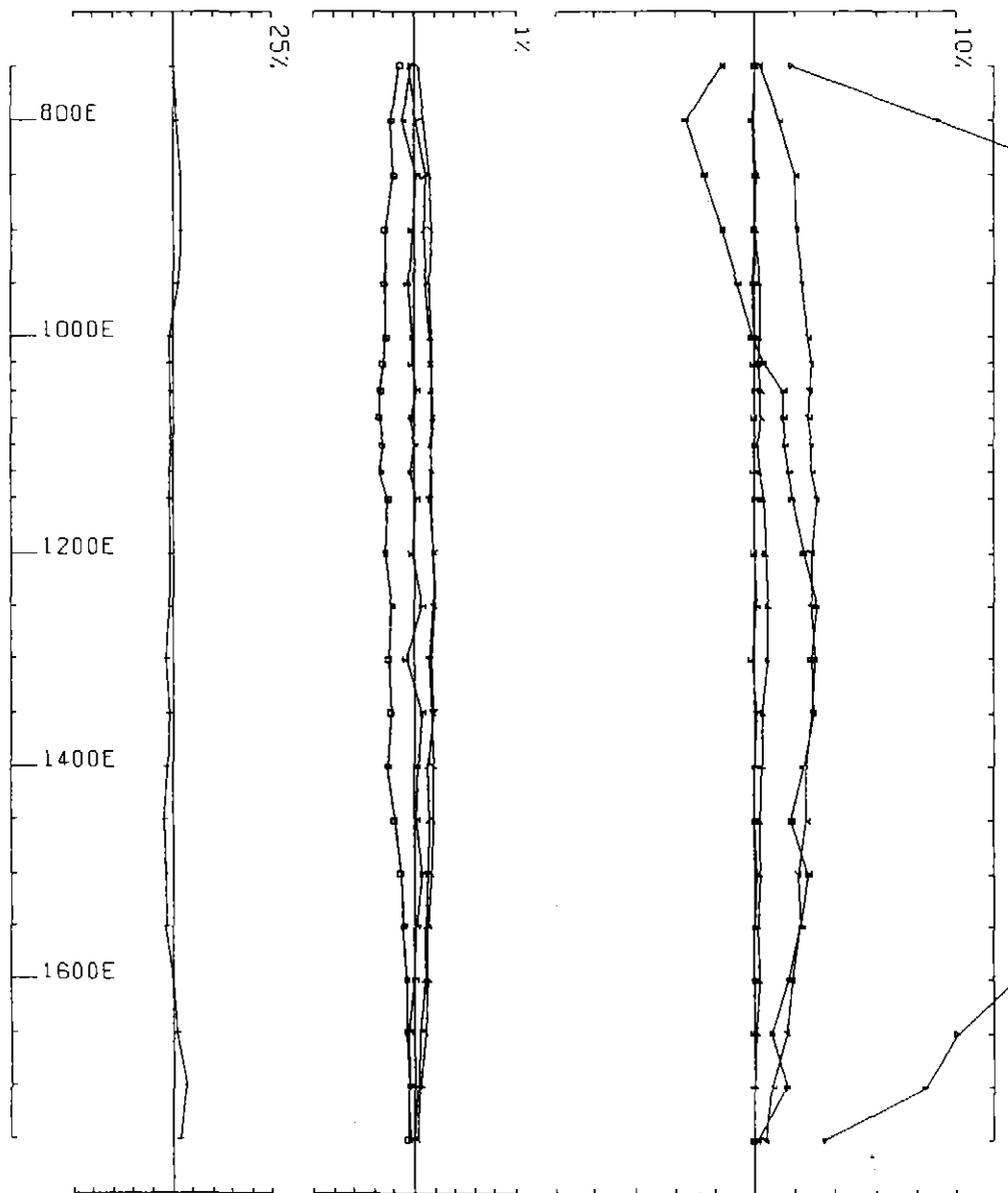
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UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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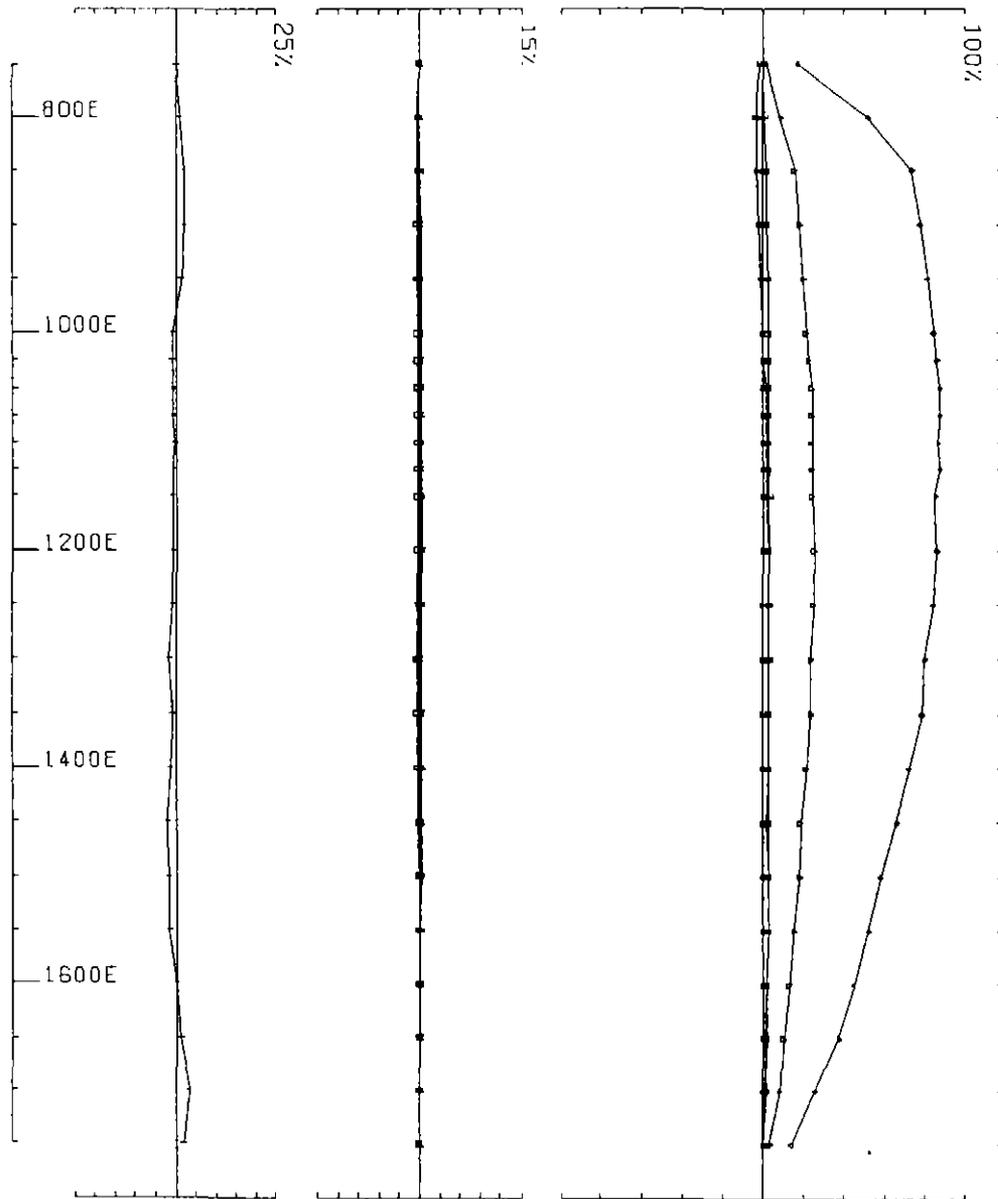
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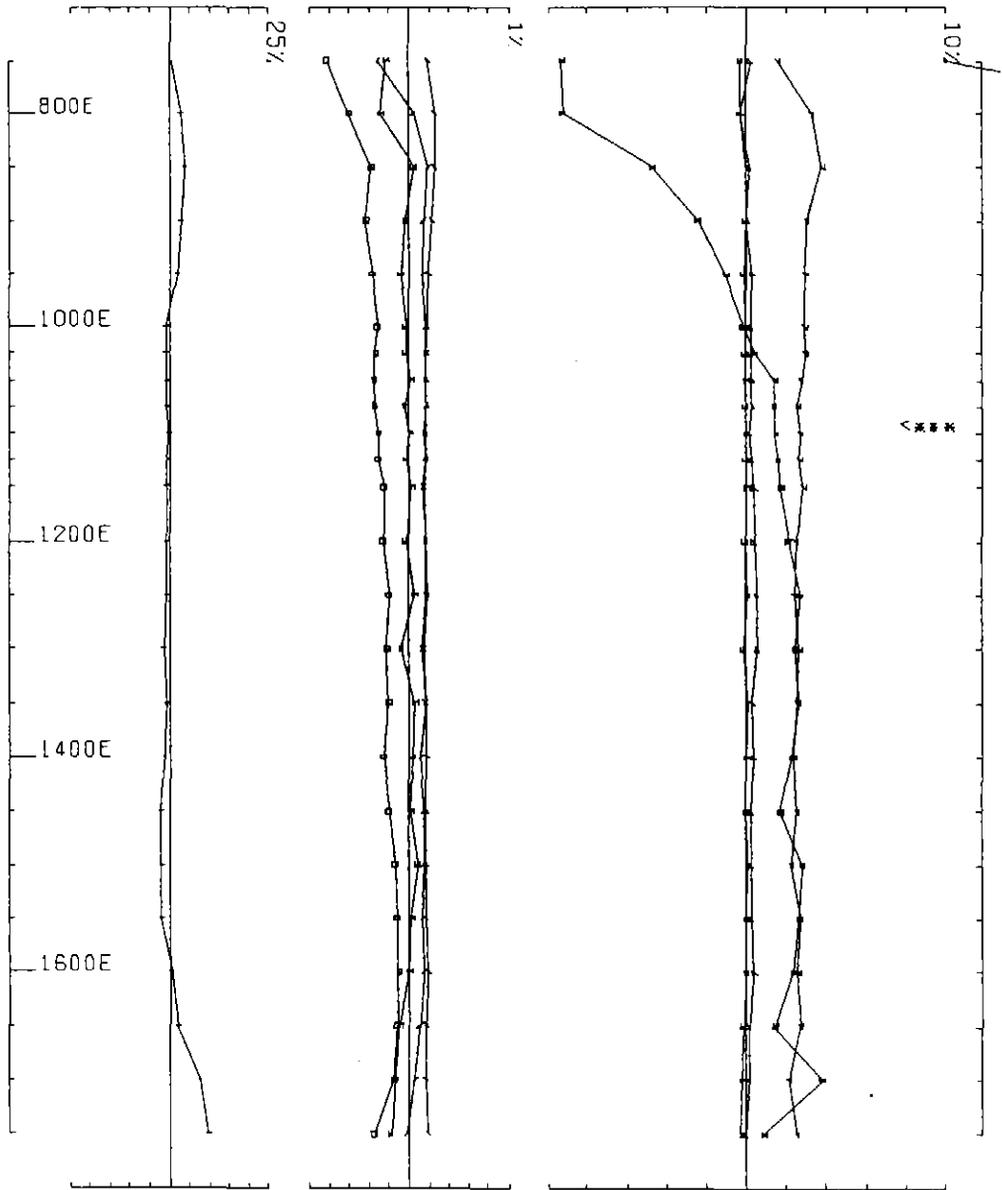


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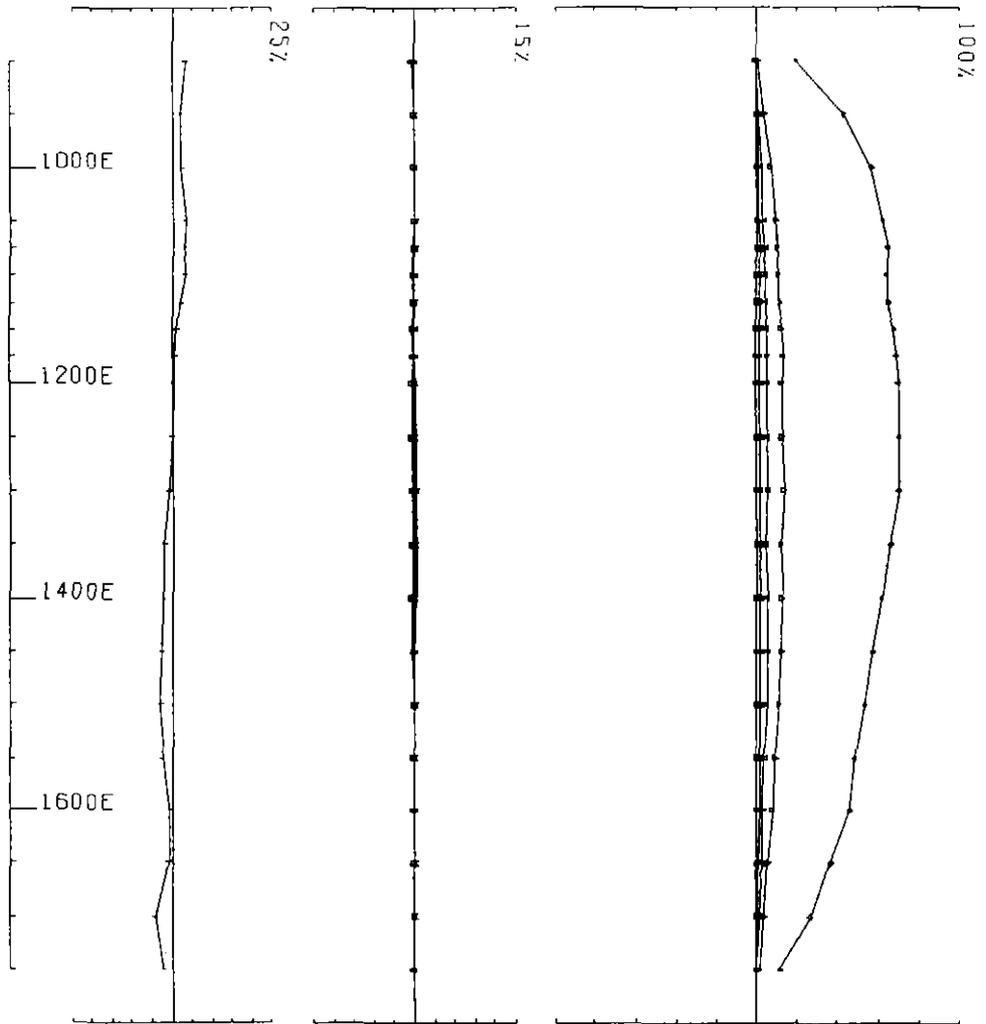
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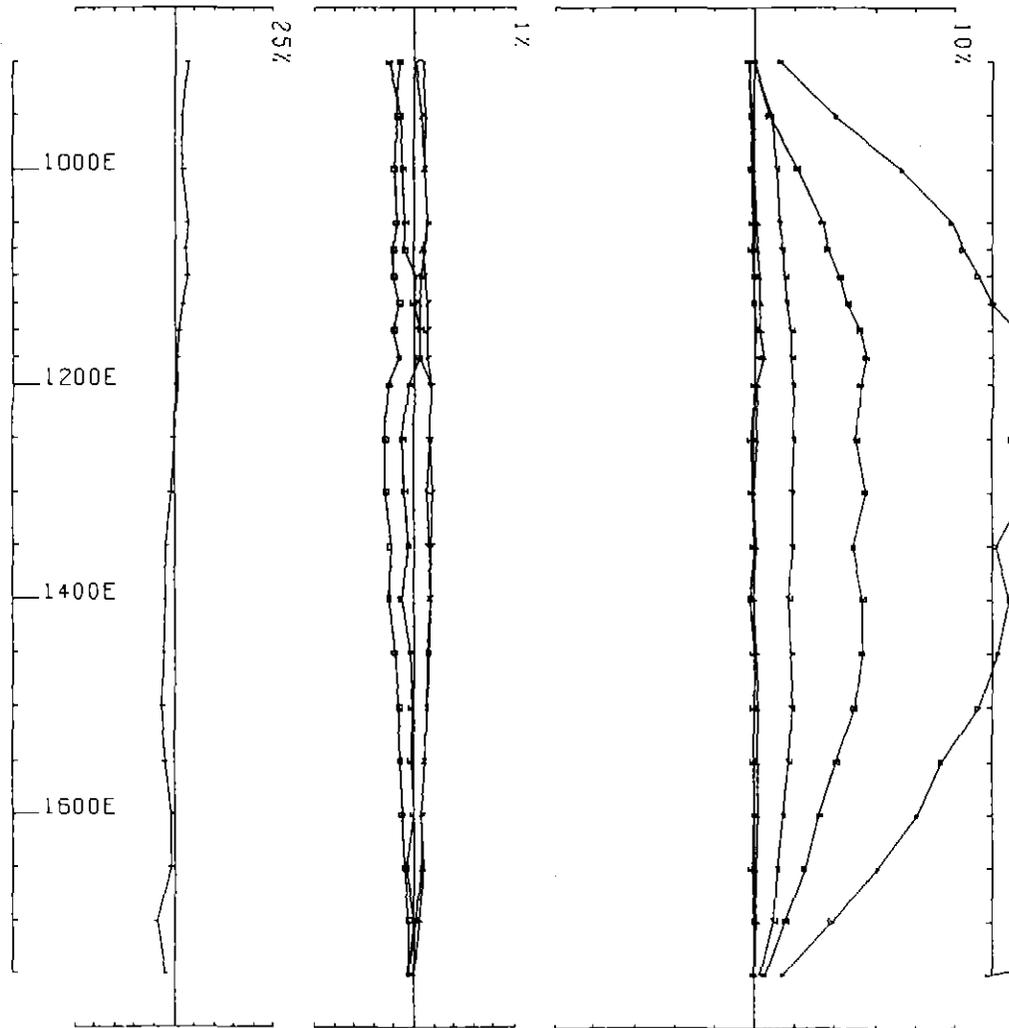
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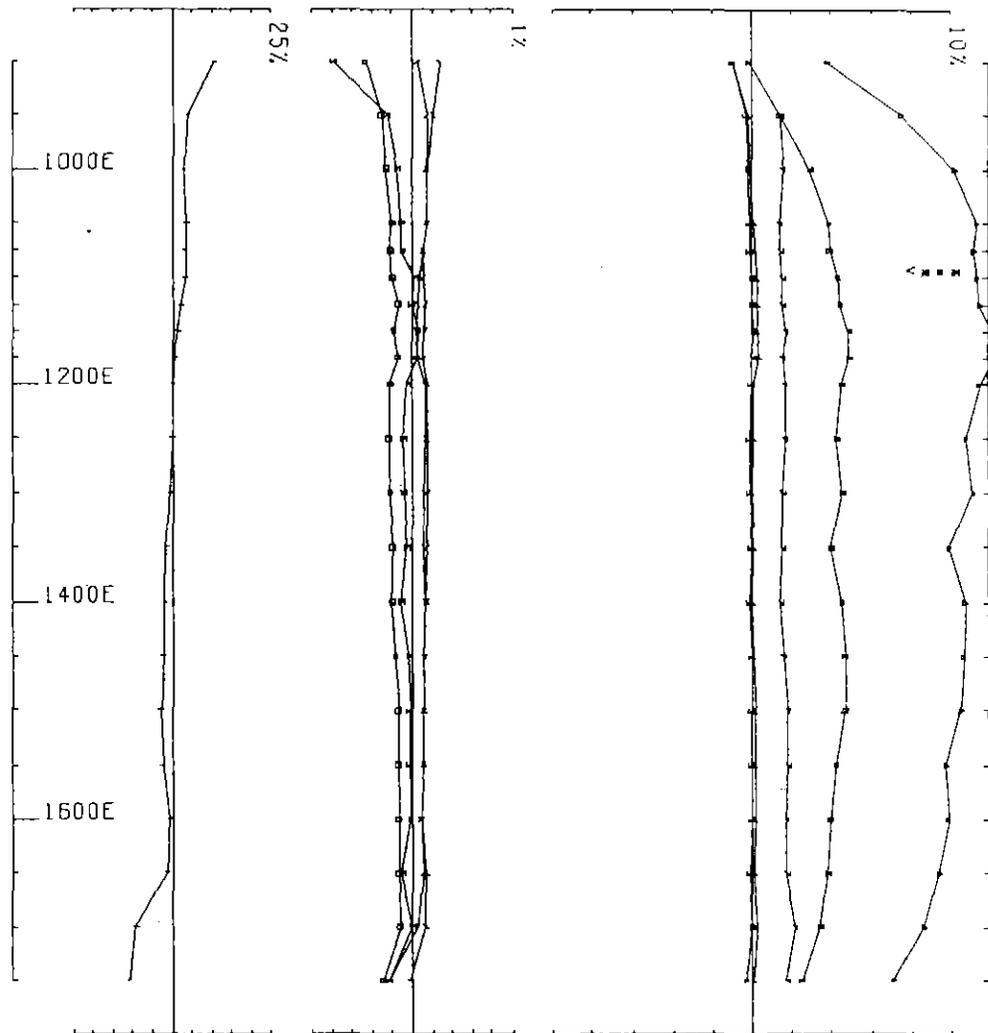
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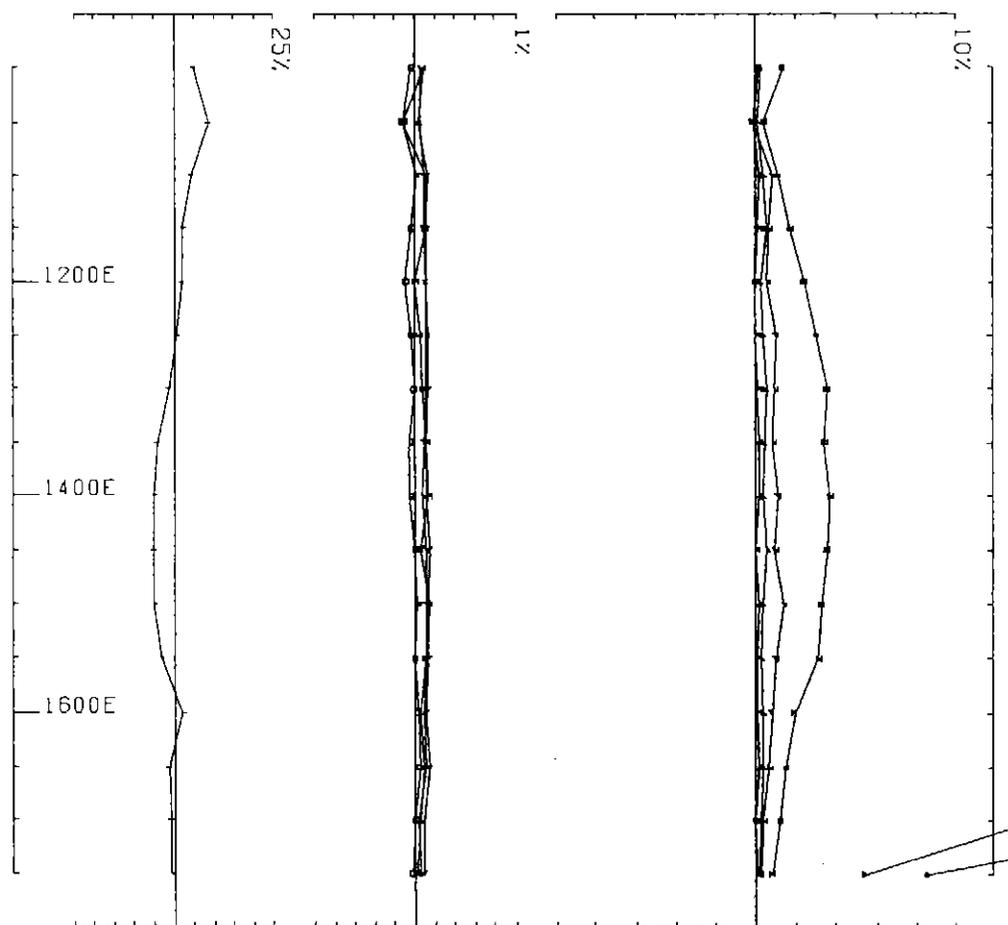
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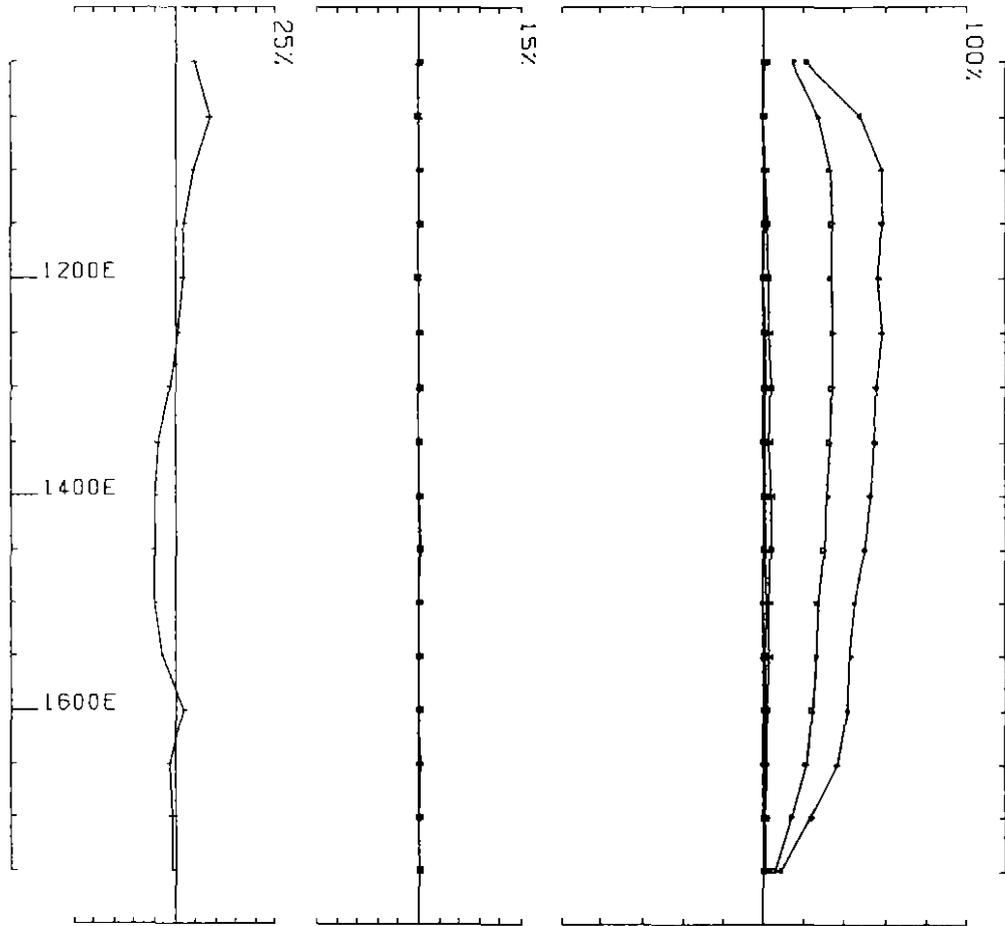
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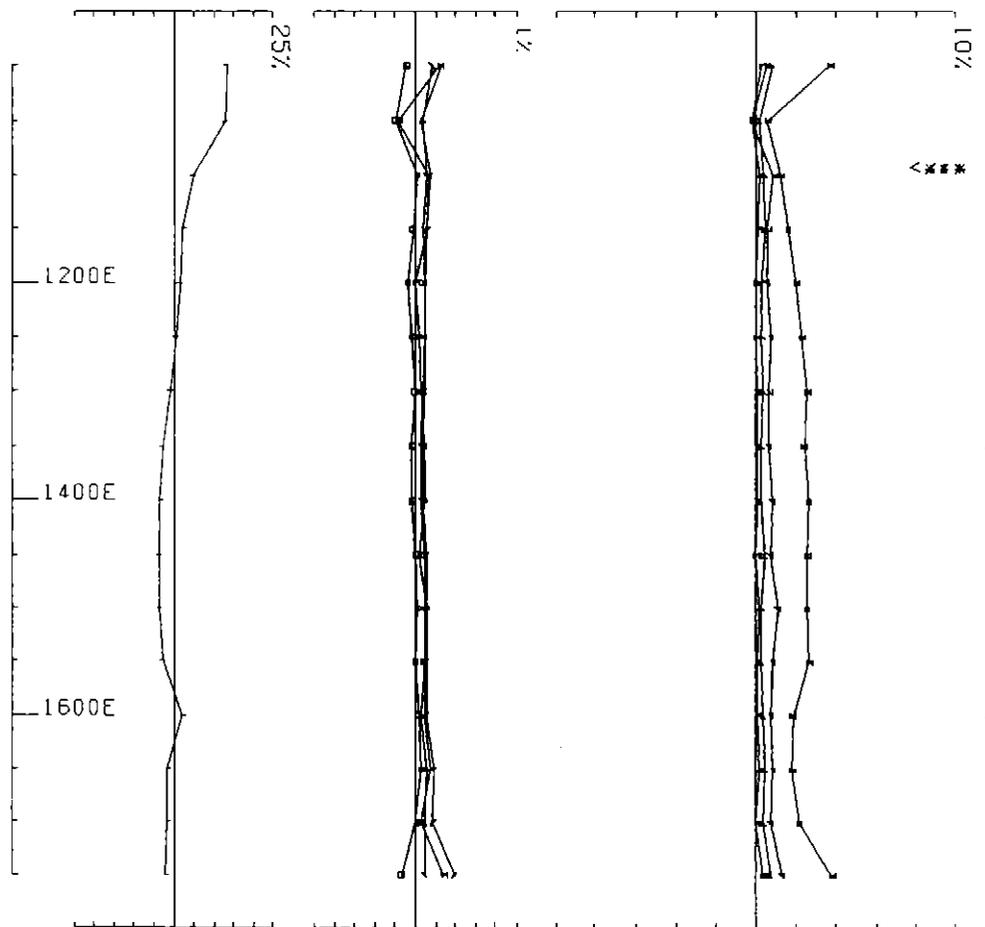
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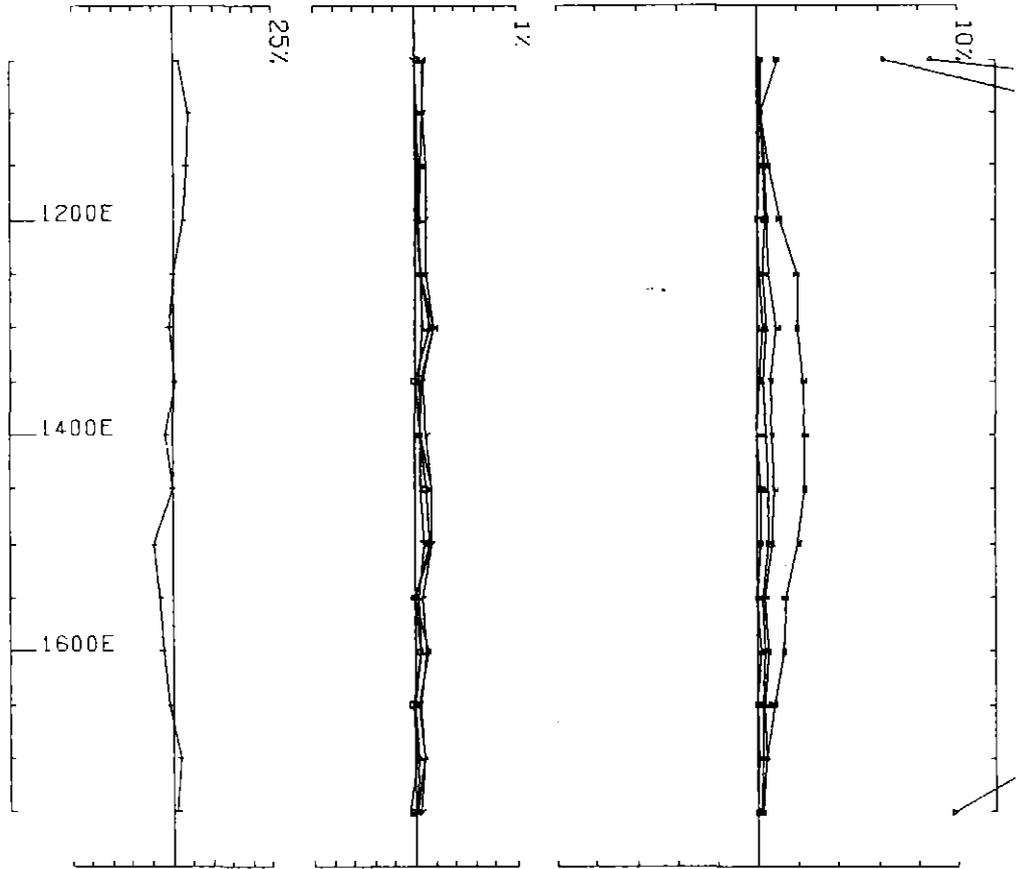
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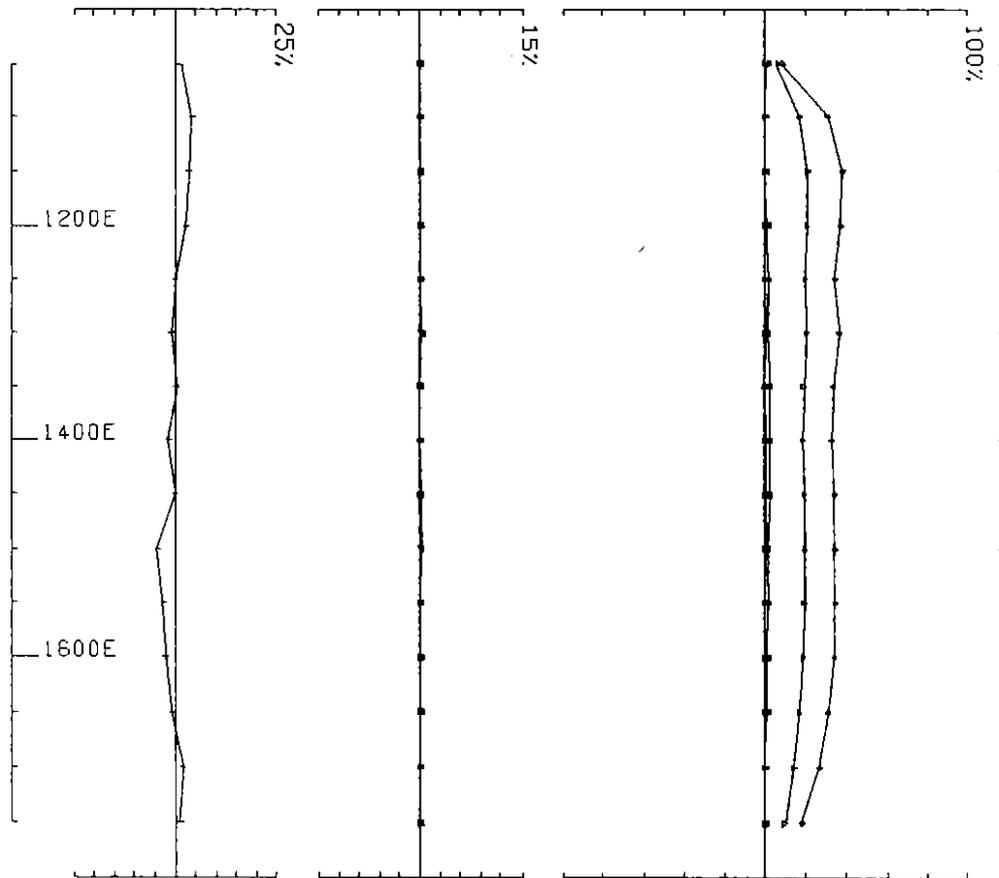
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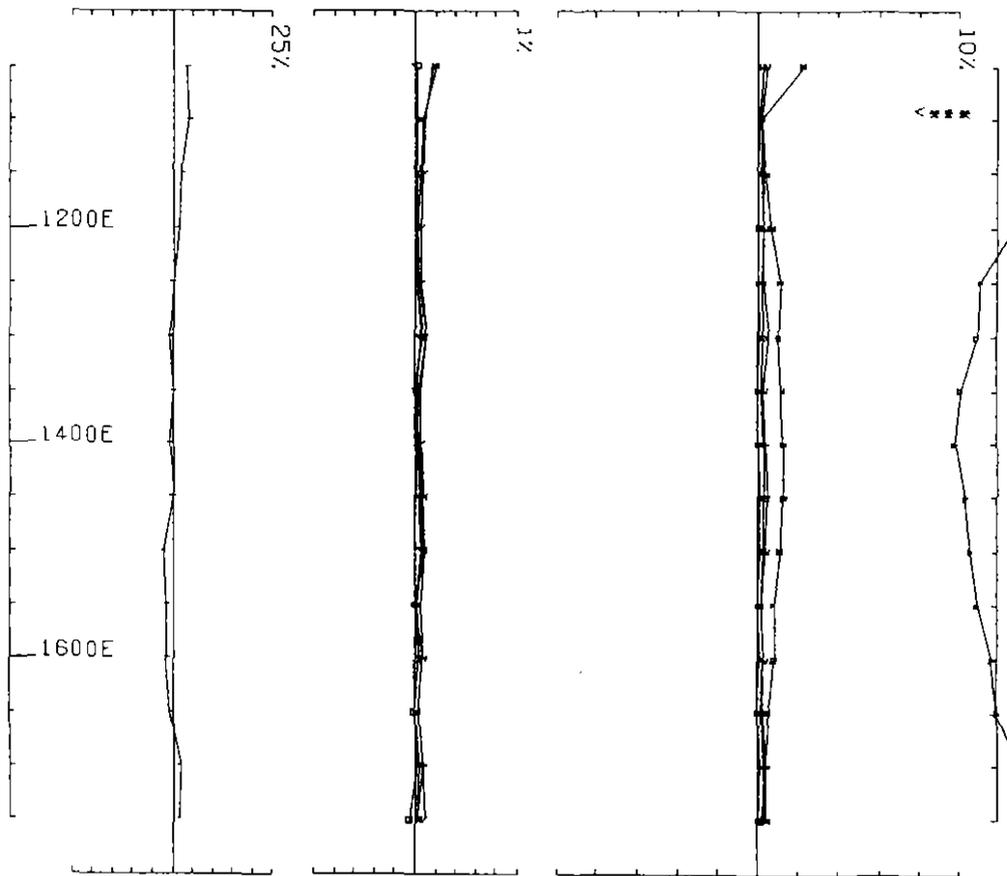
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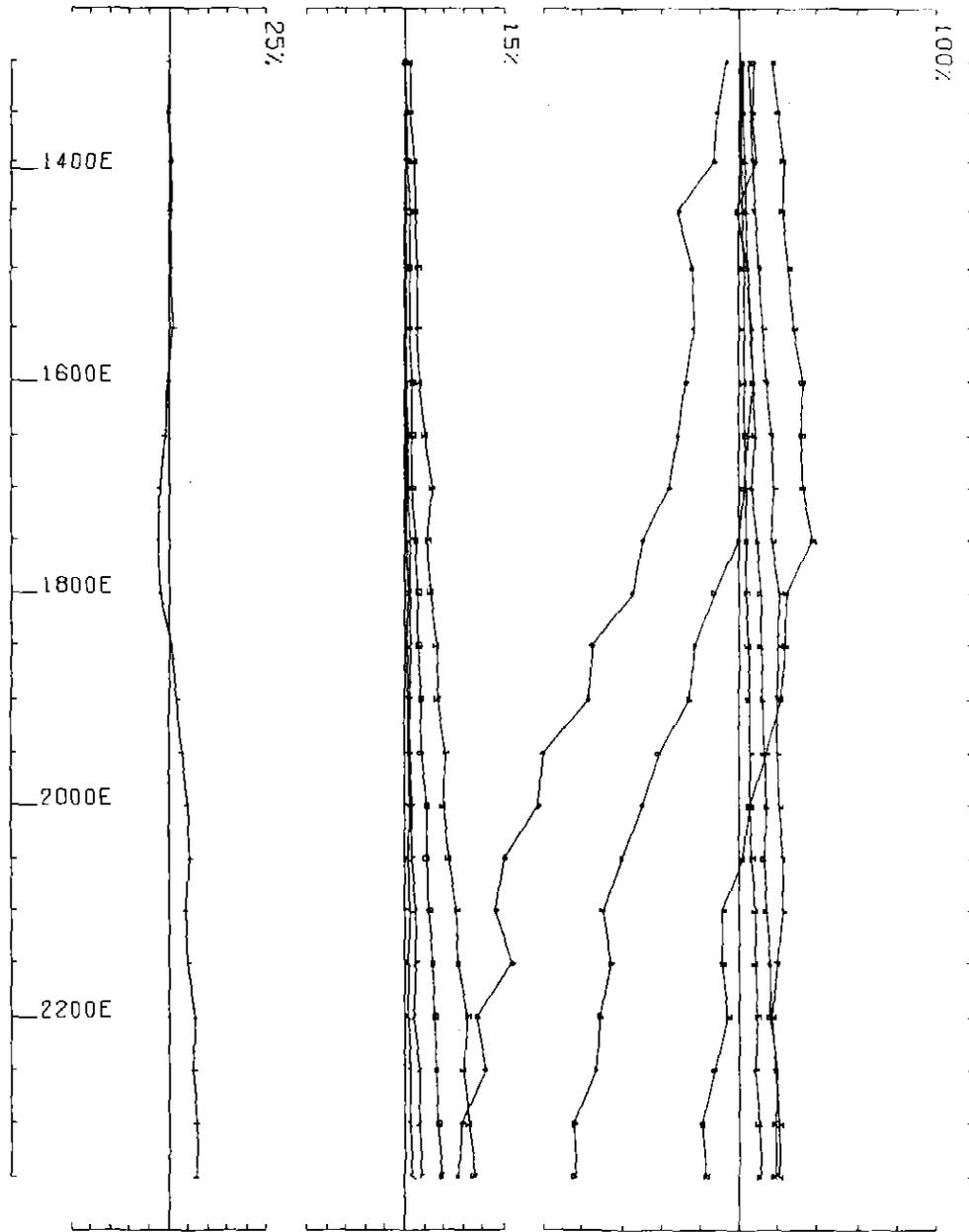
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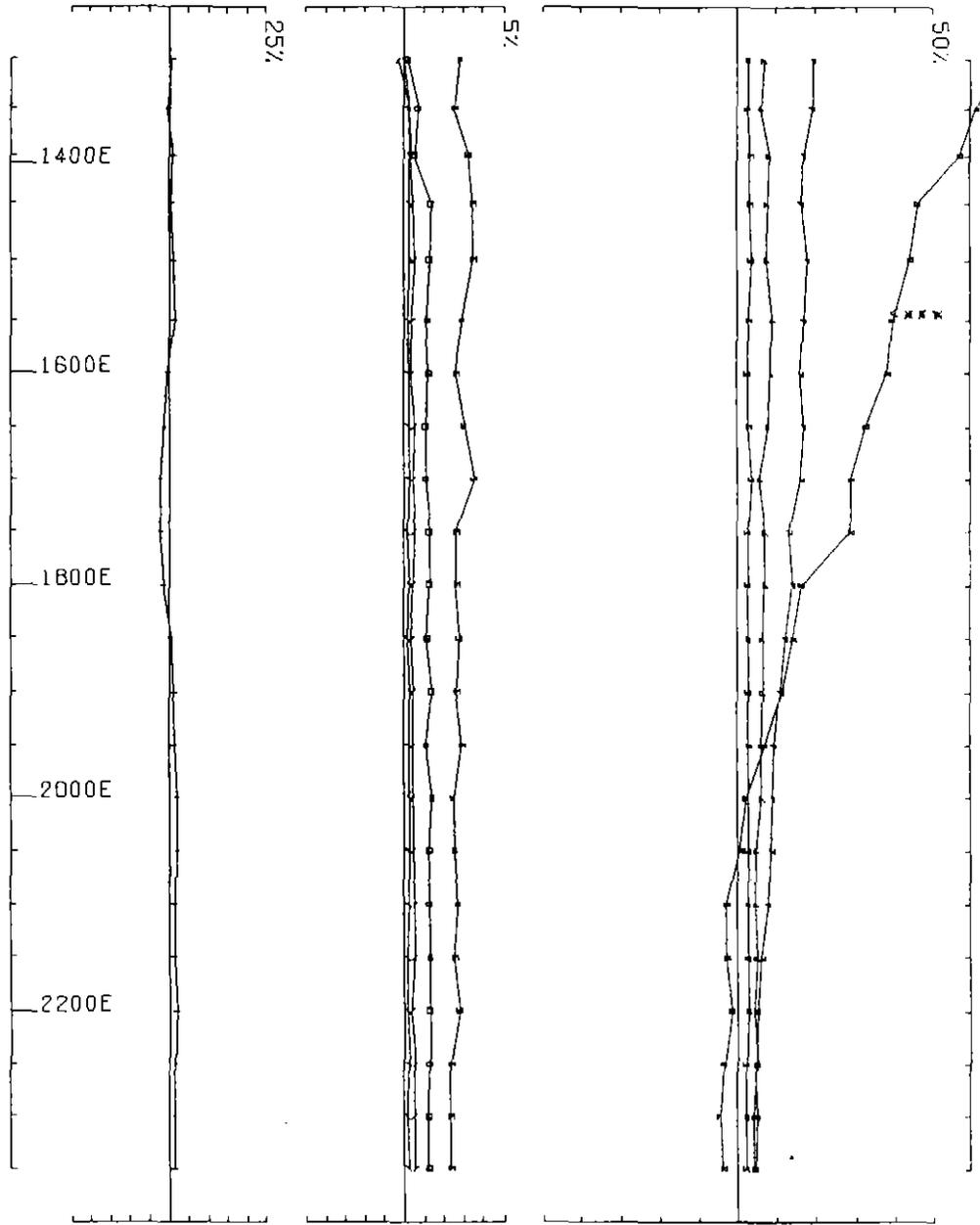
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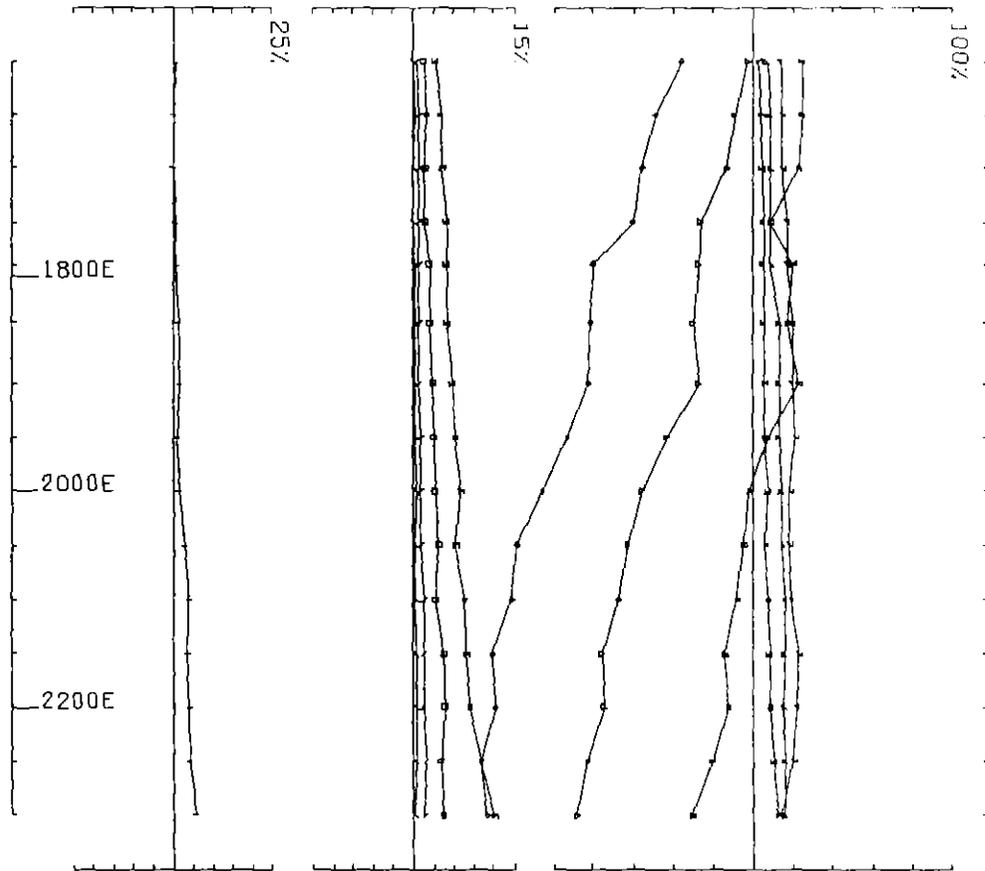
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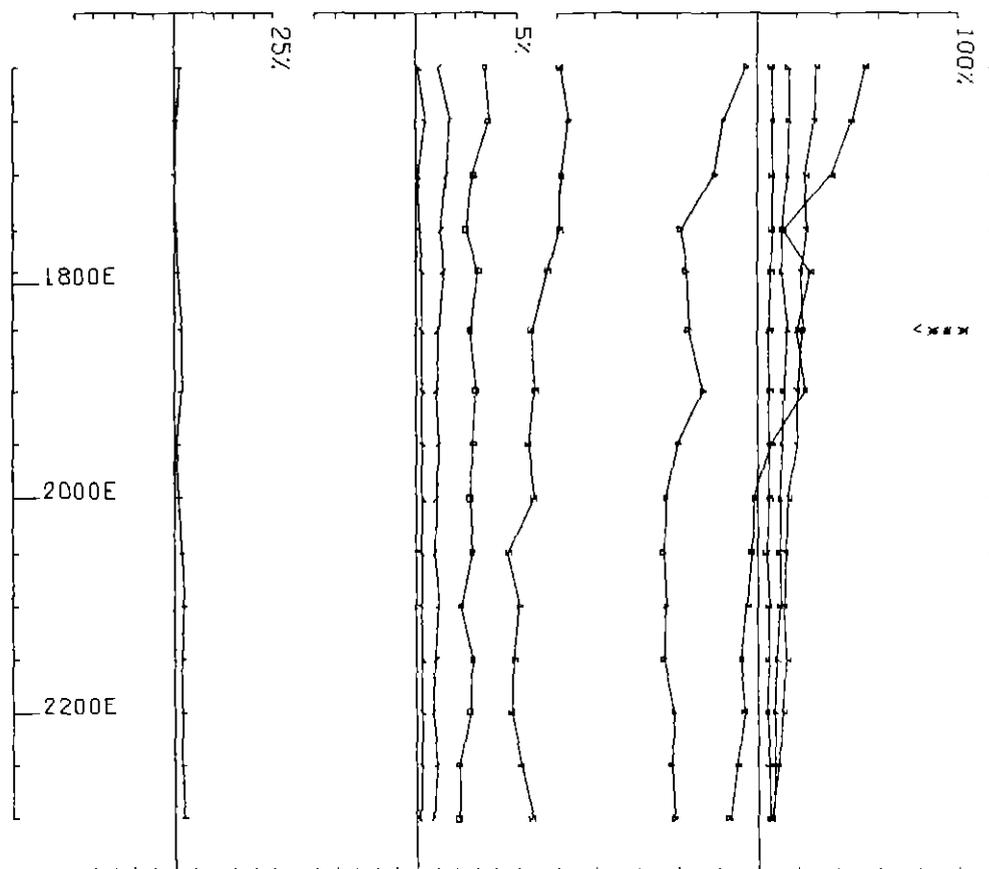
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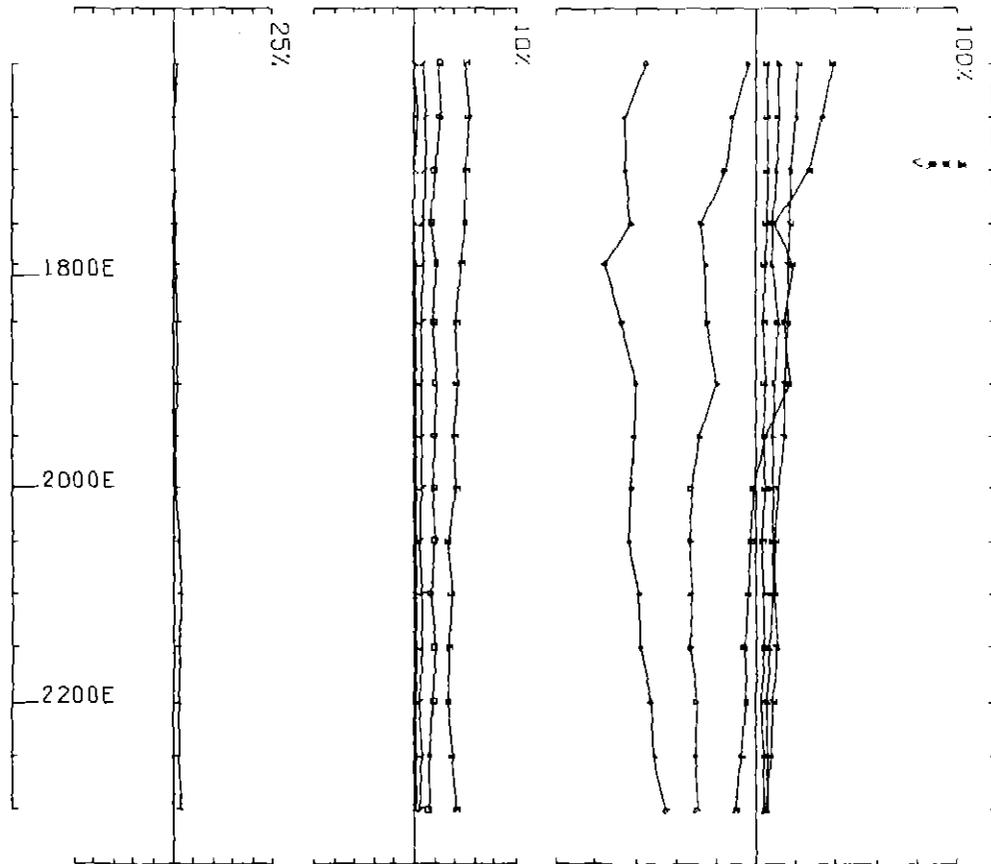
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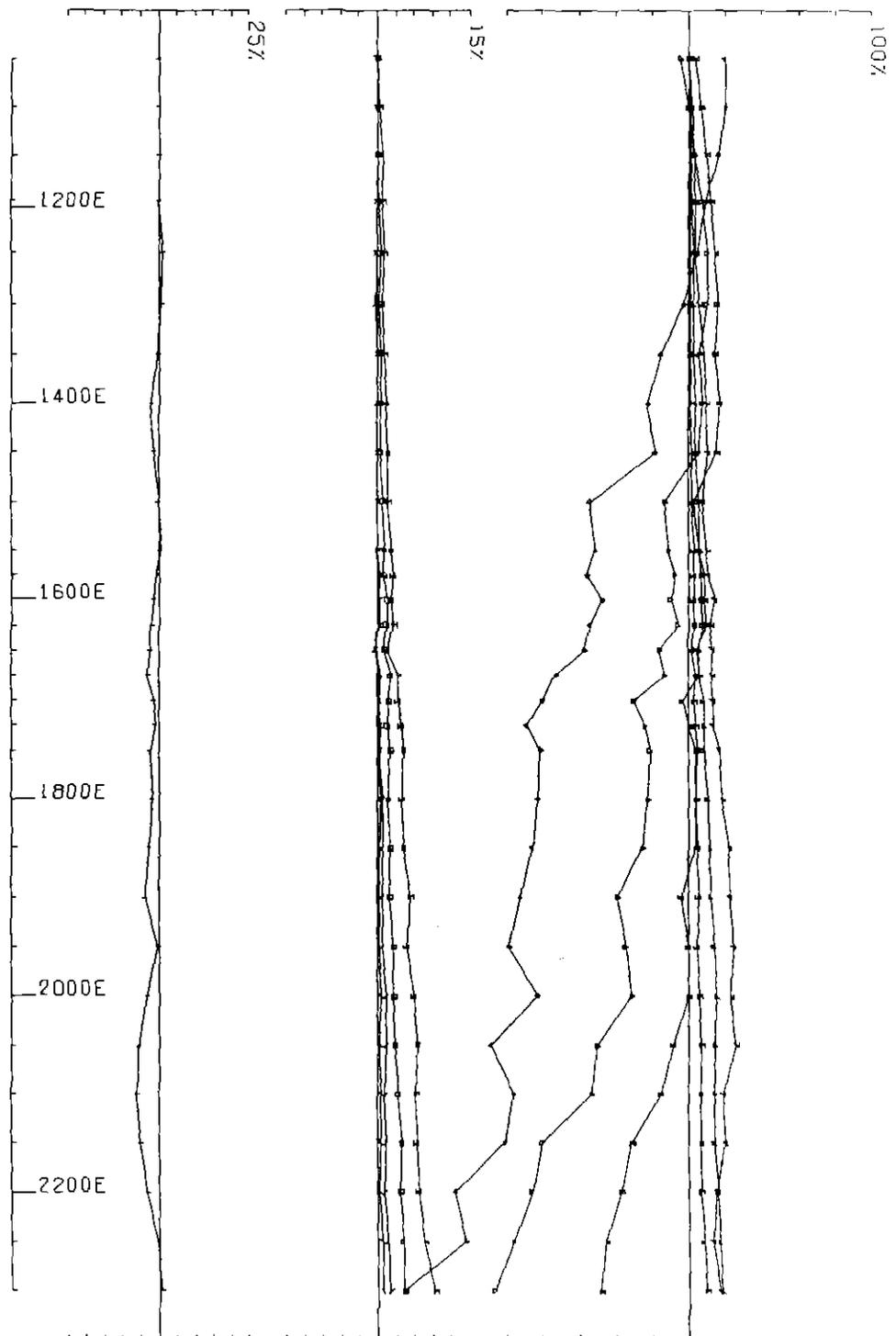
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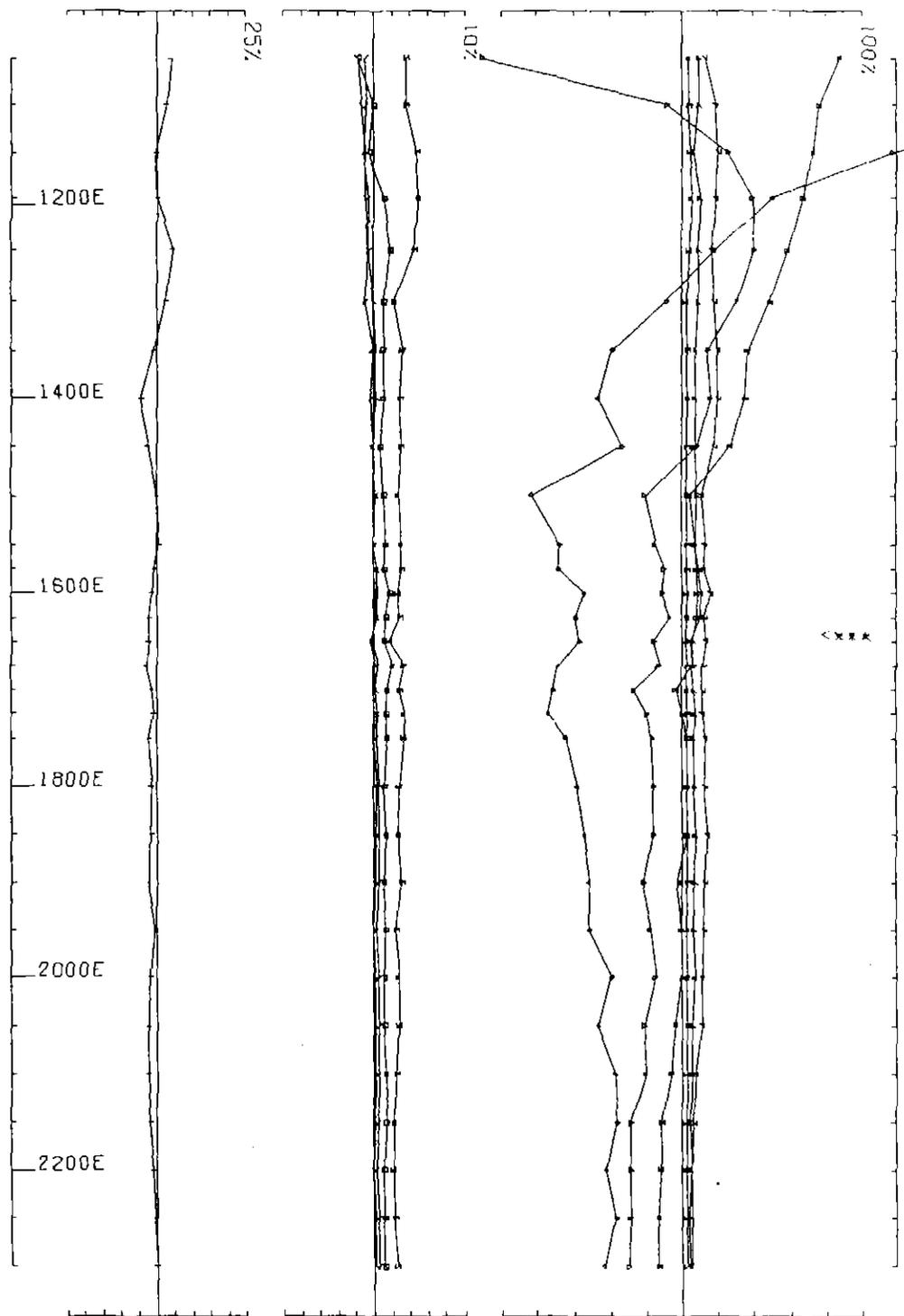
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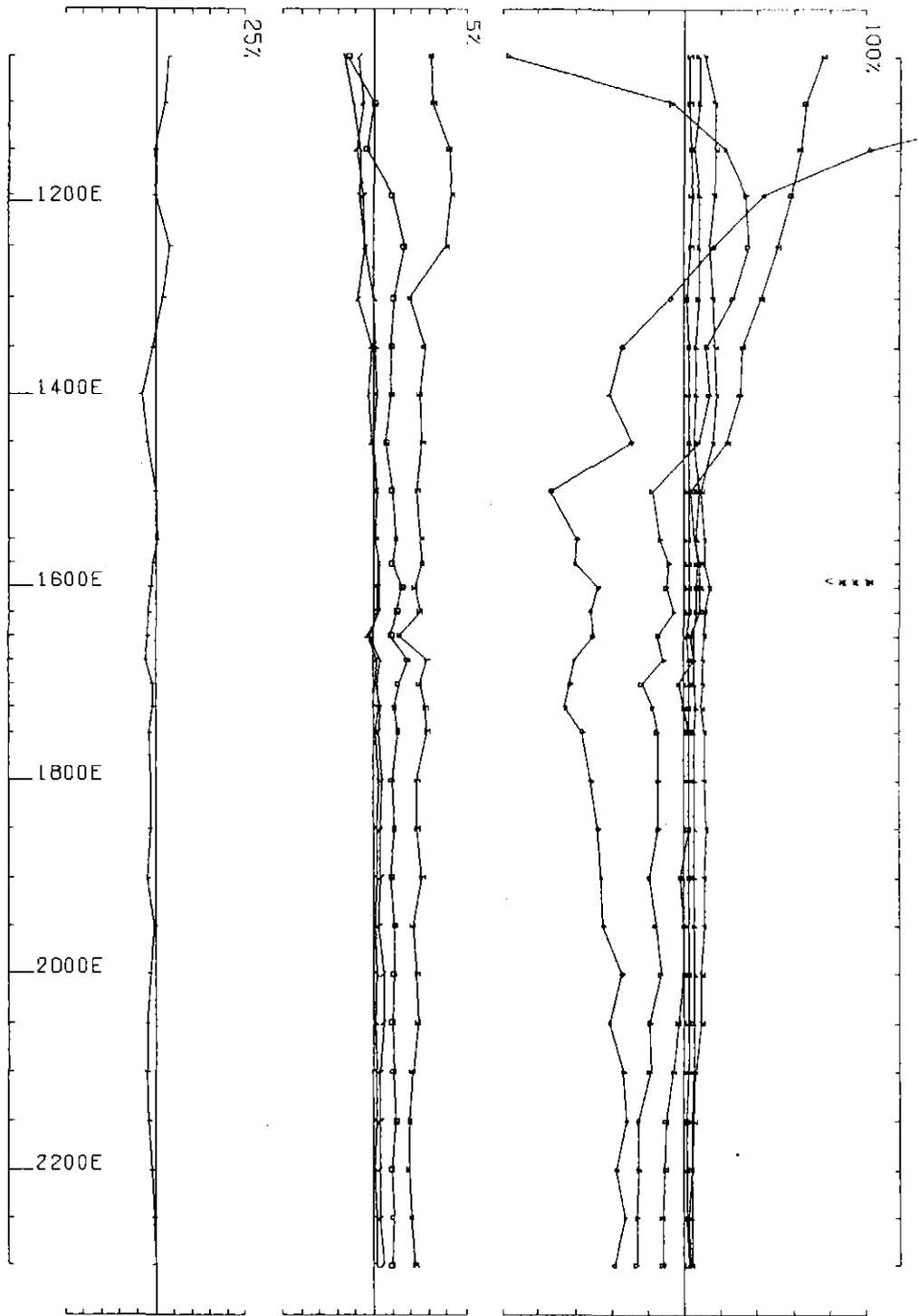
UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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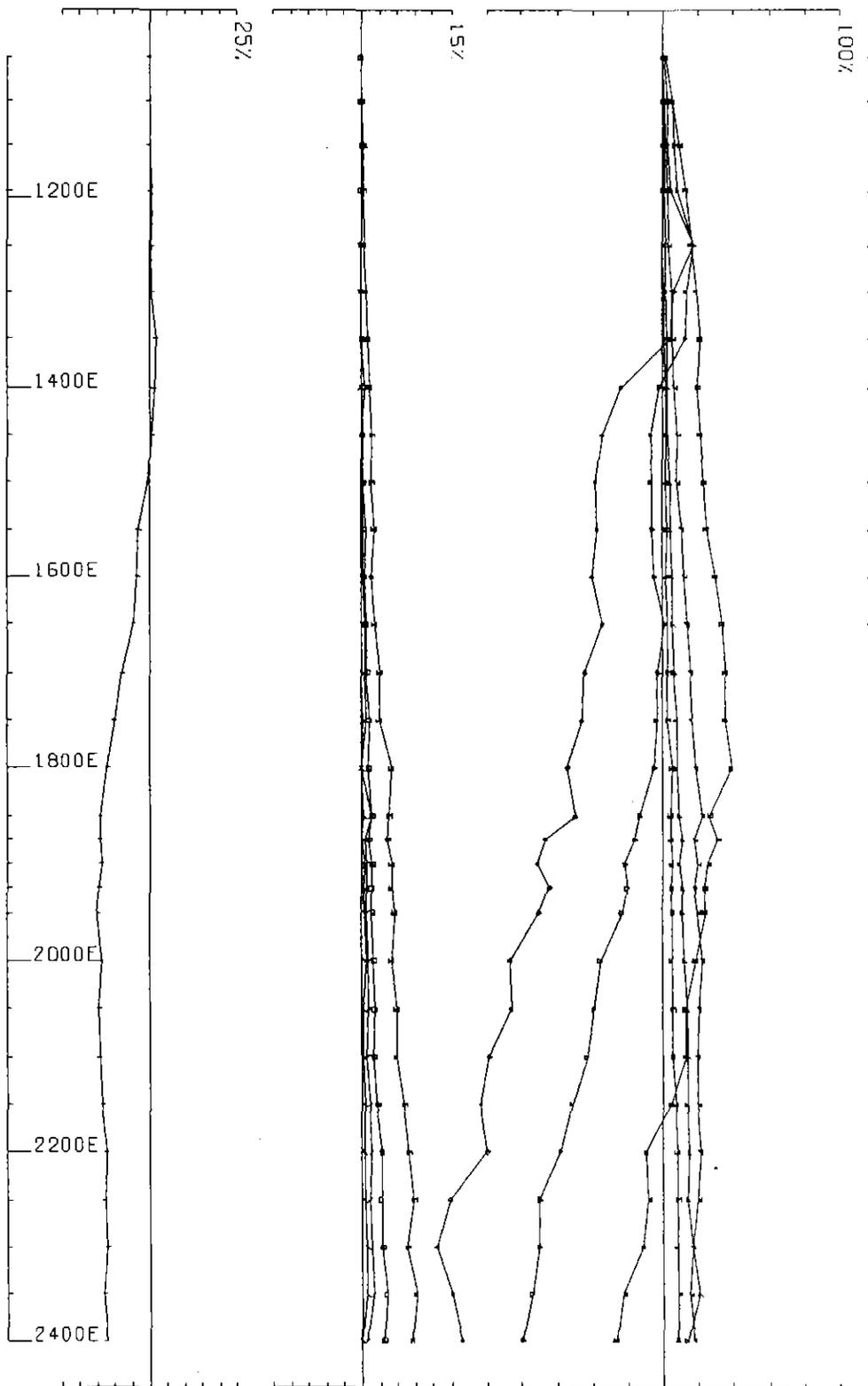
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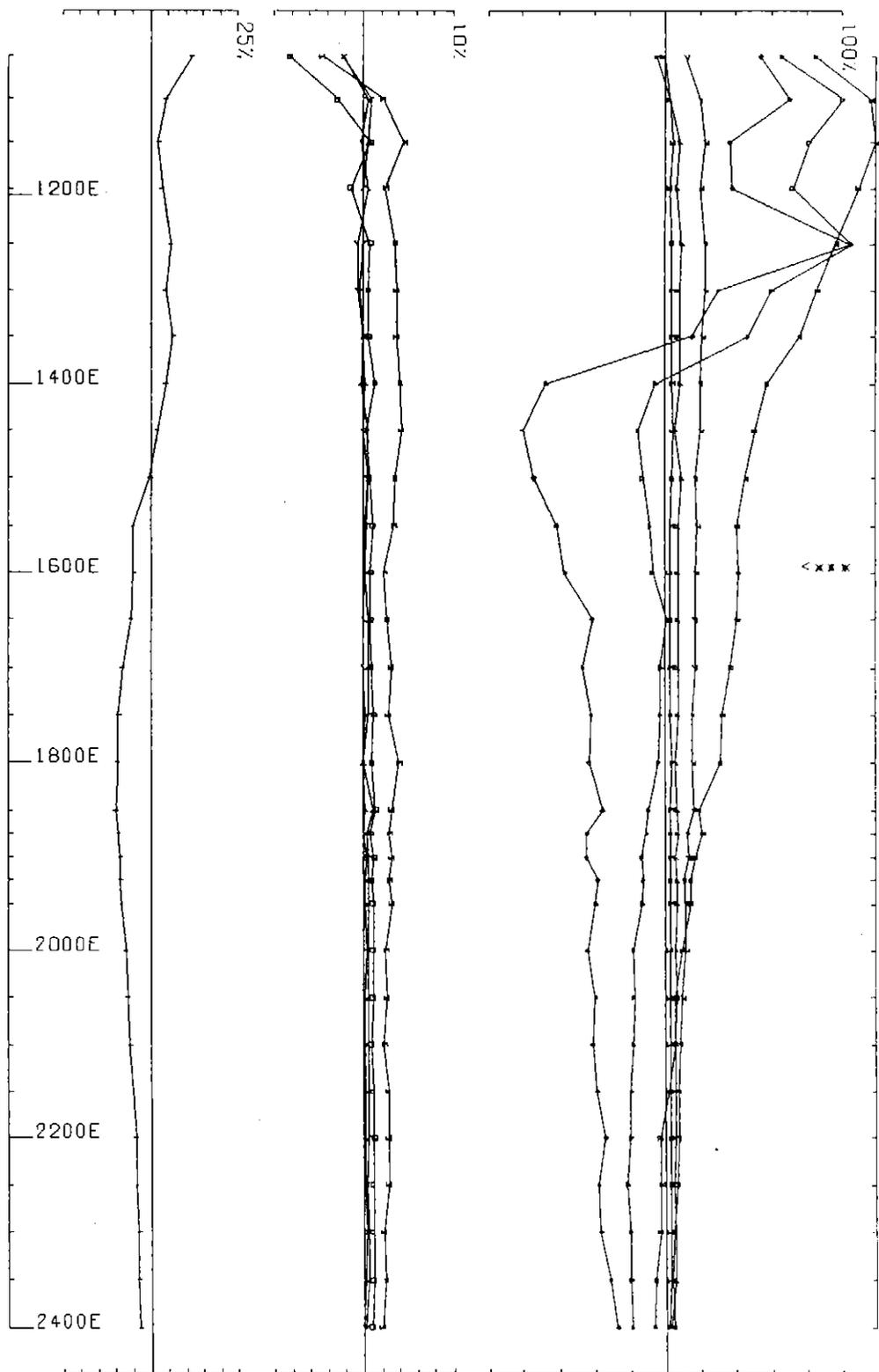
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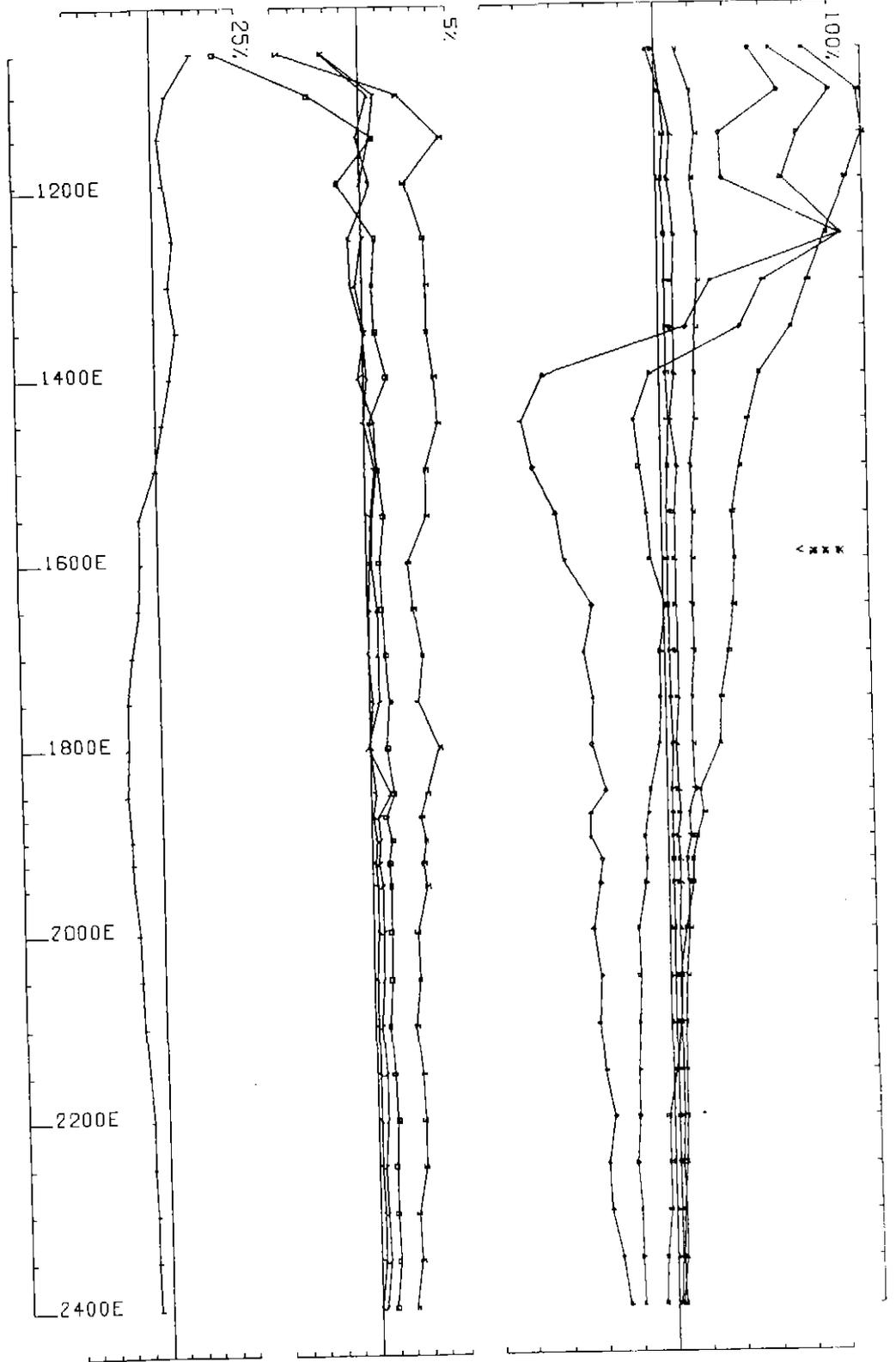
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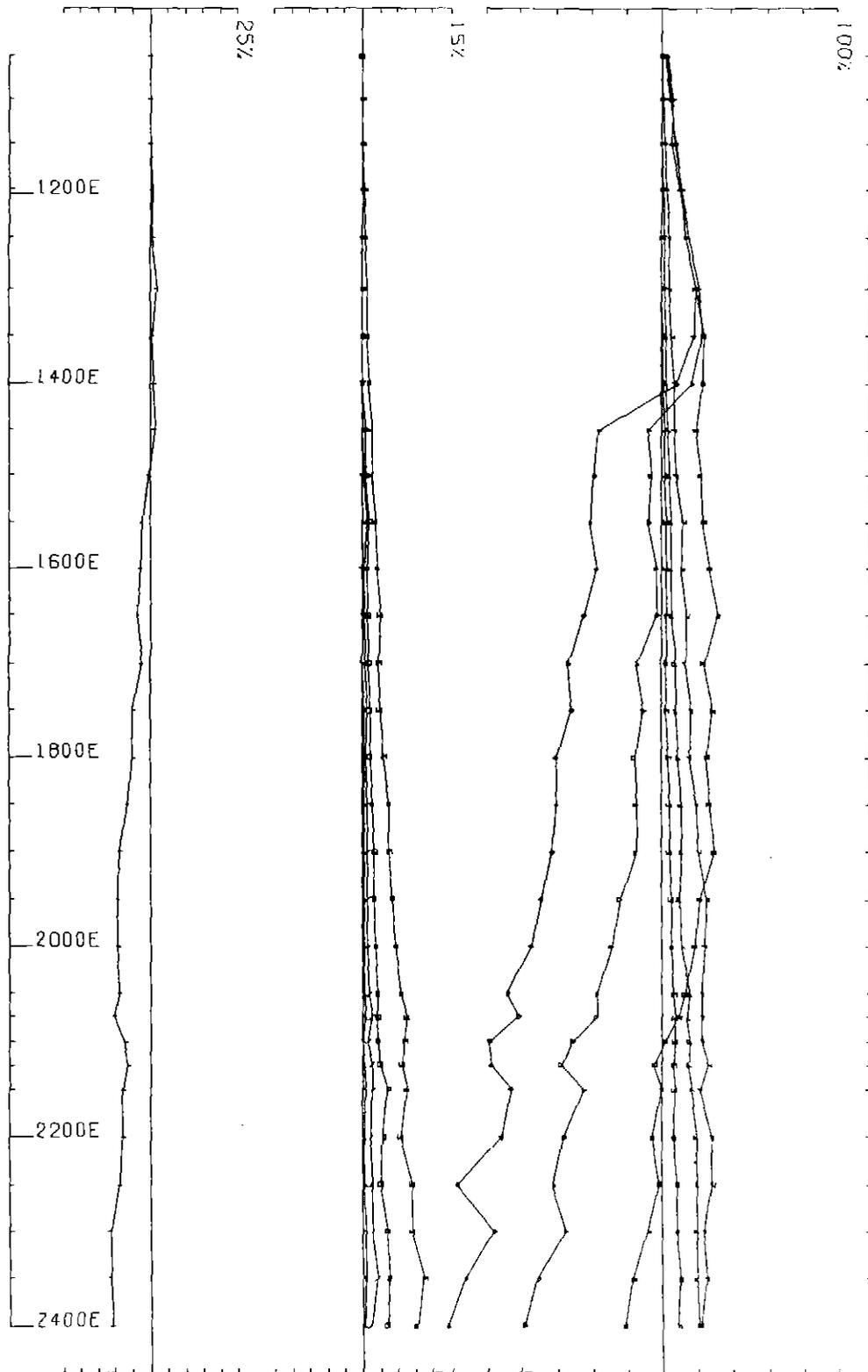
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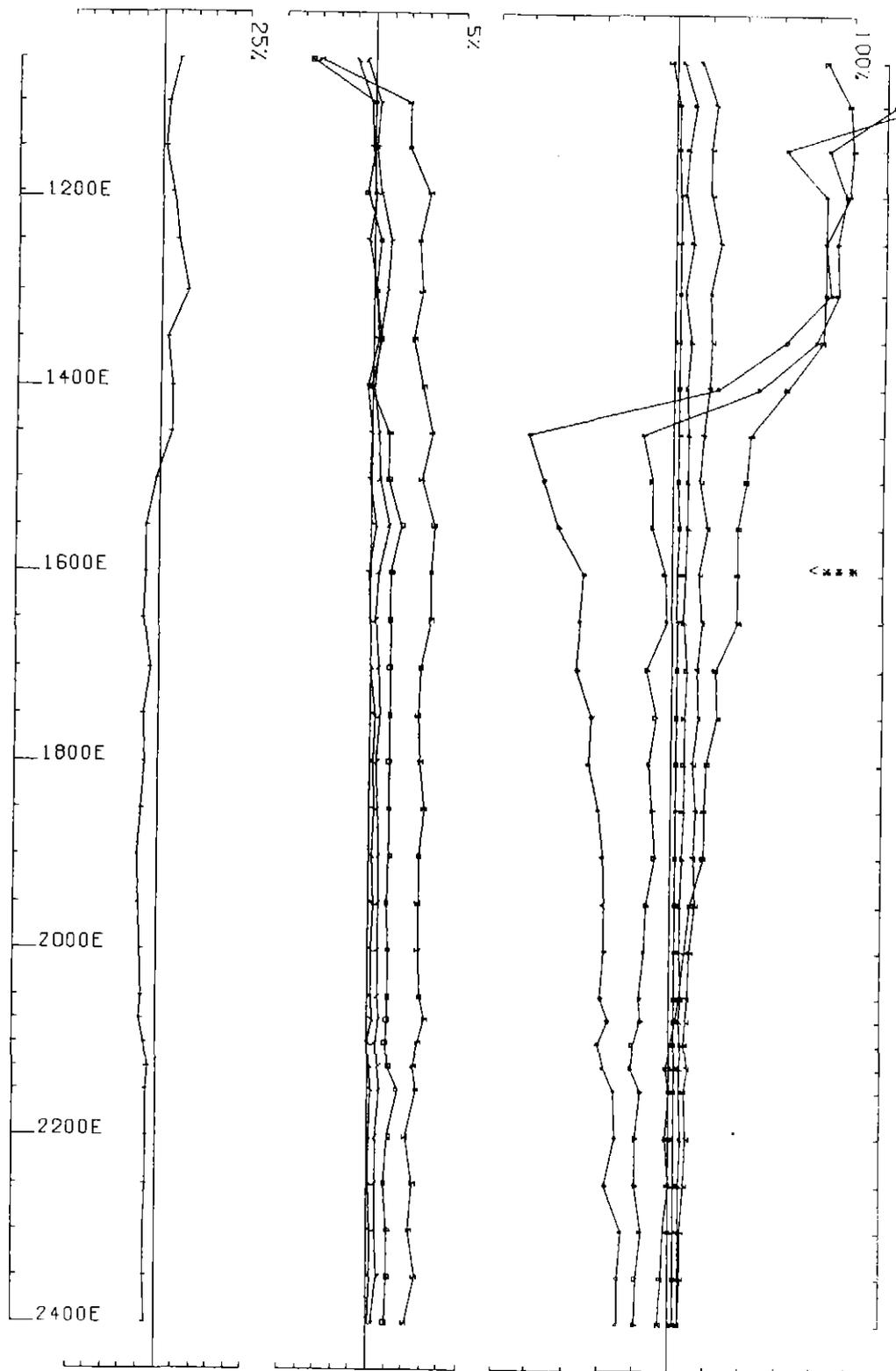
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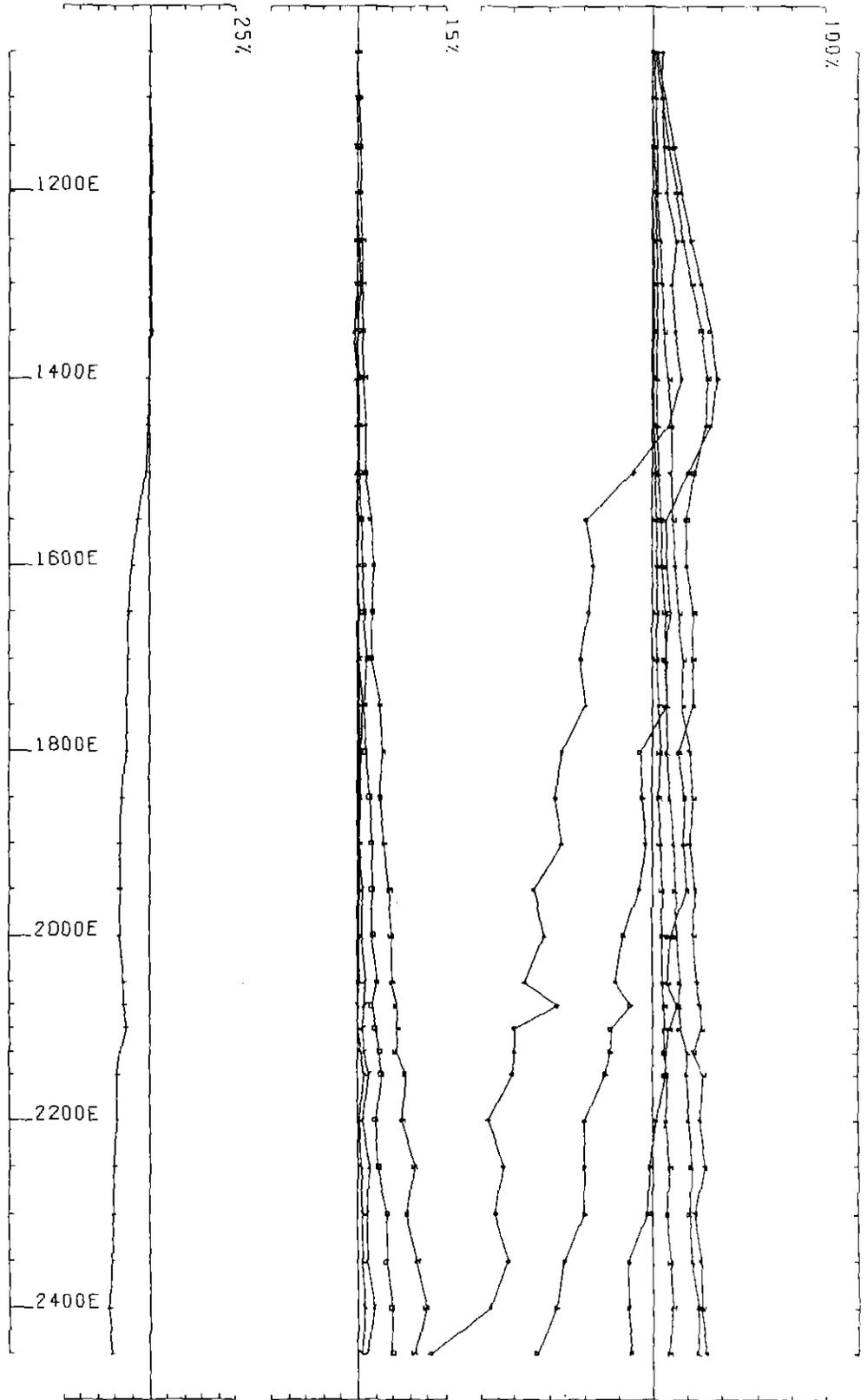
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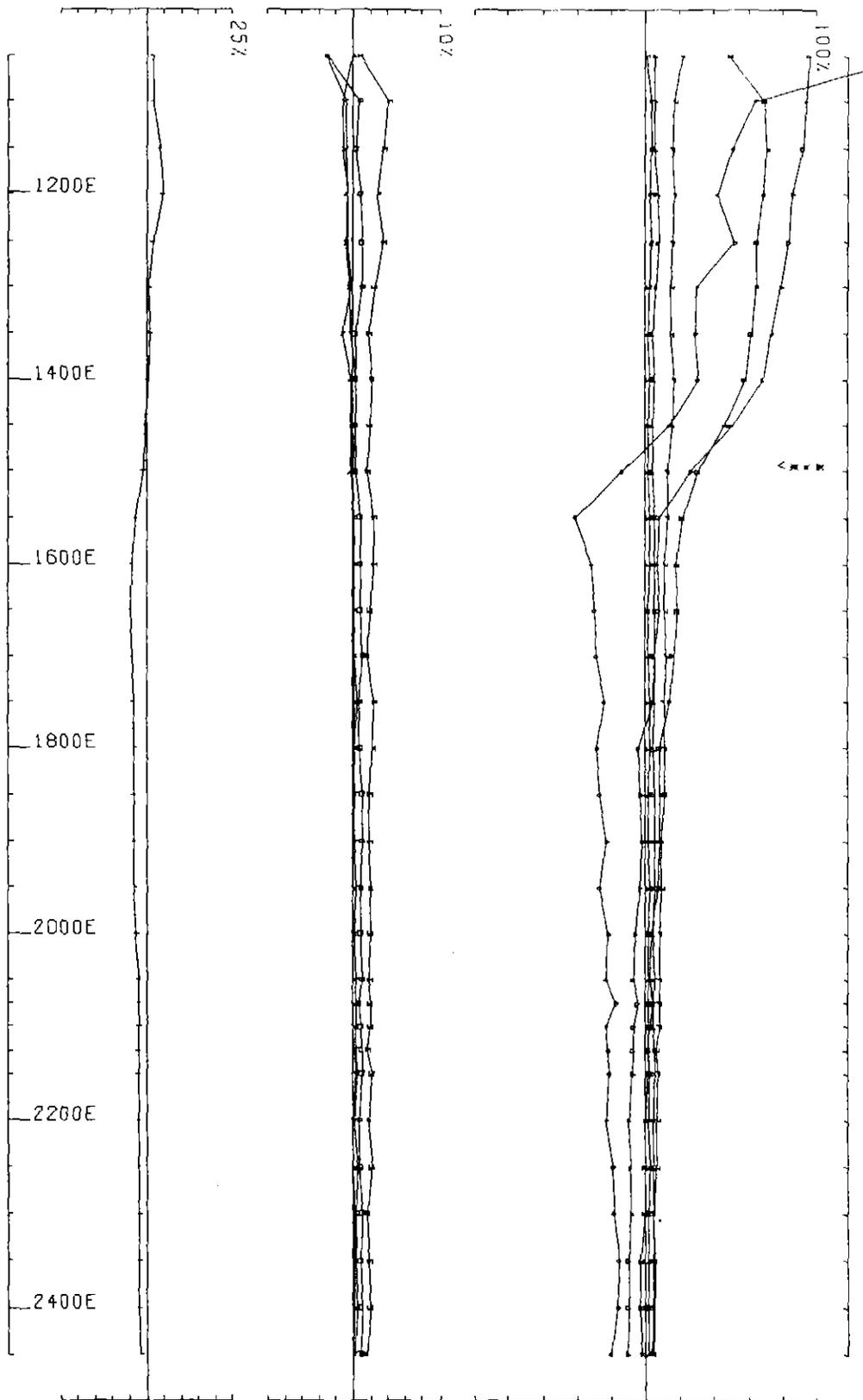
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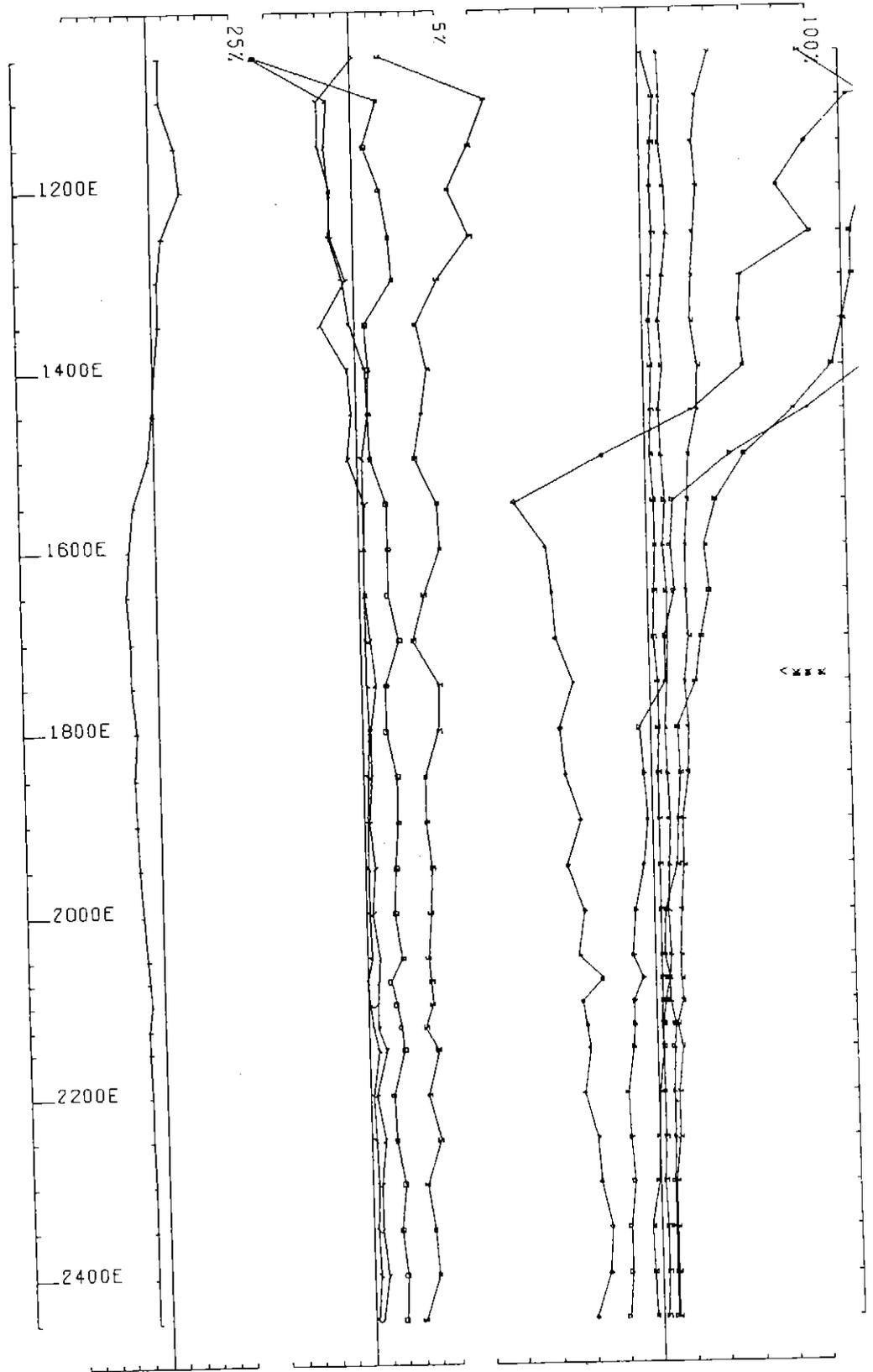
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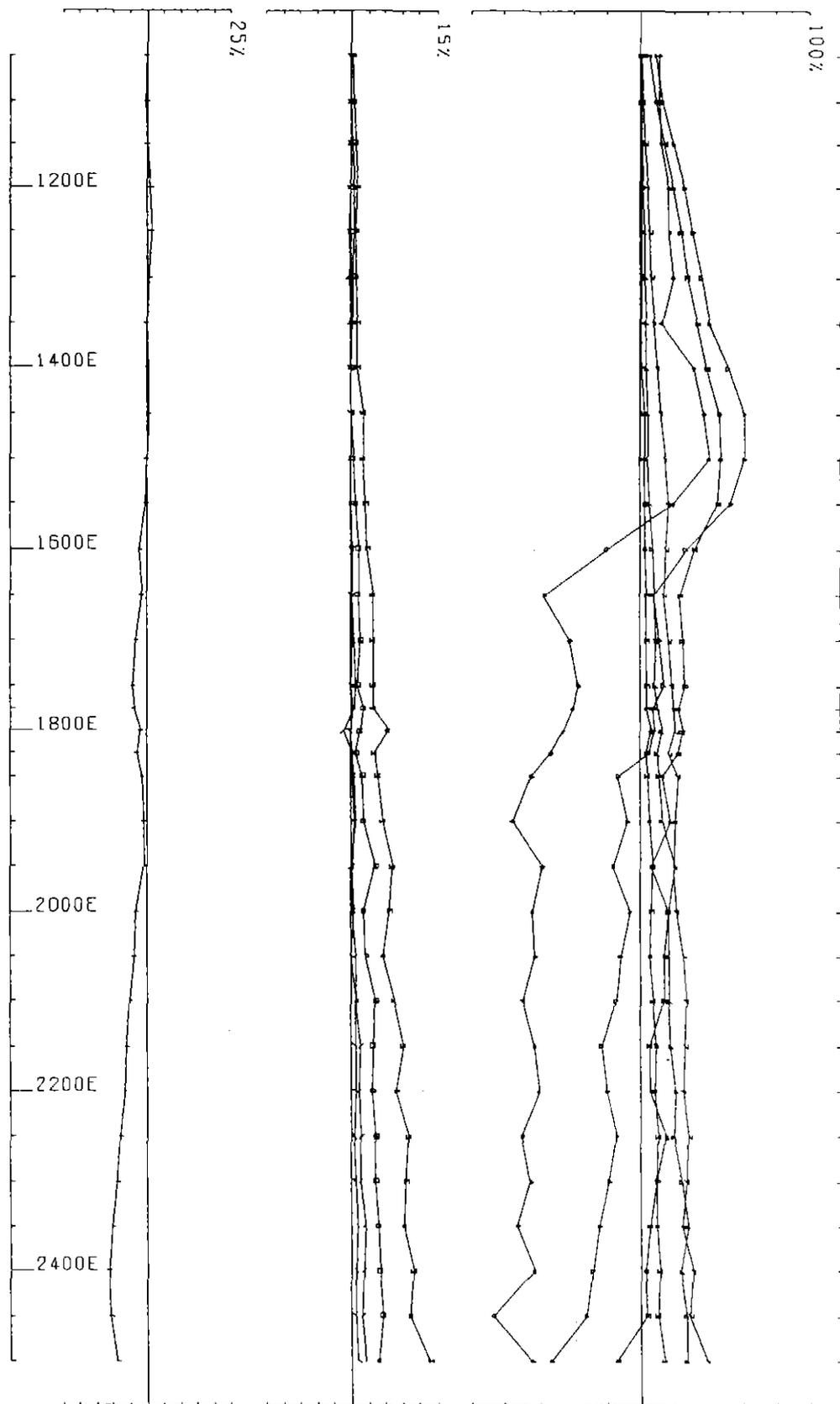
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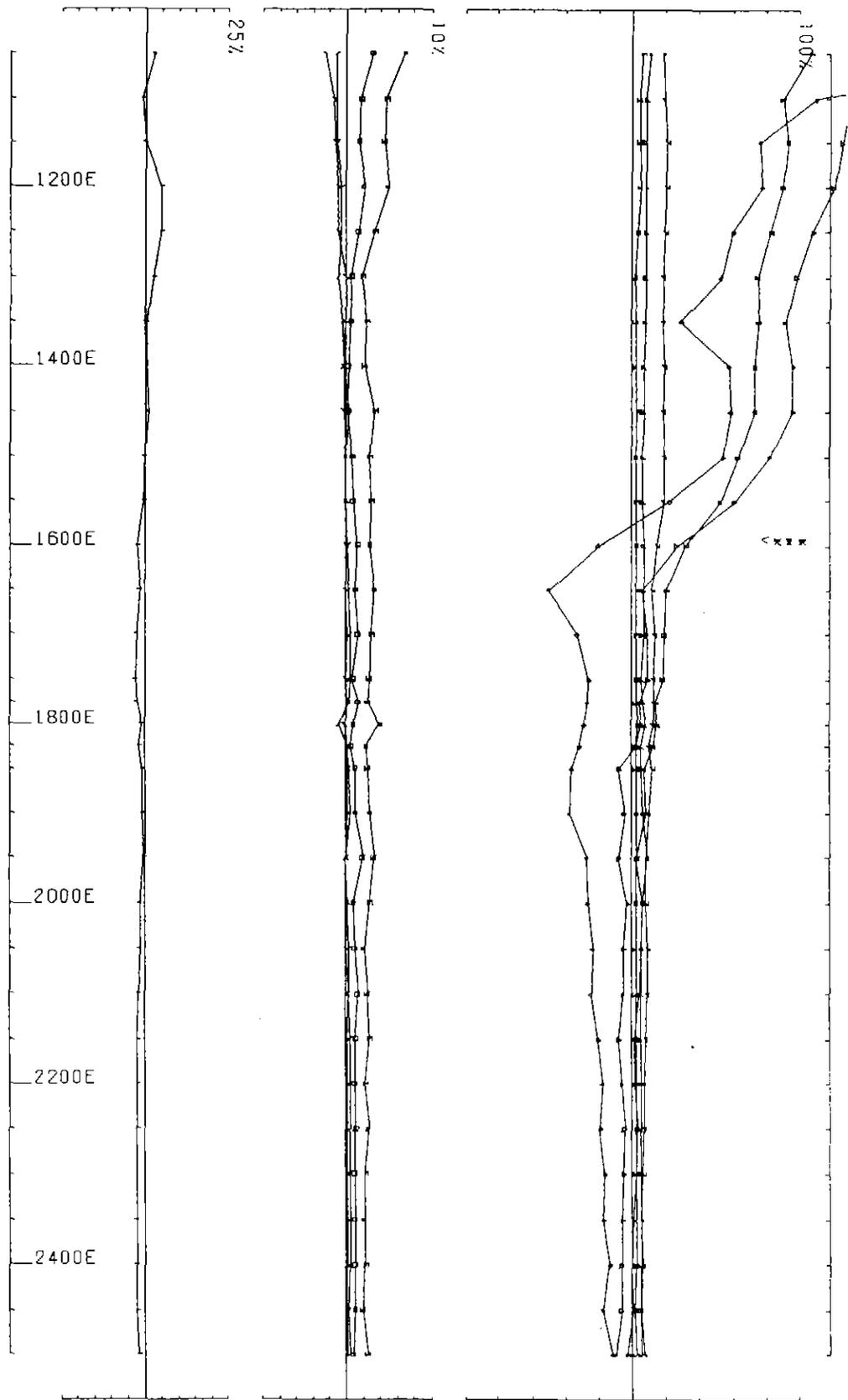
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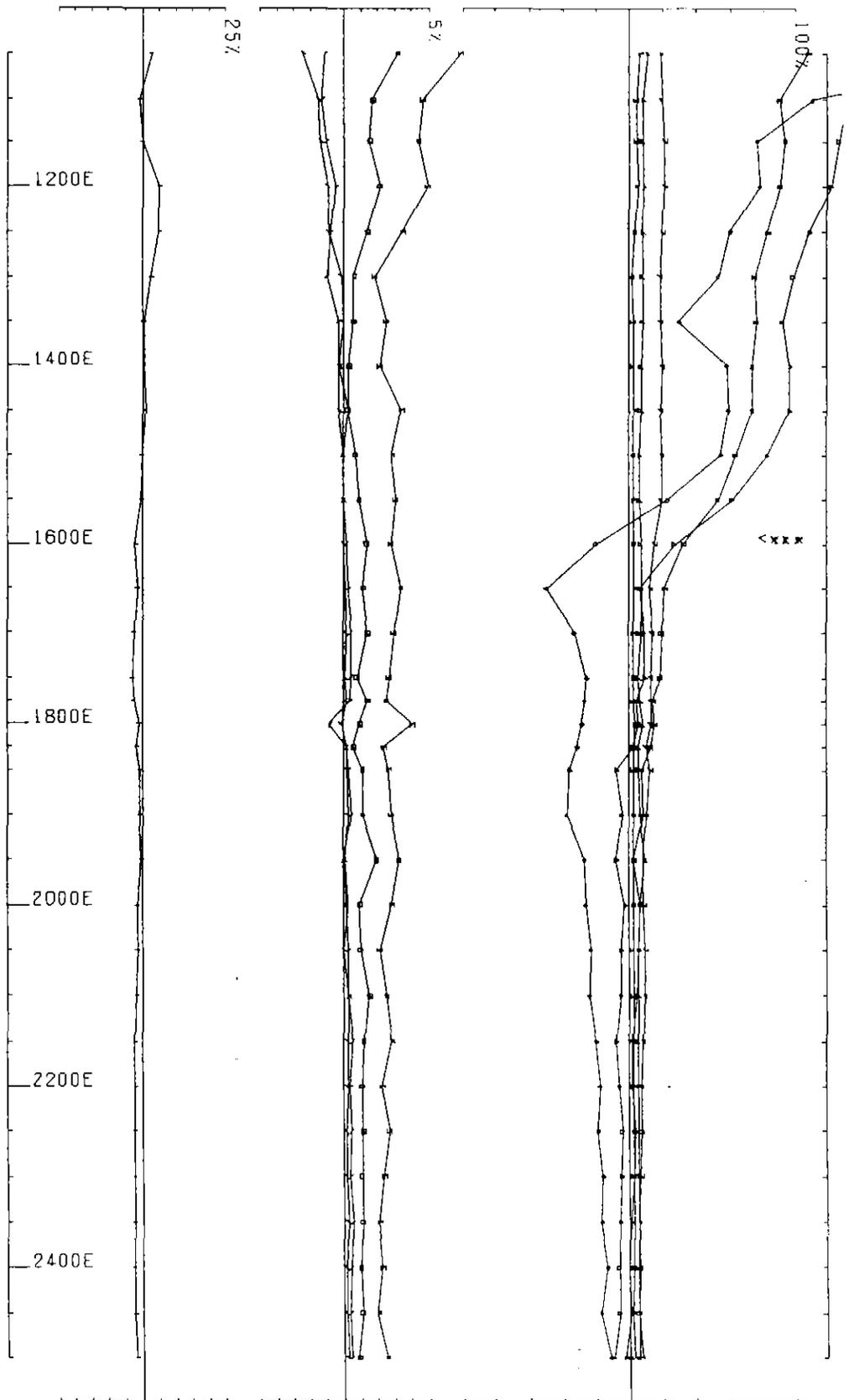
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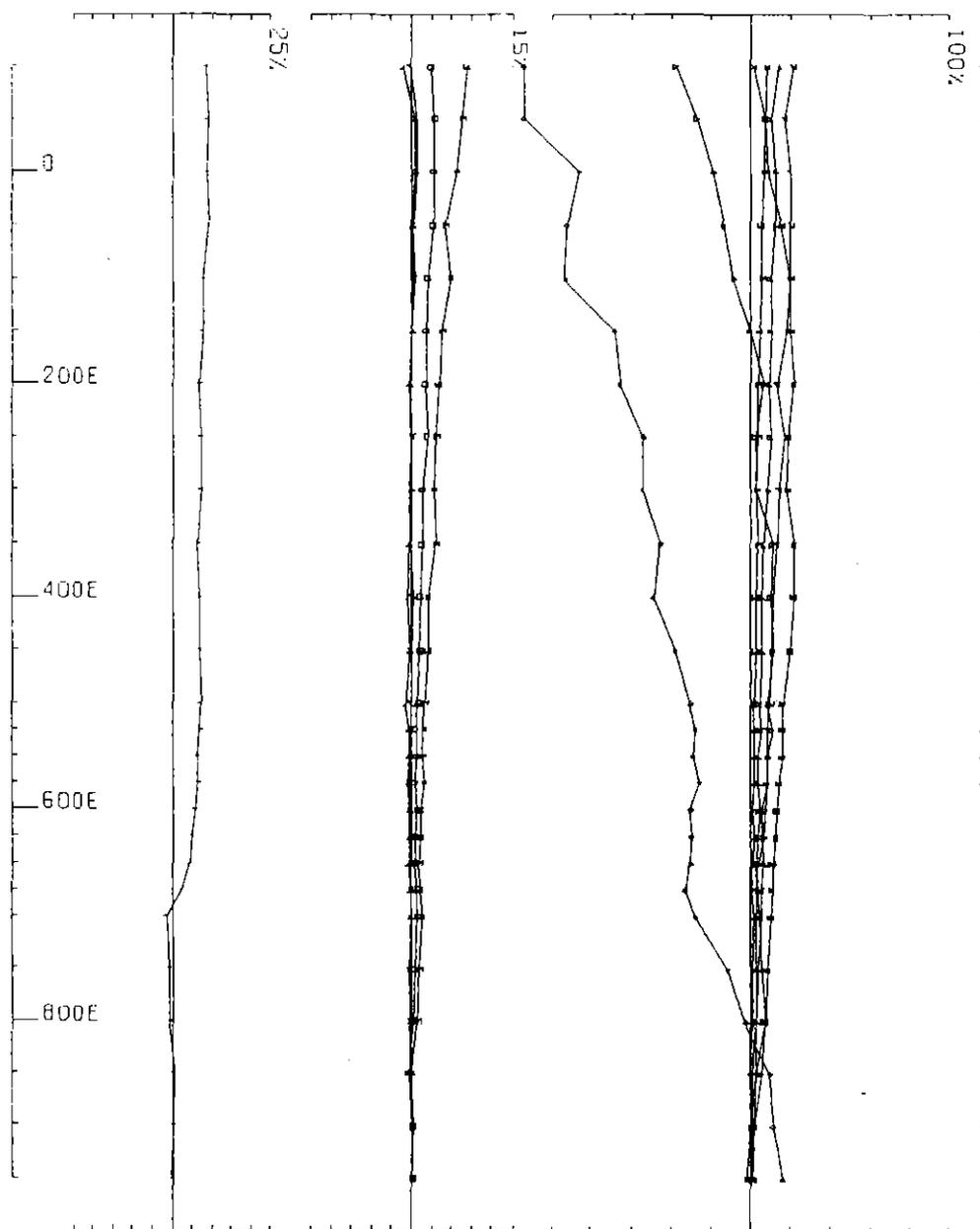
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UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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LOOP NO 16 LINE 22200 N COMPONENT HZ SECONDARY FIELD CHI POINT NORM.



UTEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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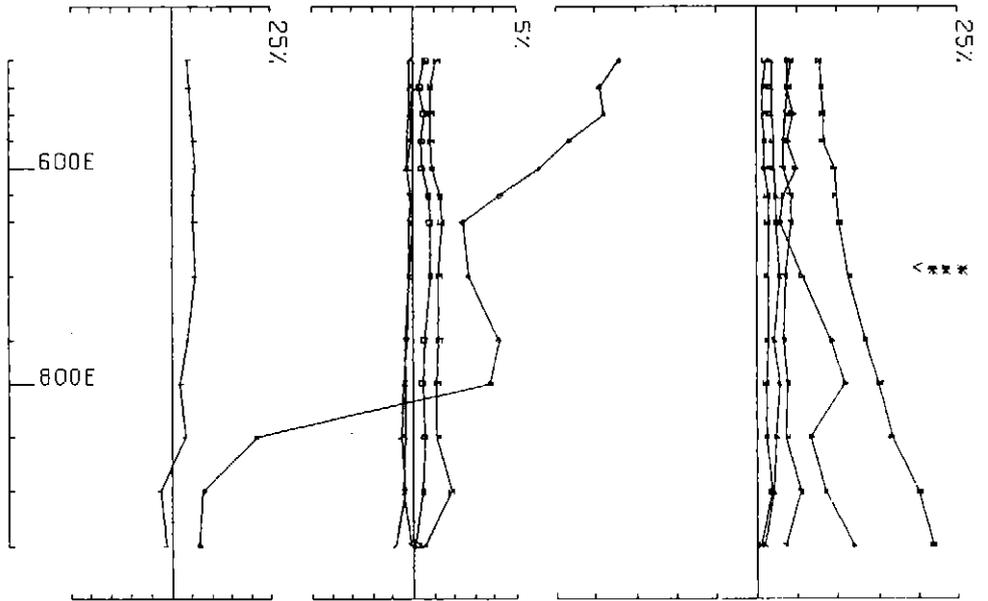


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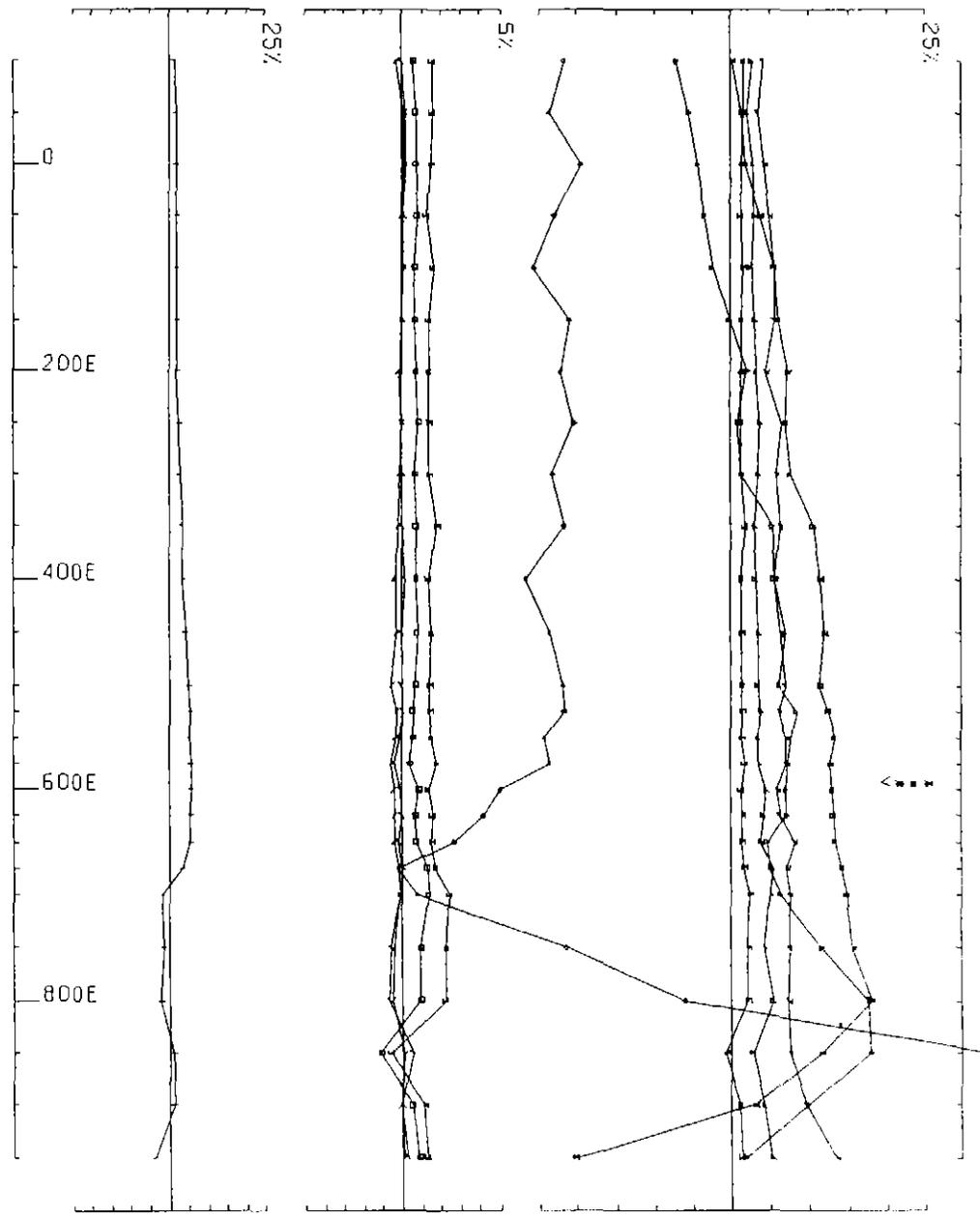
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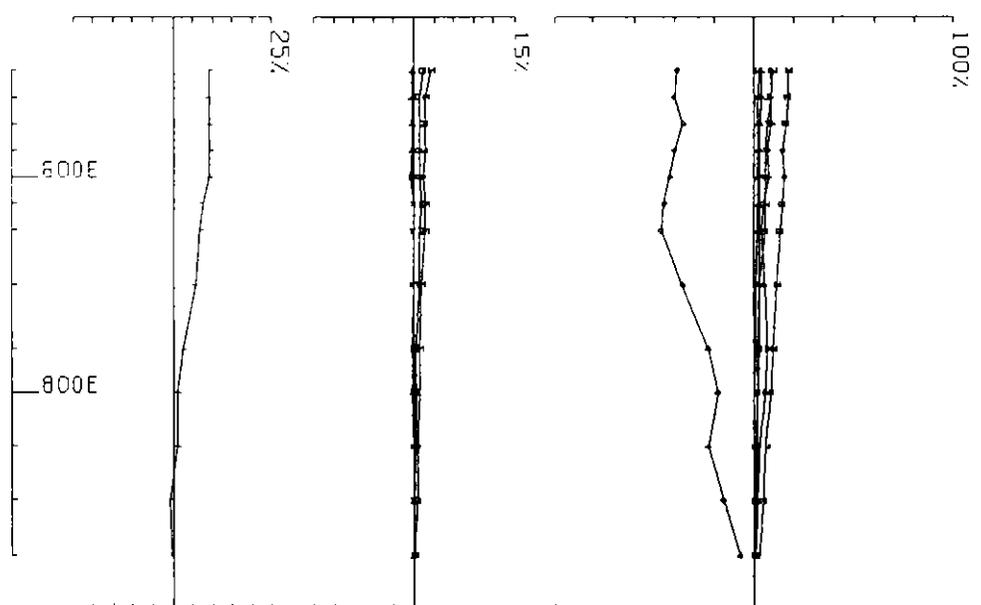
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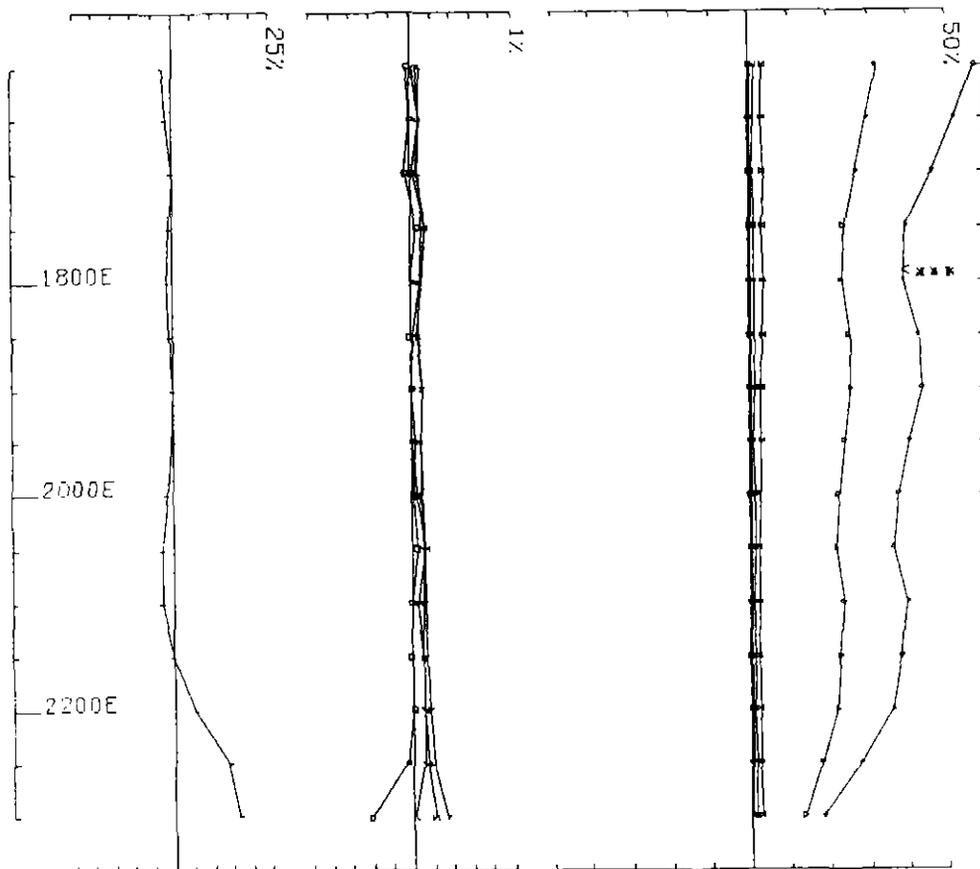
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UIEM SURVEY AT GARFIELD FOR BHP - UTAH NOVEMBER 1990
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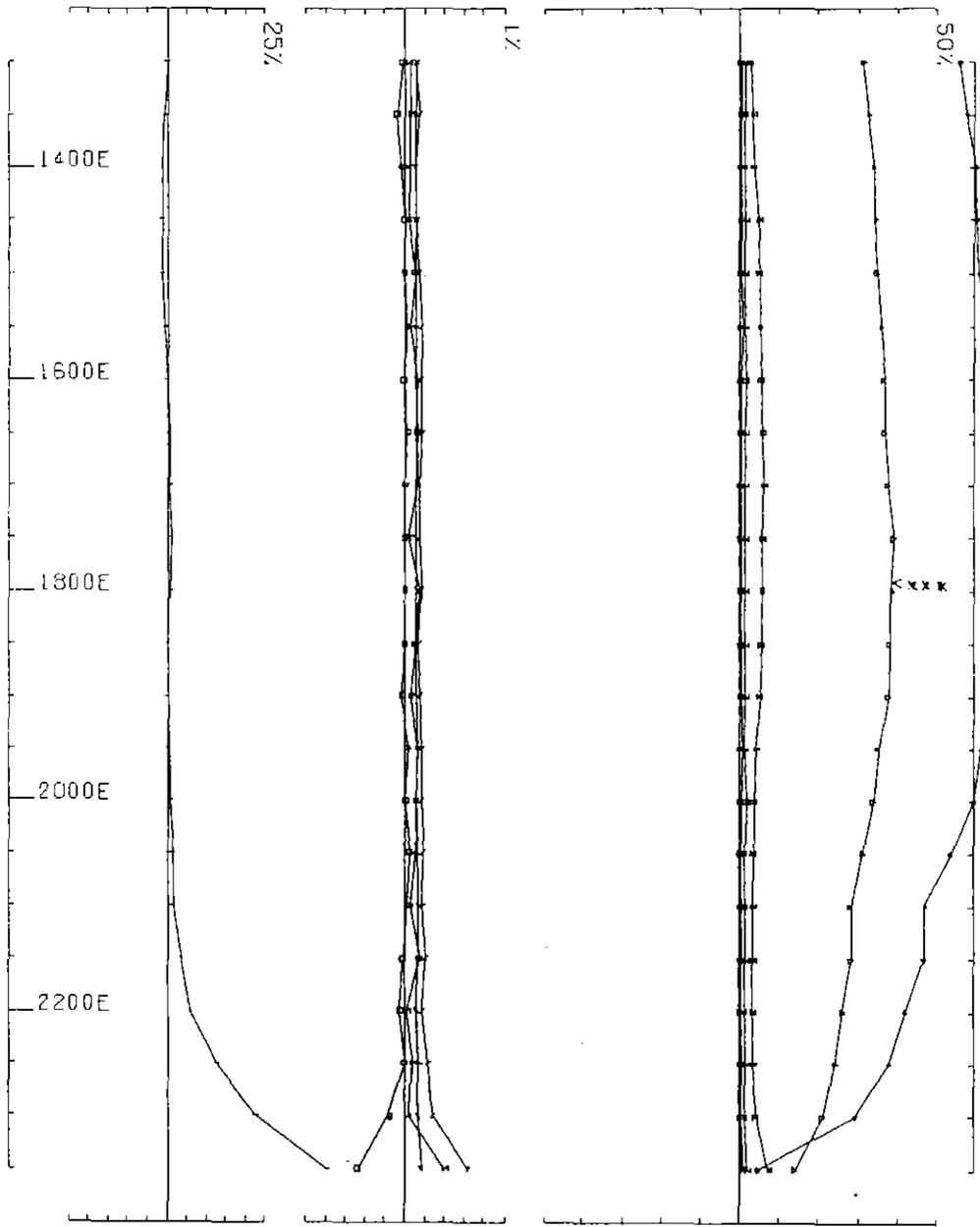


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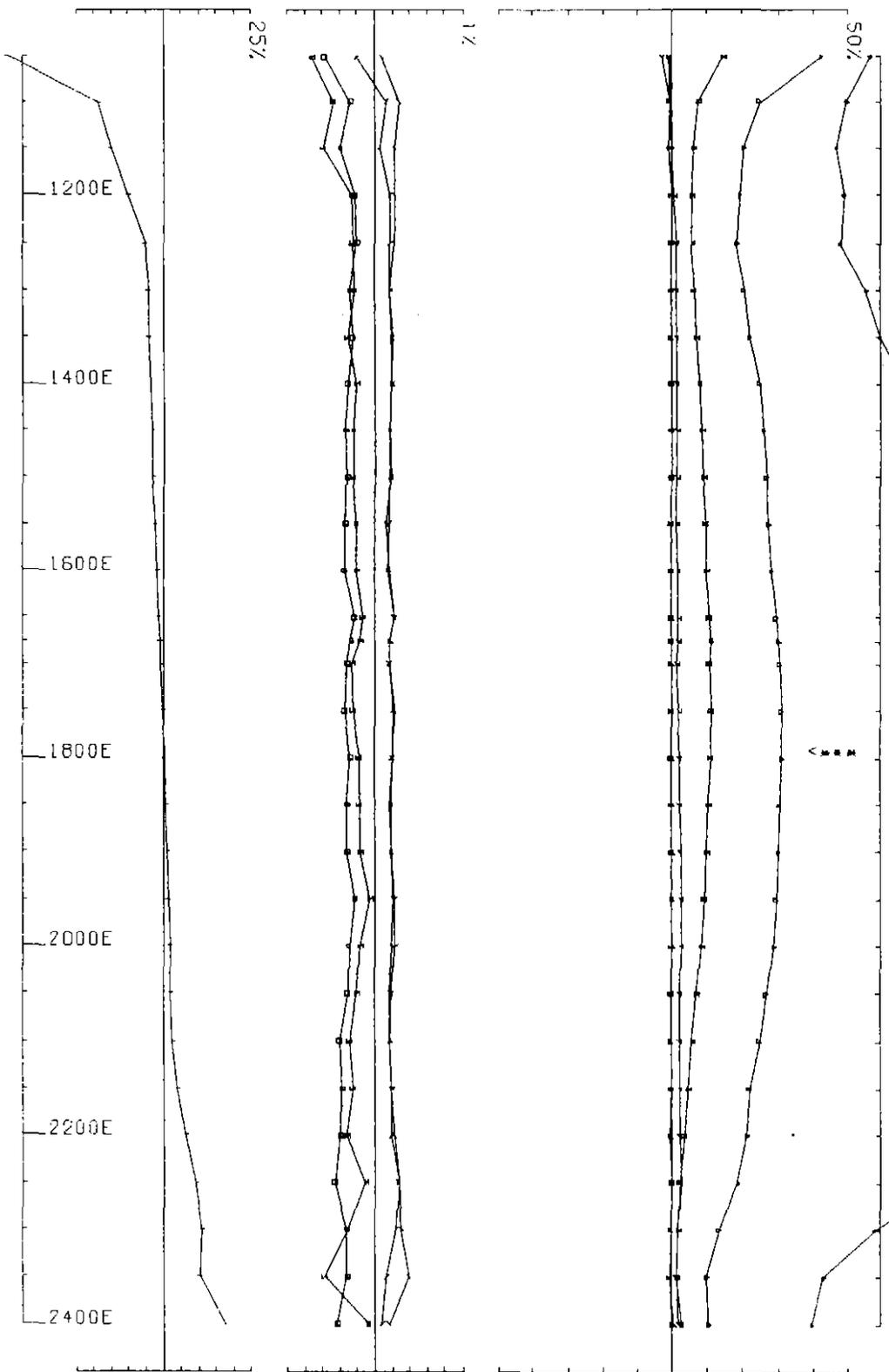


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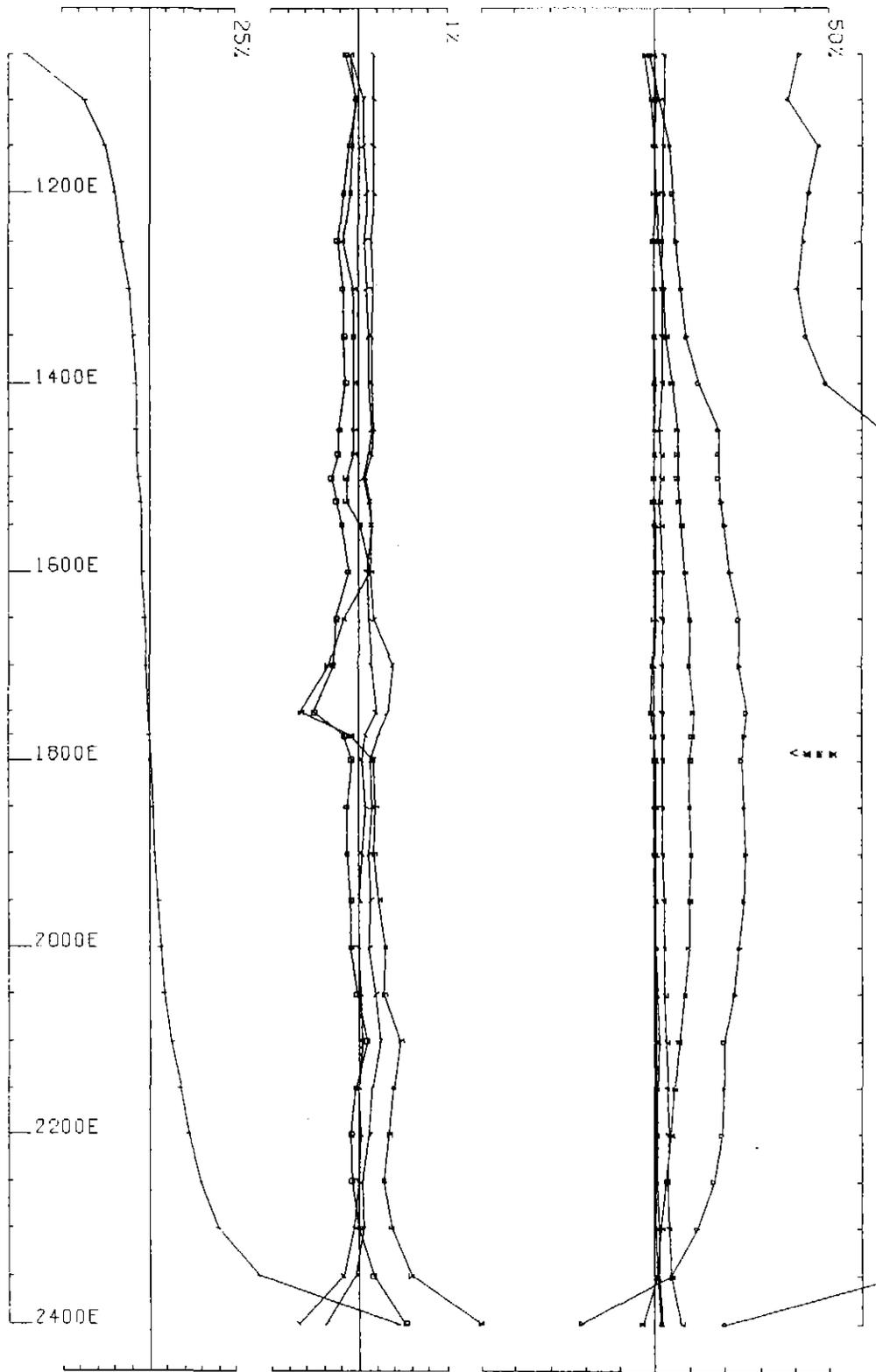
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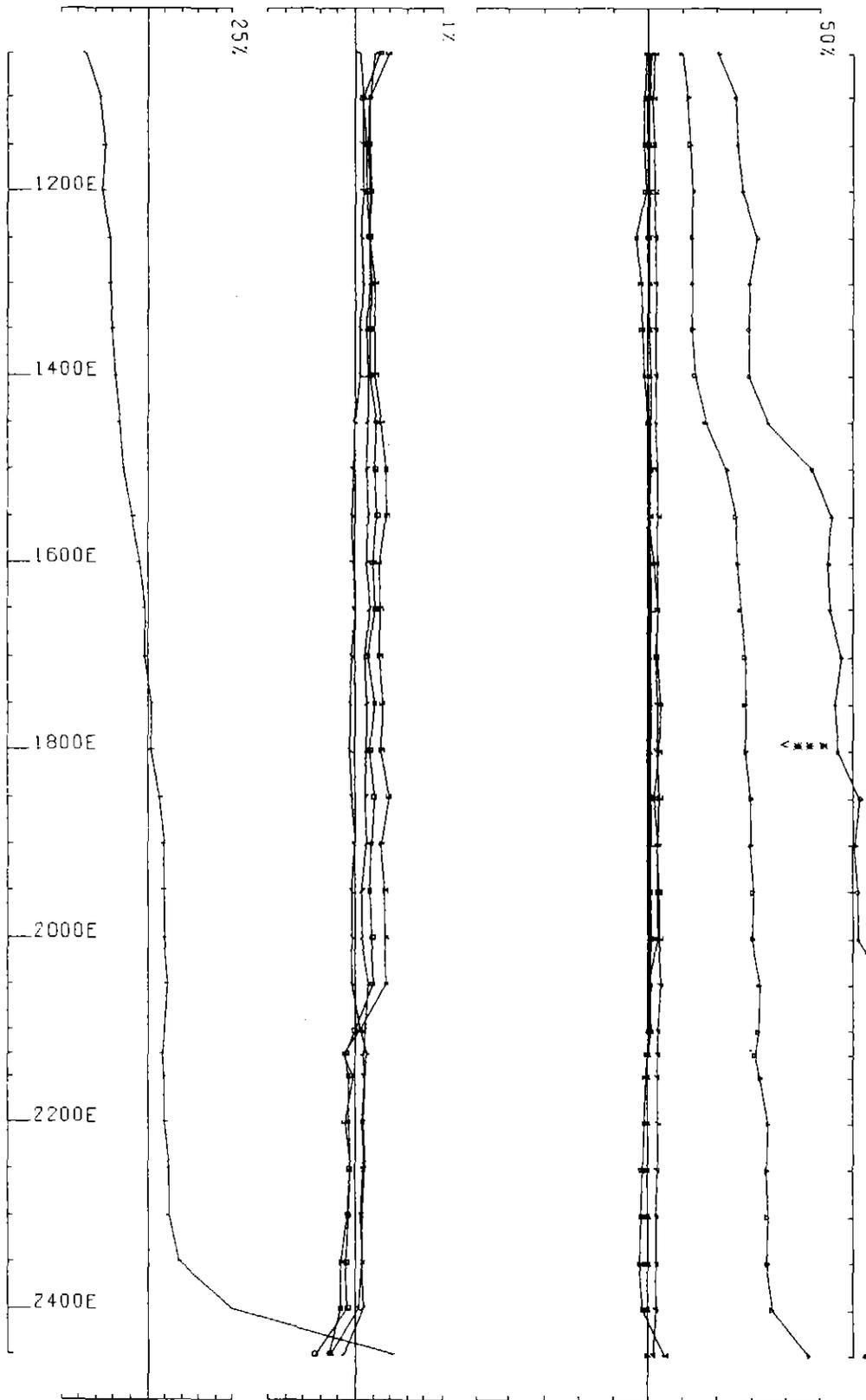
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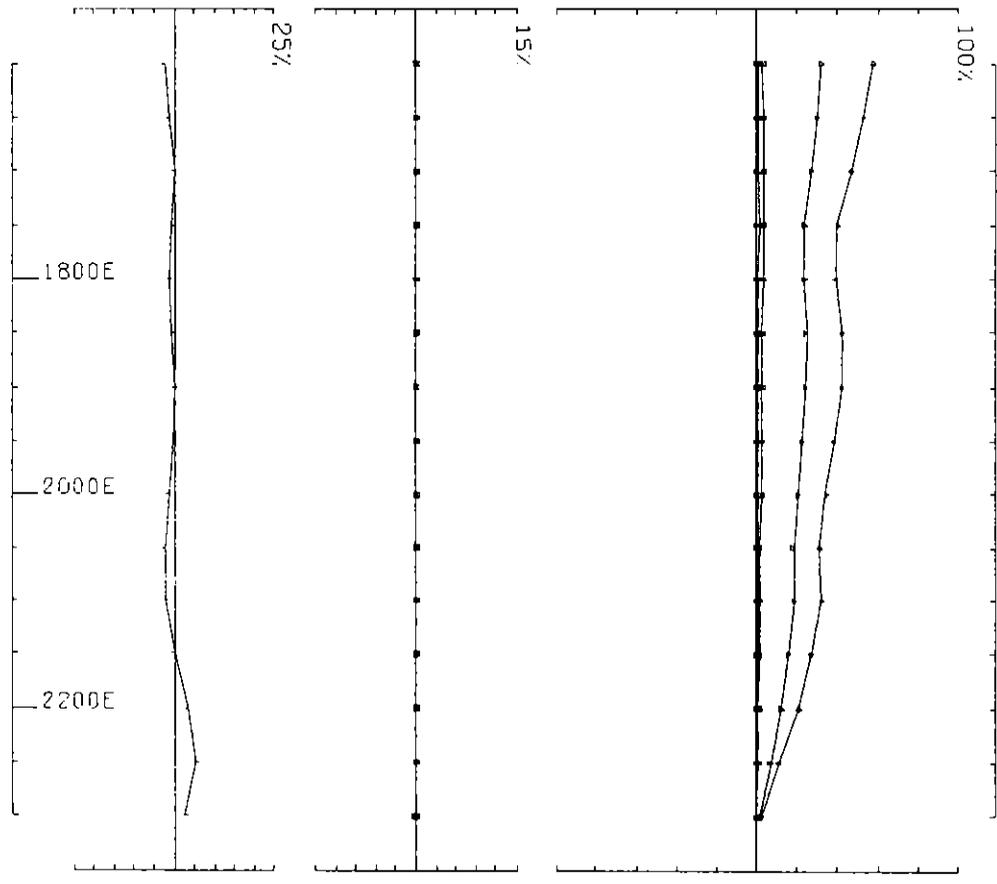
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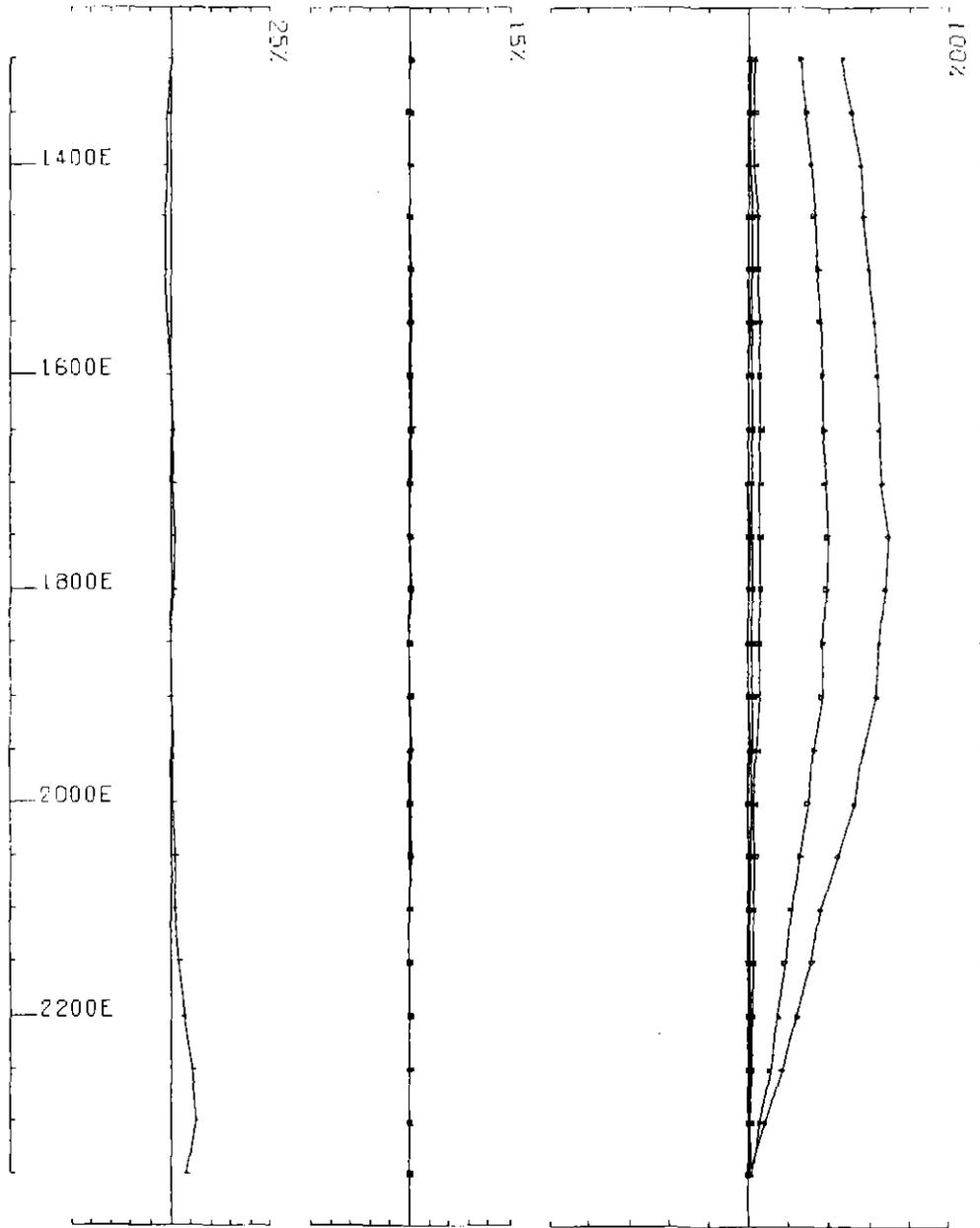
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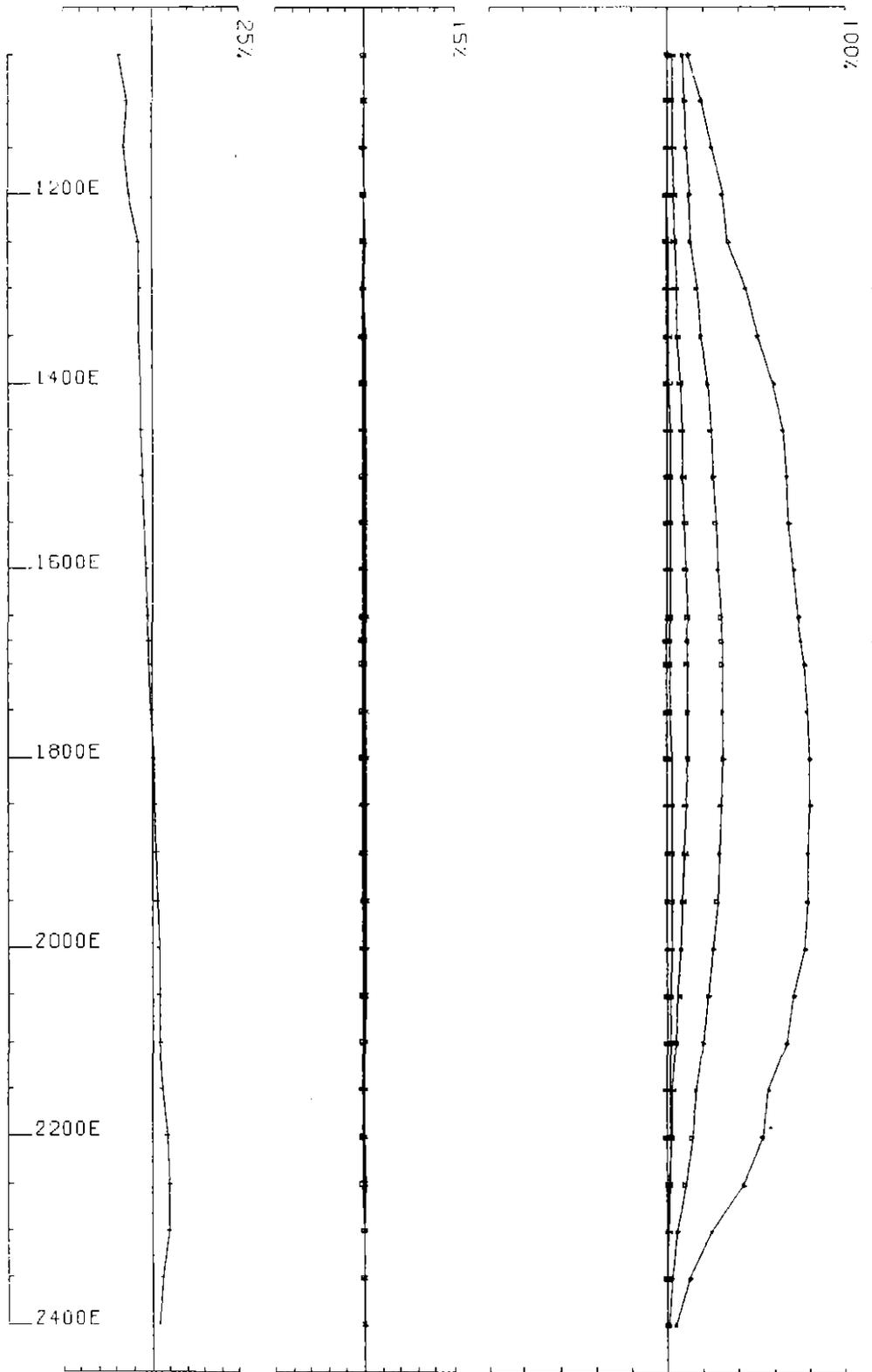
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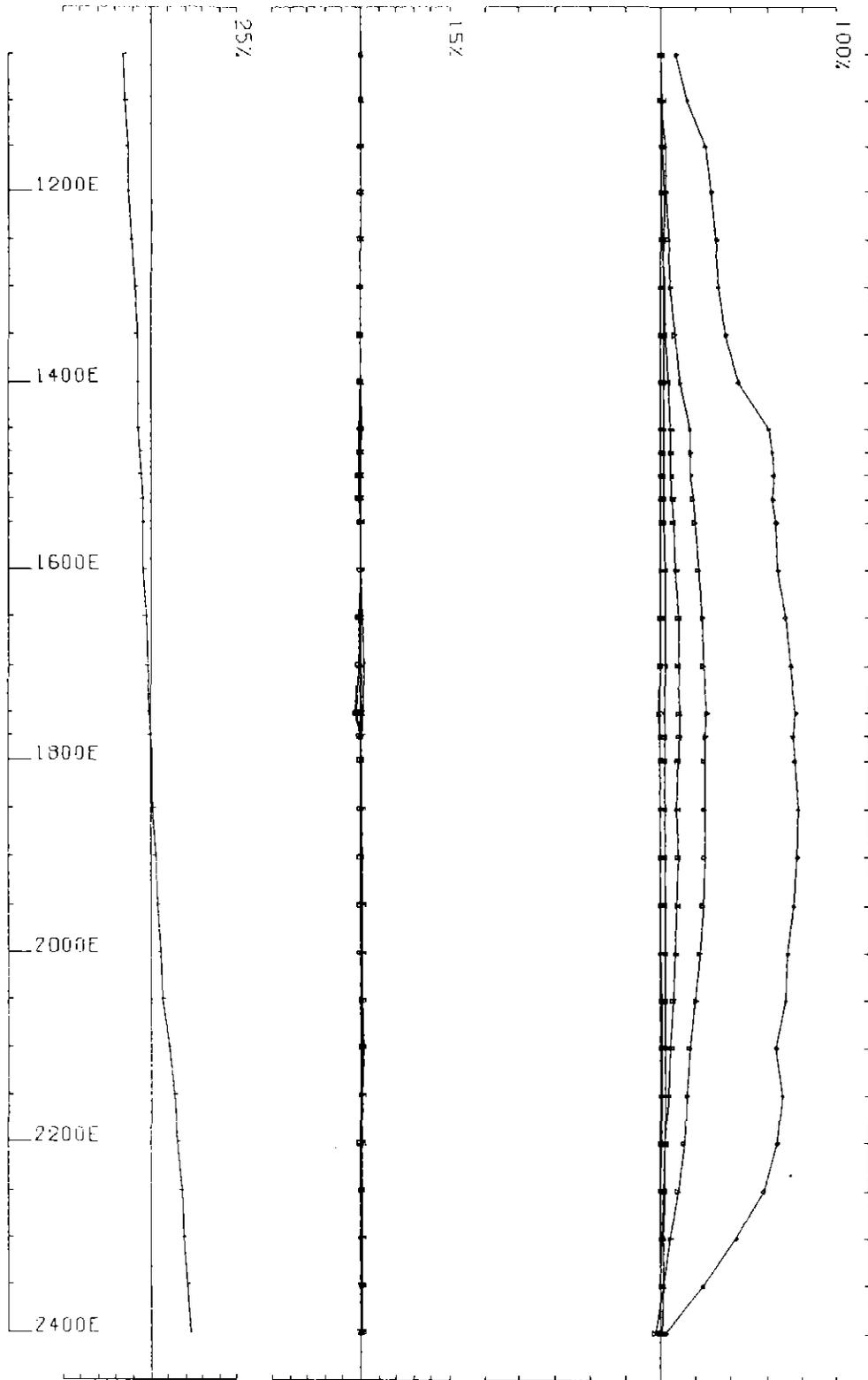
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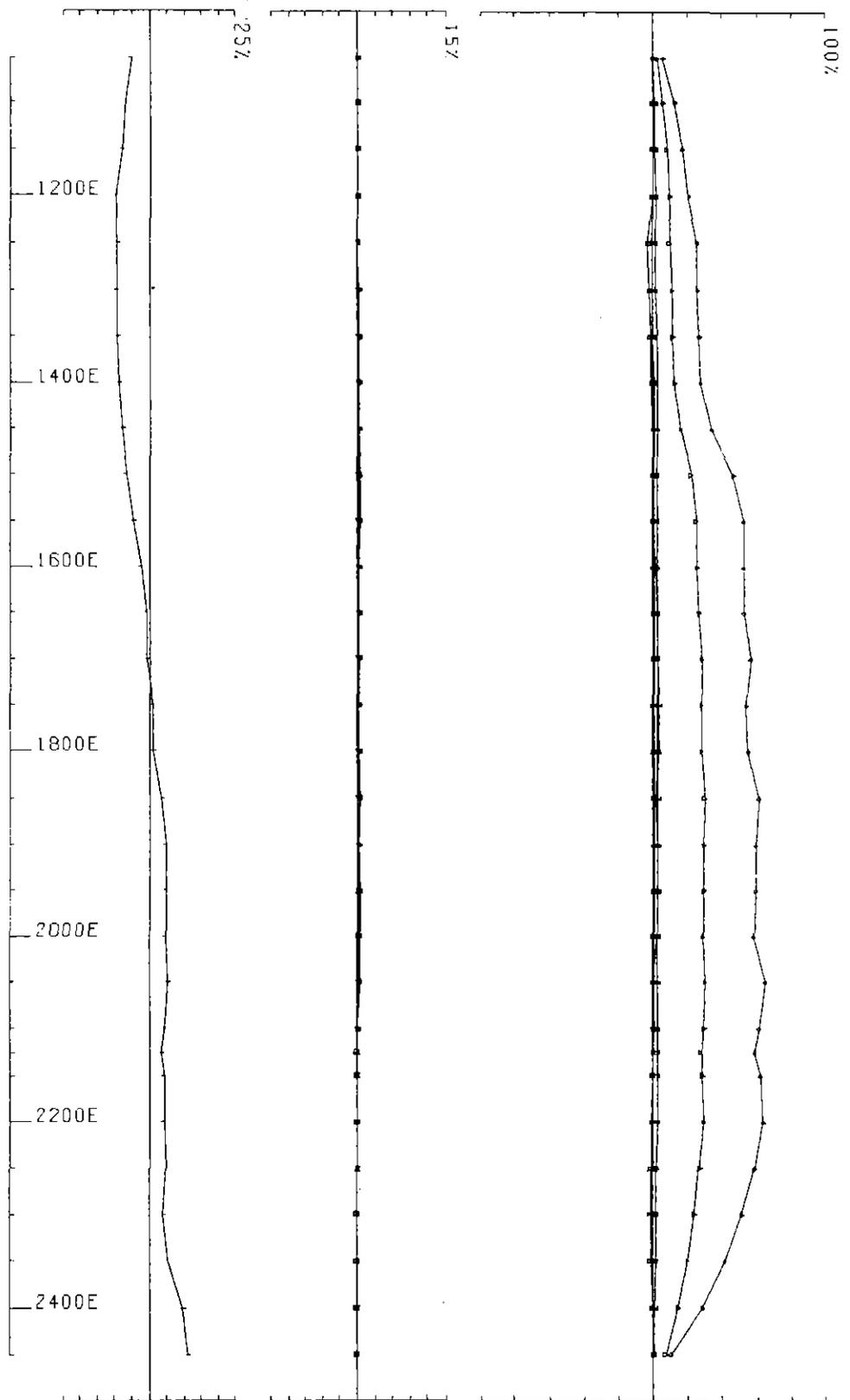
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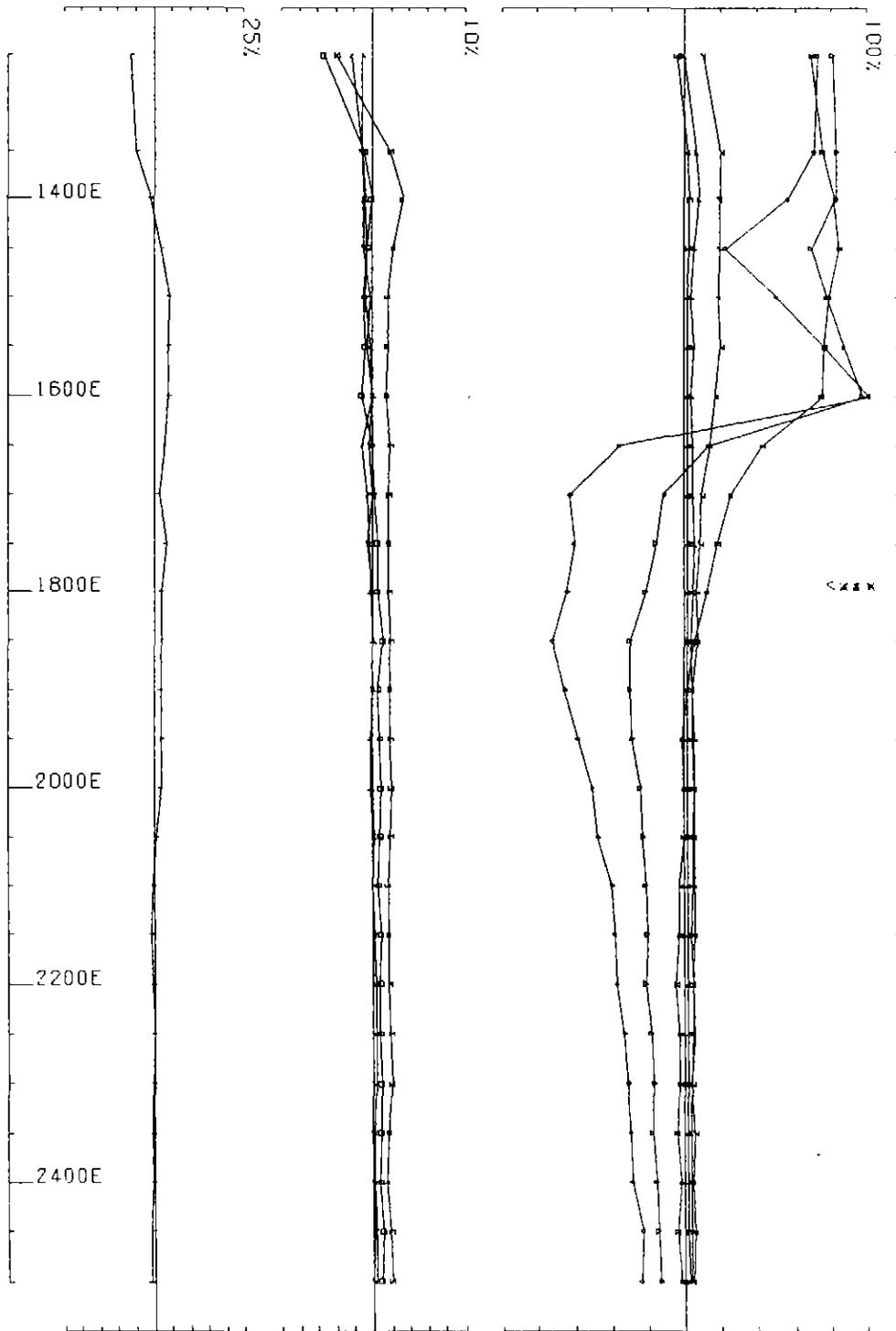
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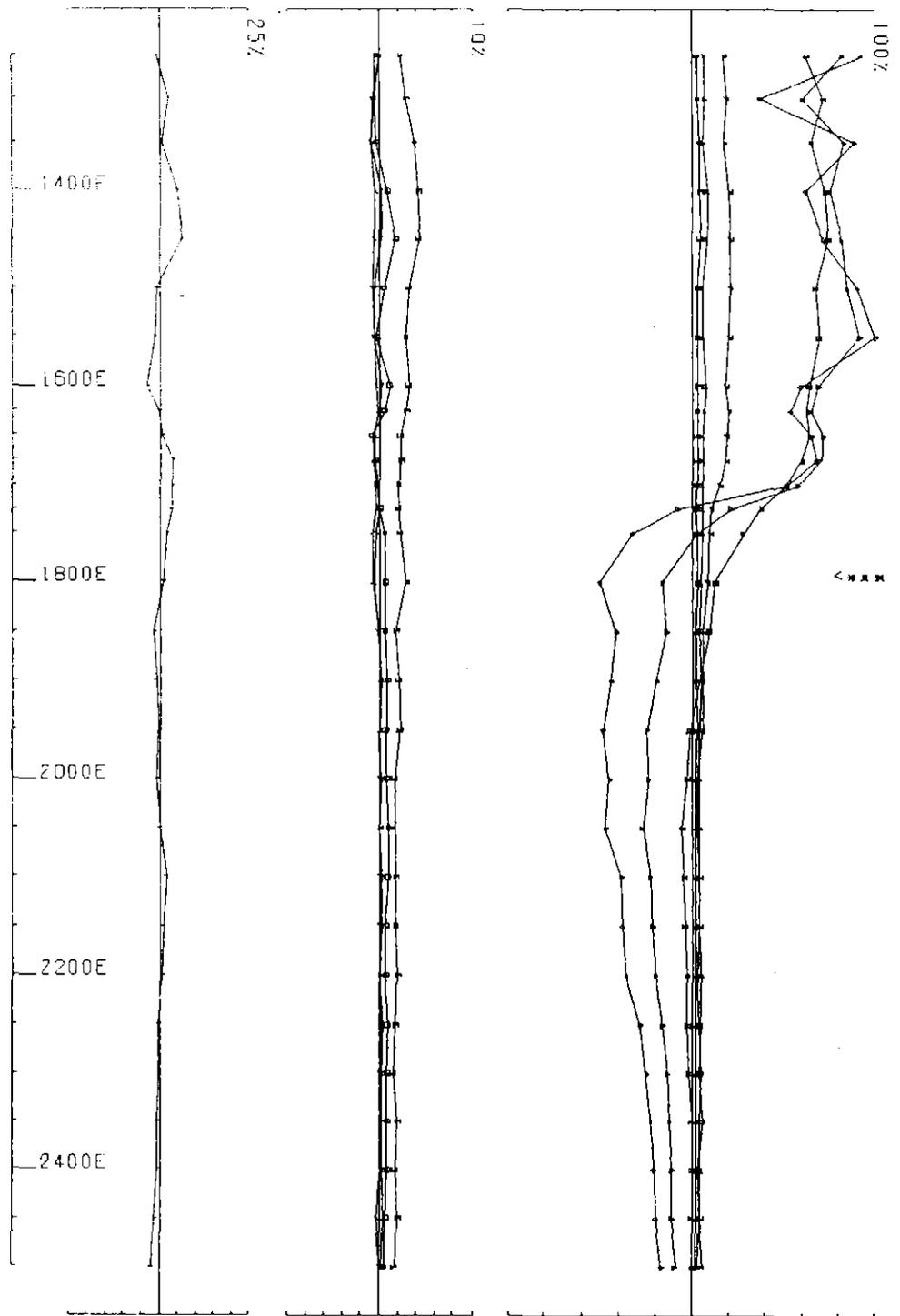
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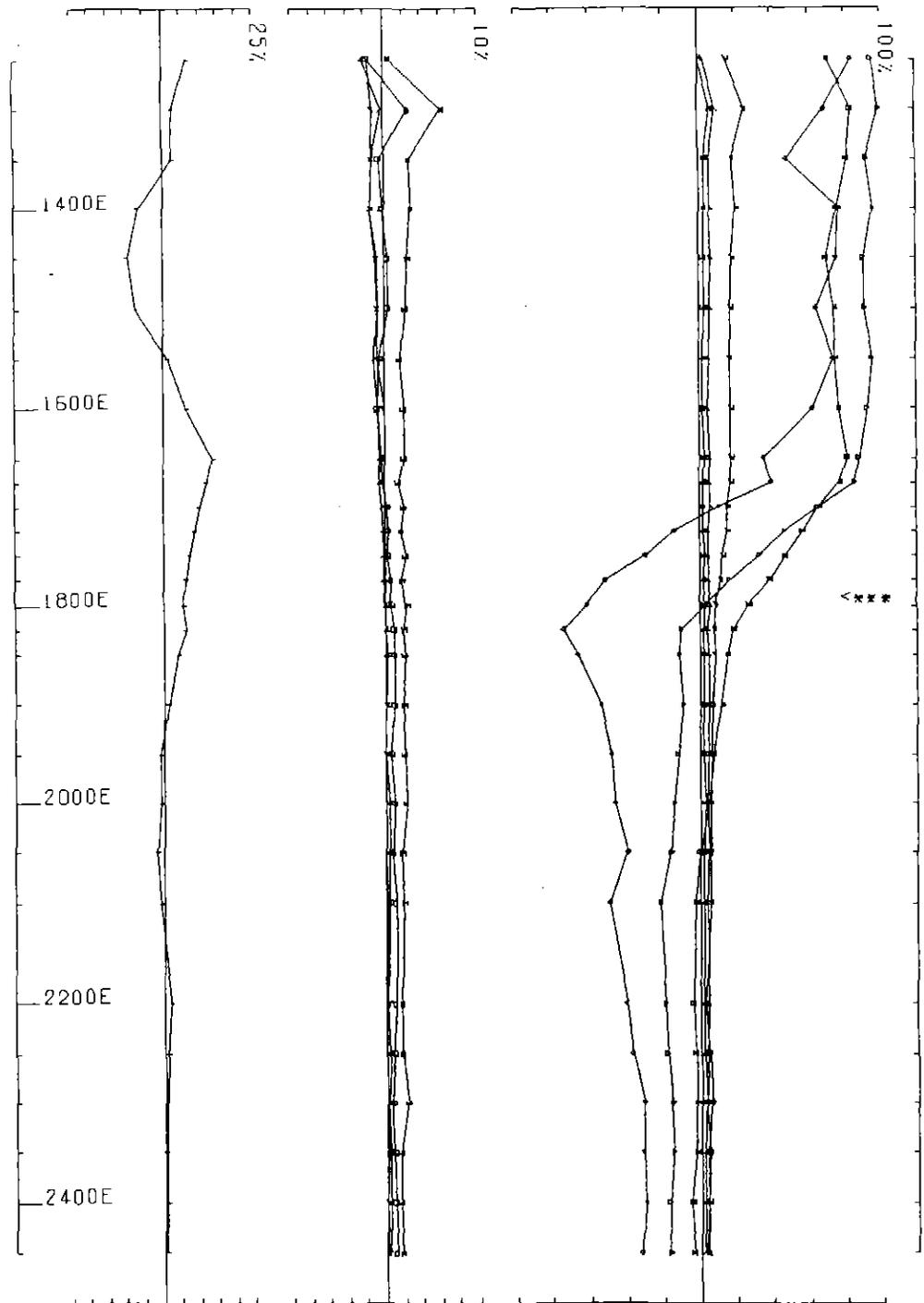
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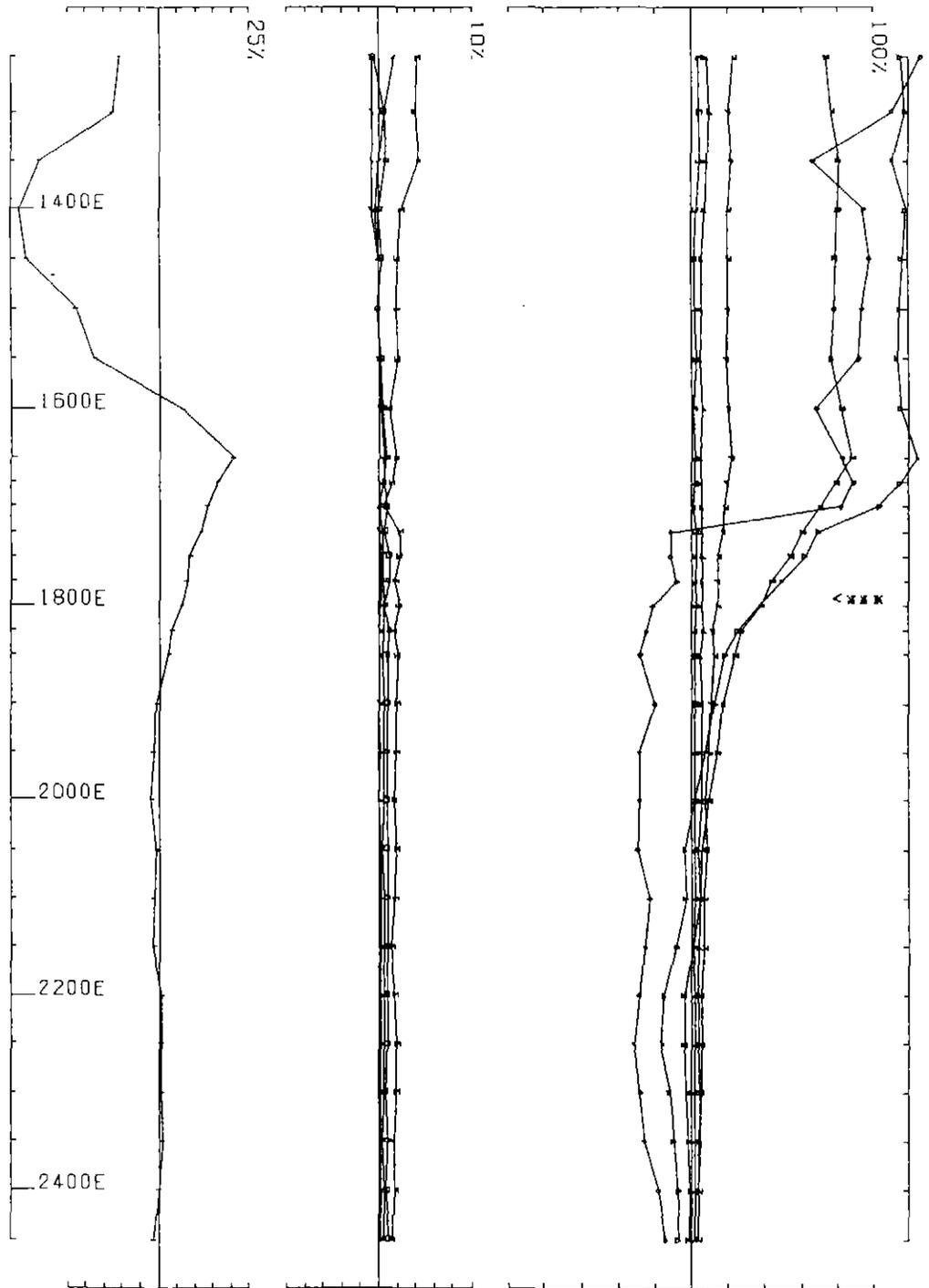
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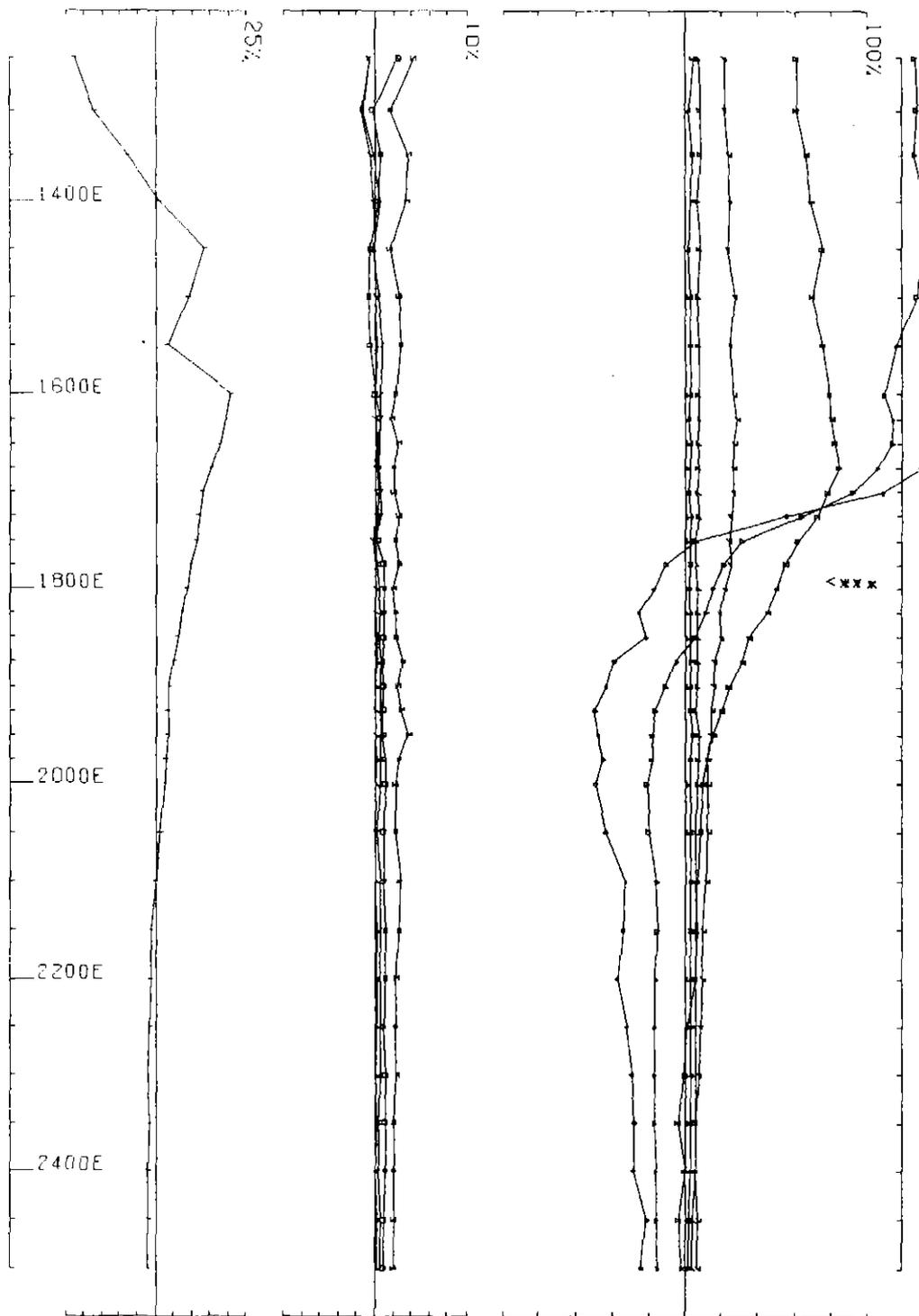
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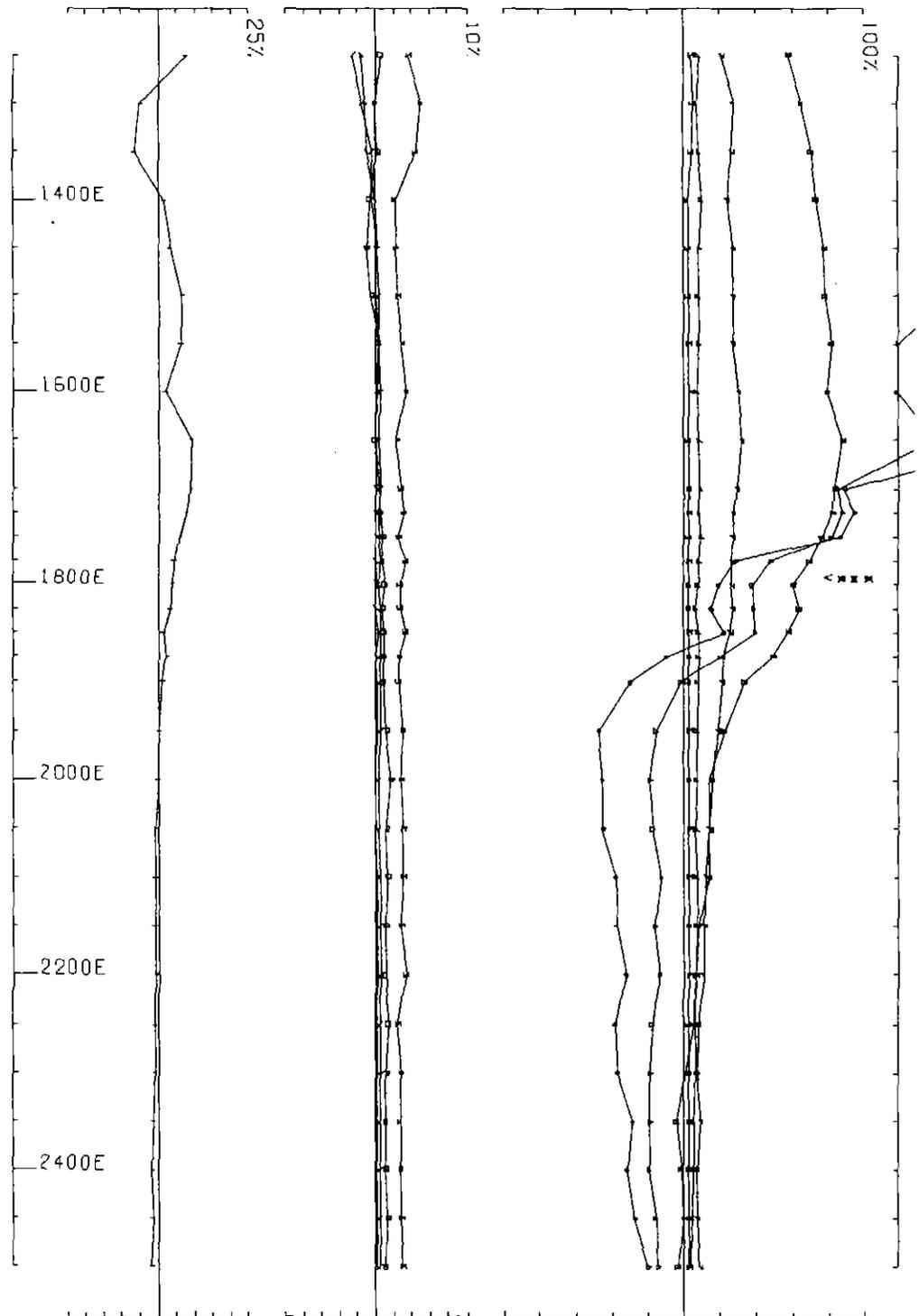
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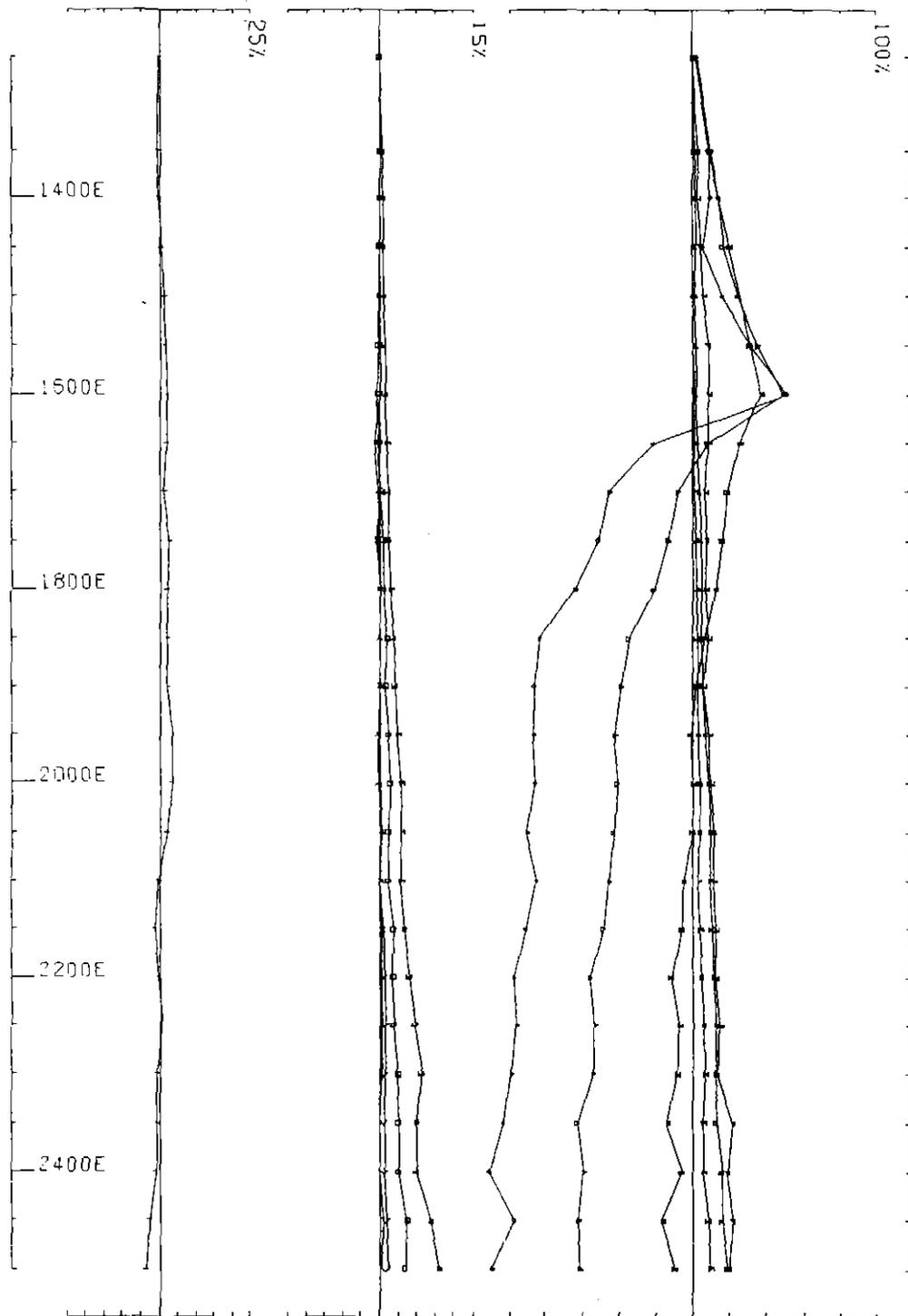
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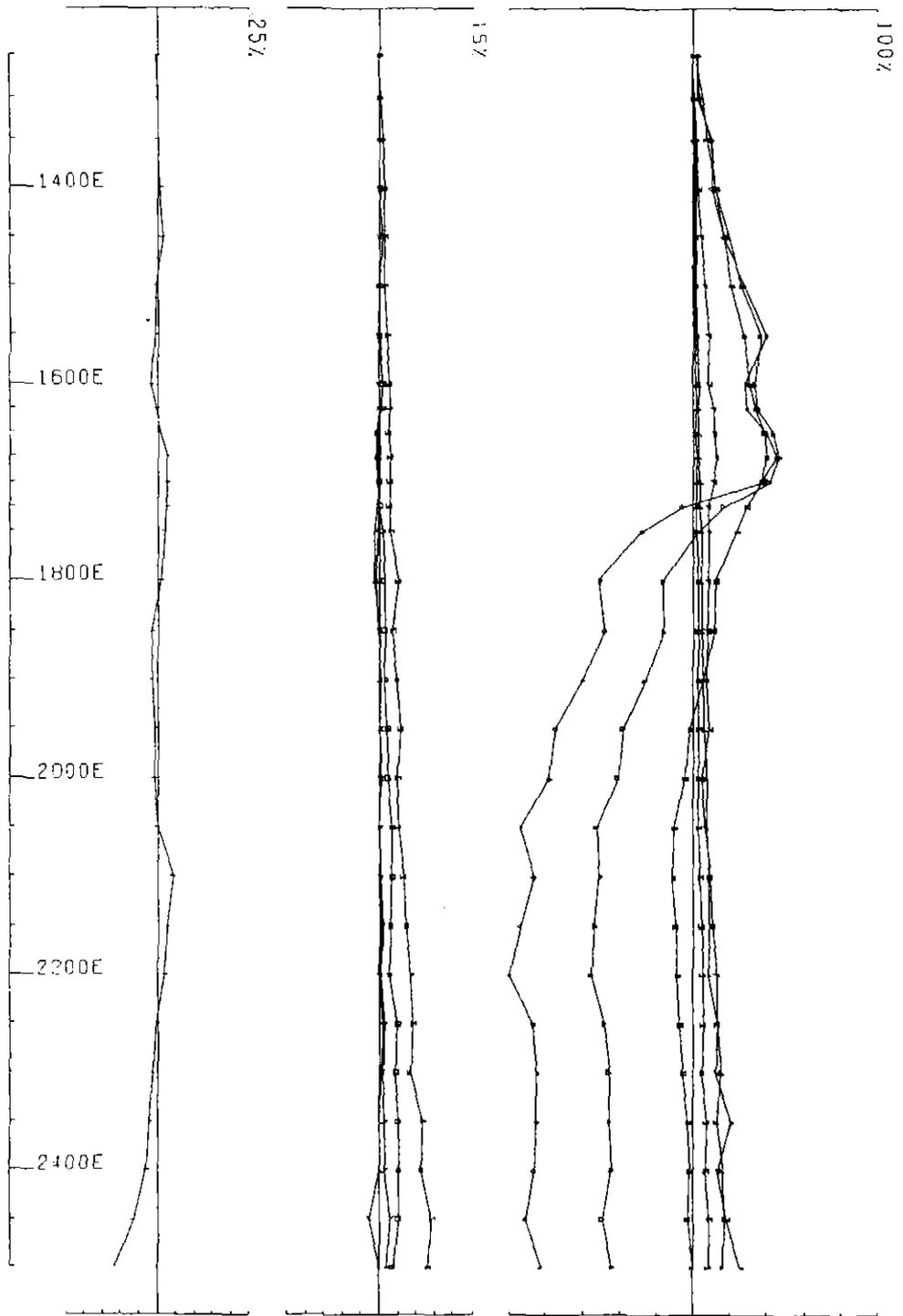
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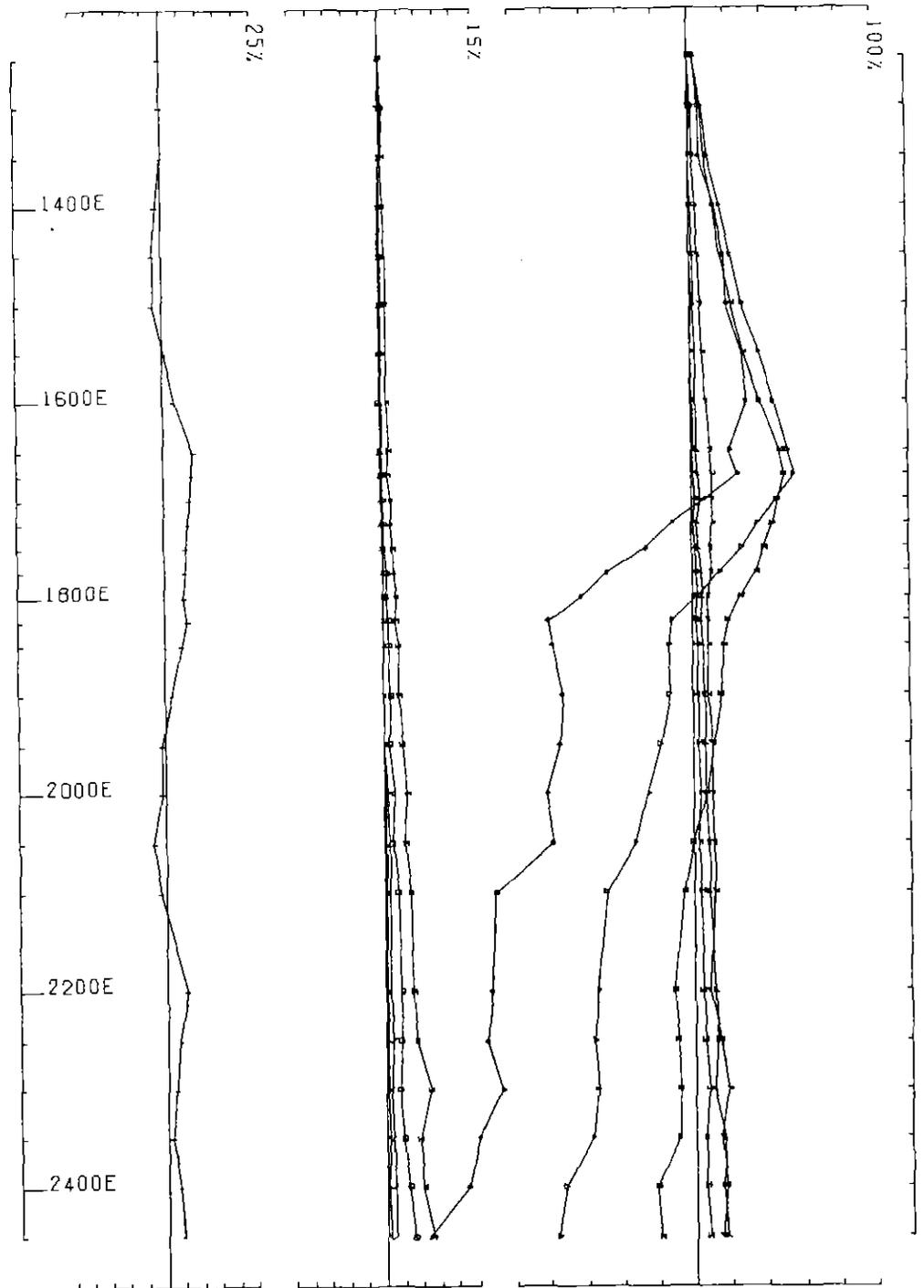
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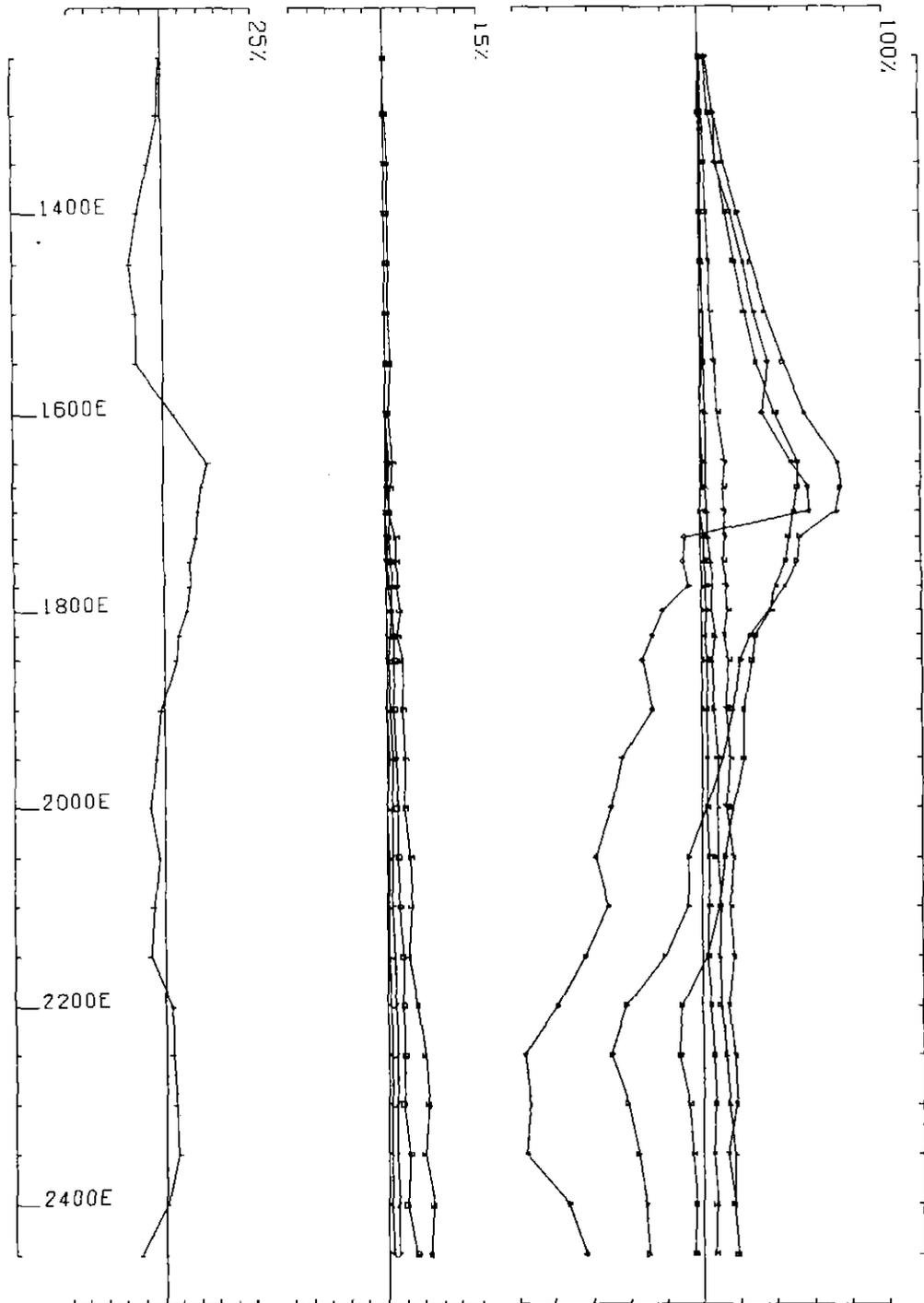
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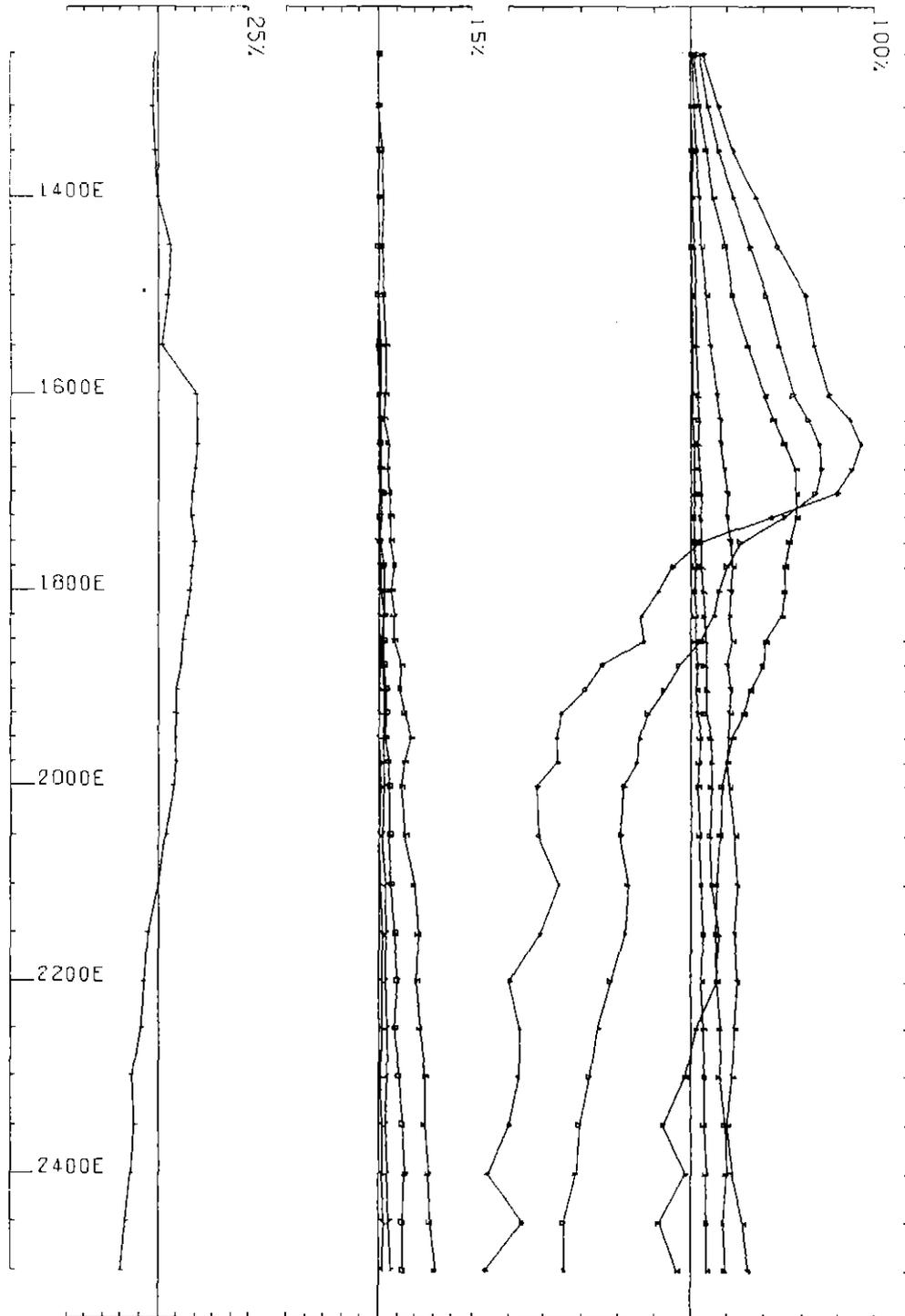
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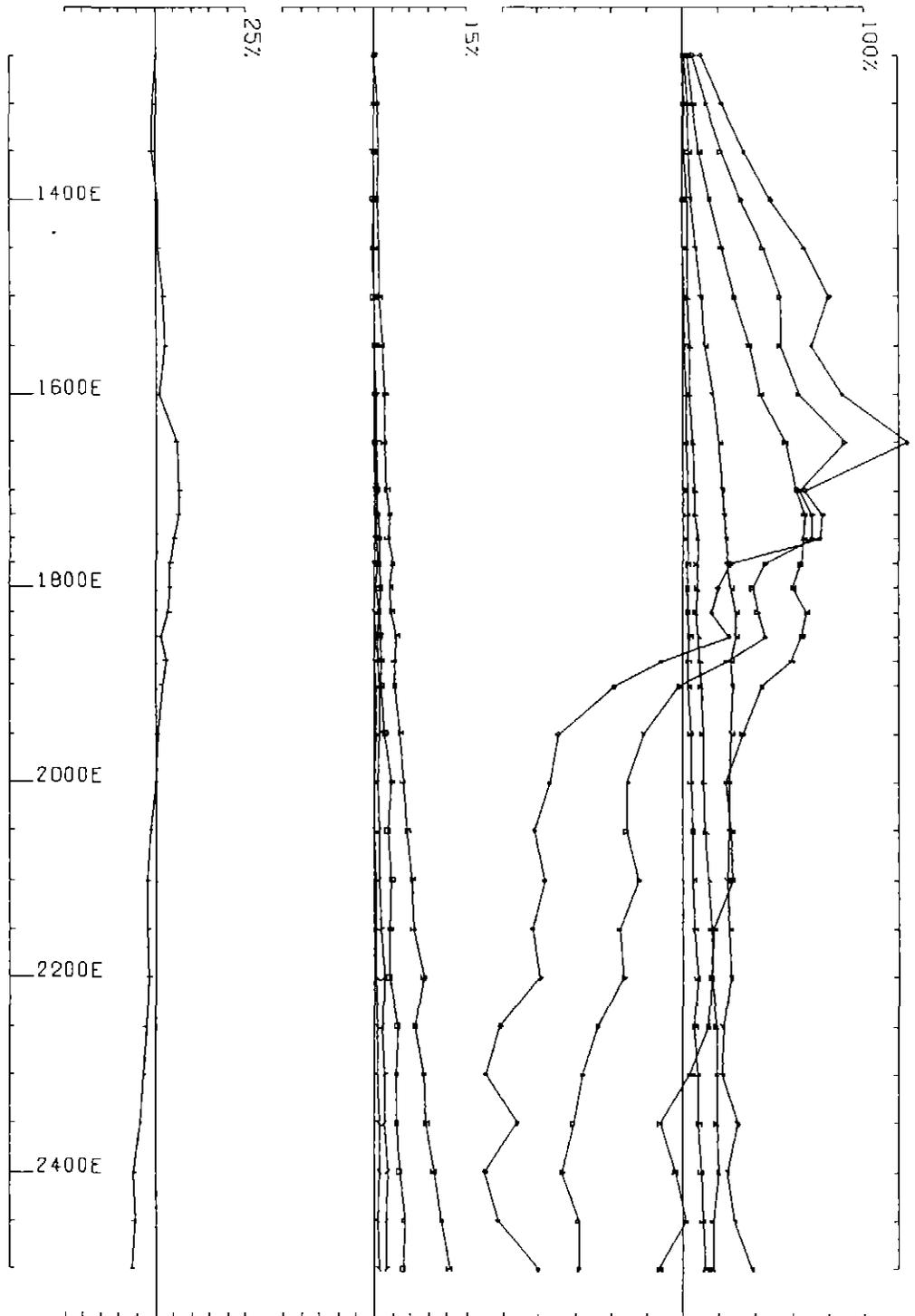
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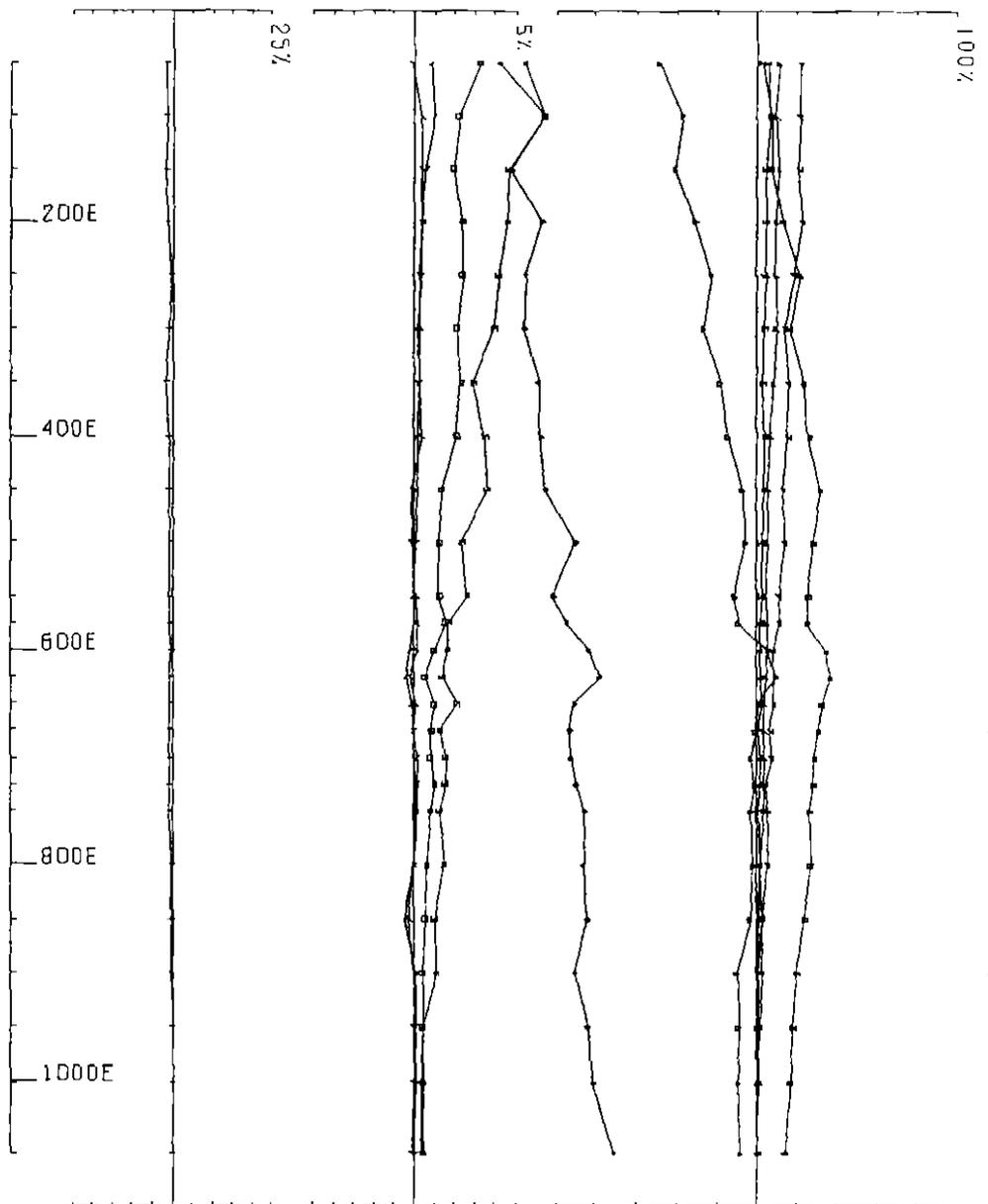
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UTEM SURVEY AT GARFIELD FOR BHP-UTAH NOVEMBER 1990
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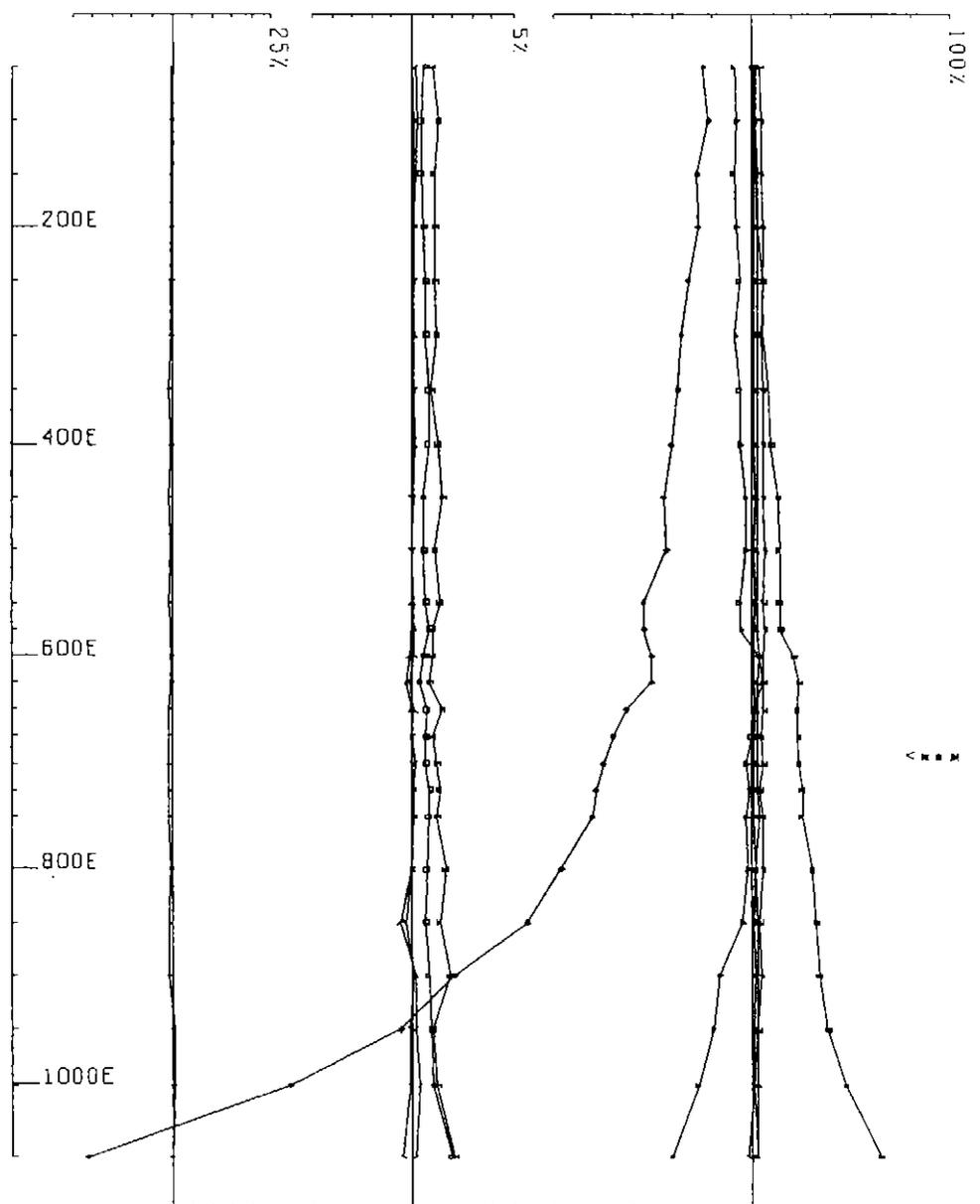
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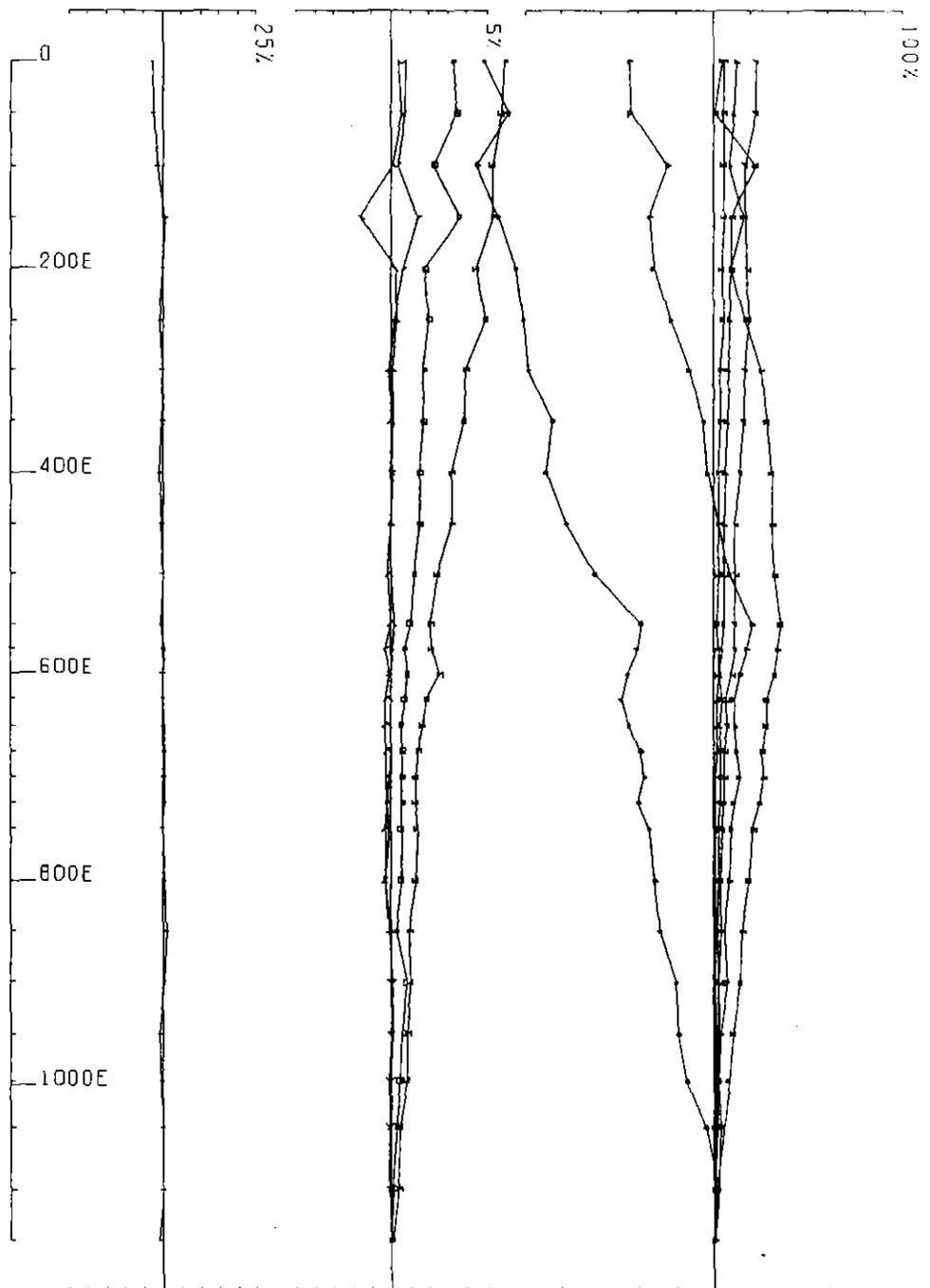
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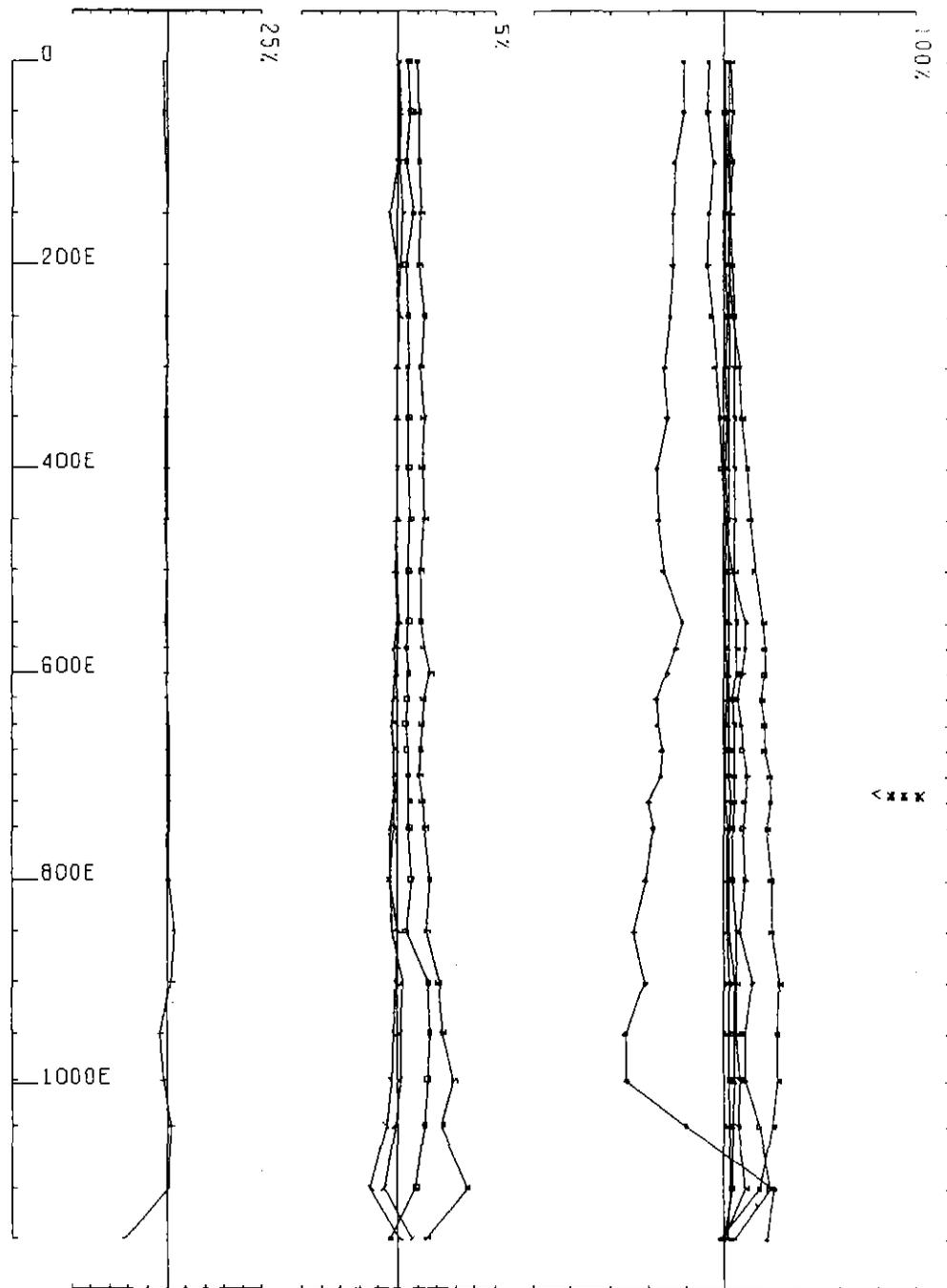
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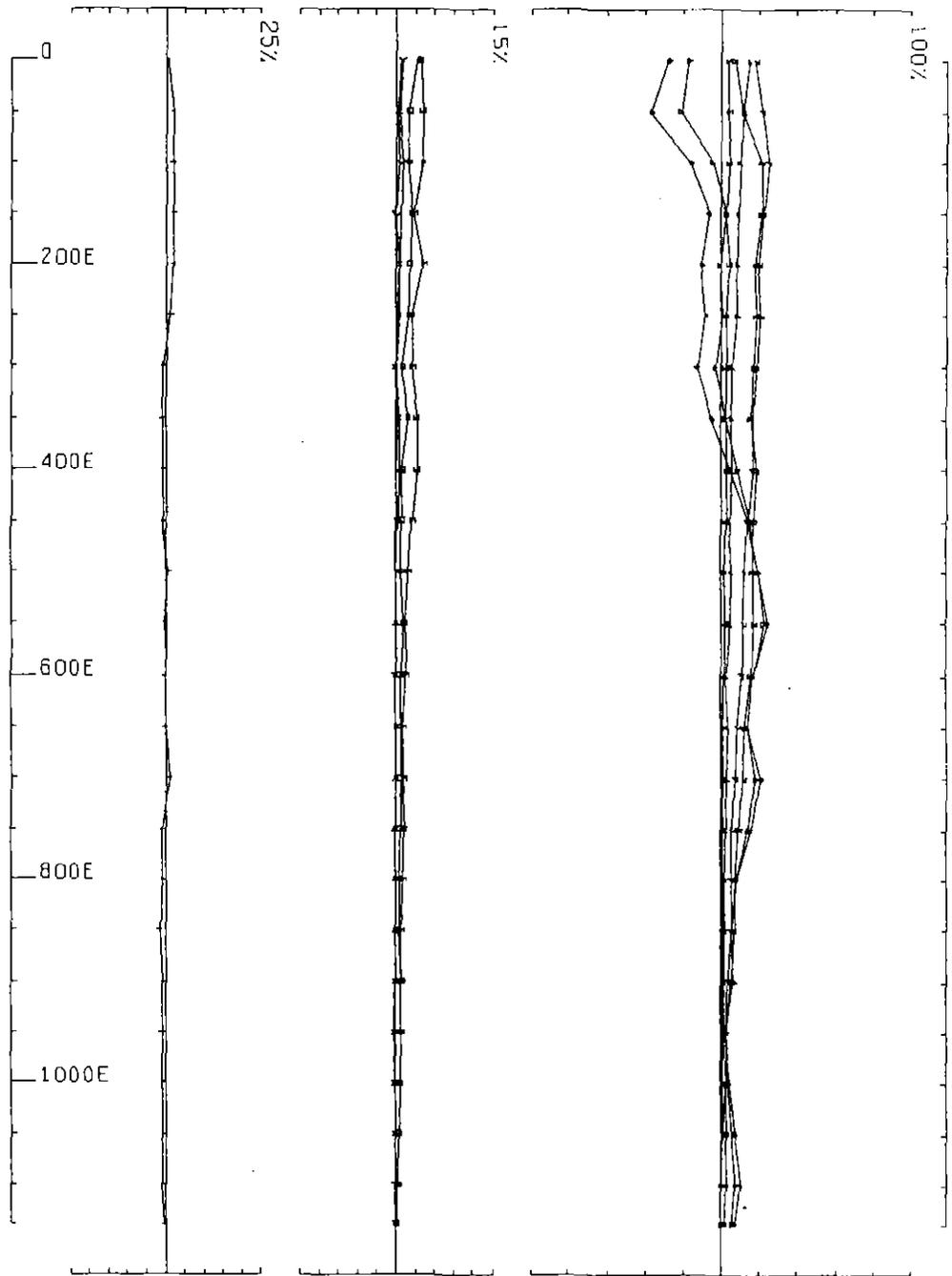
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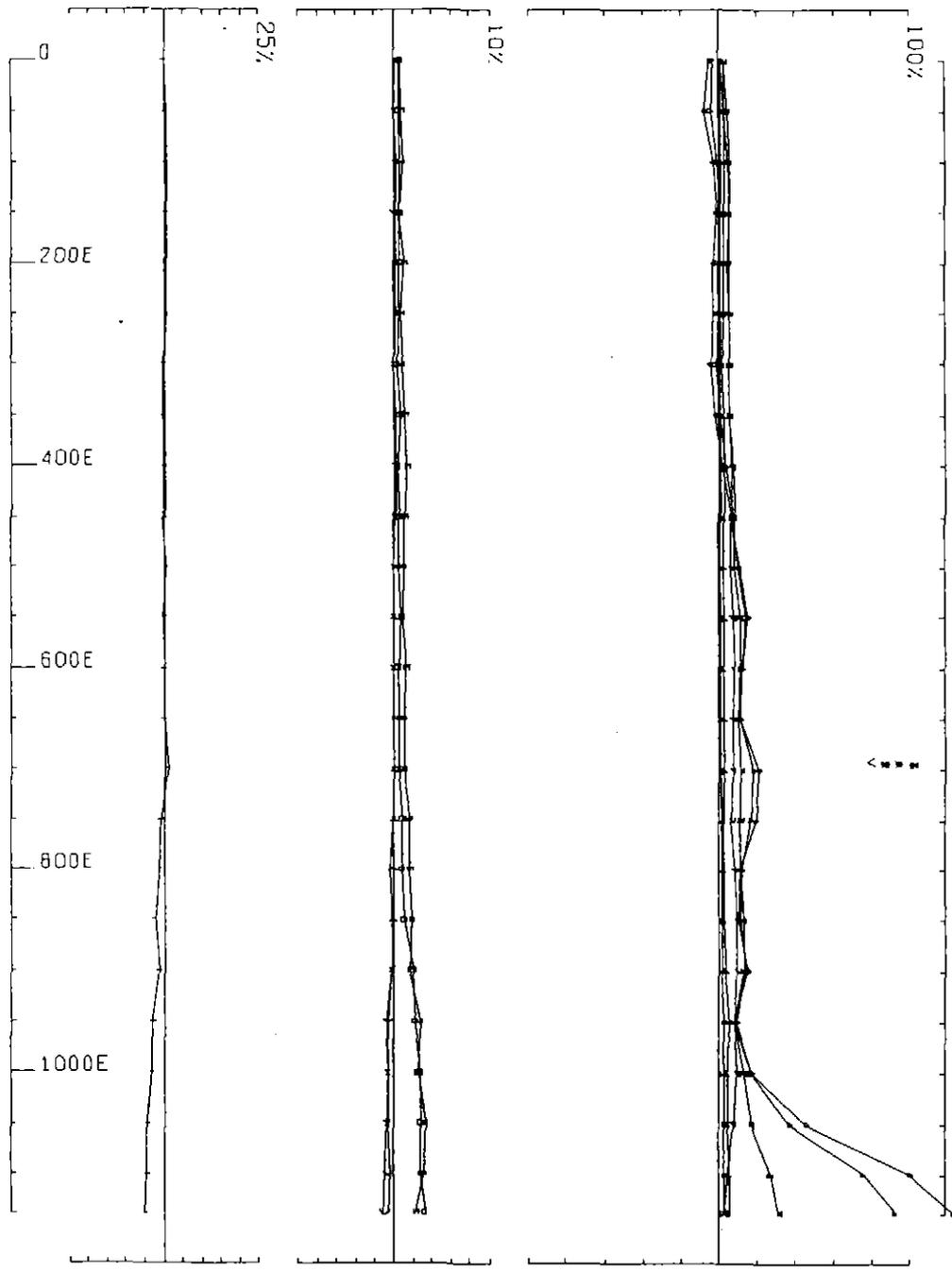
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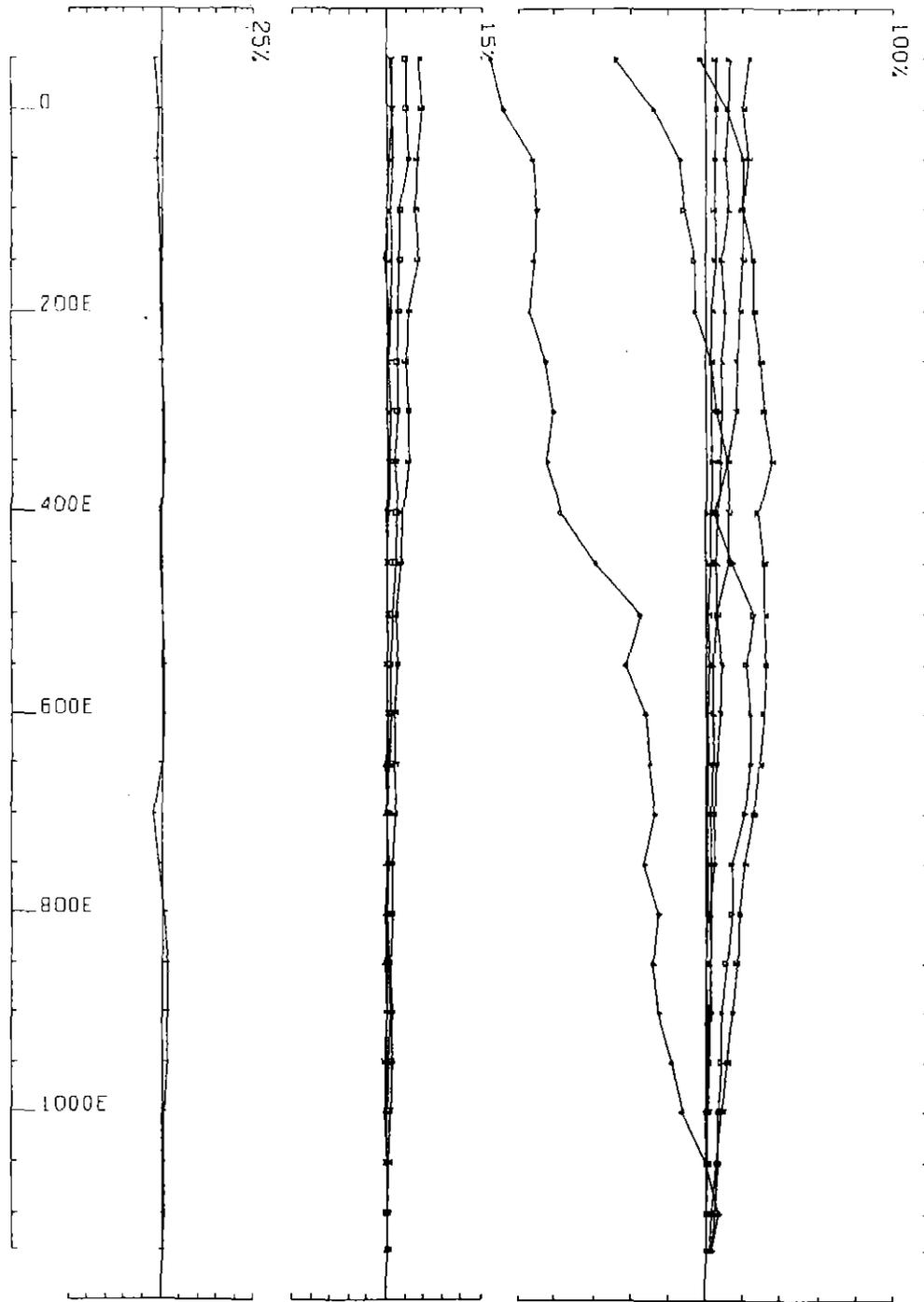
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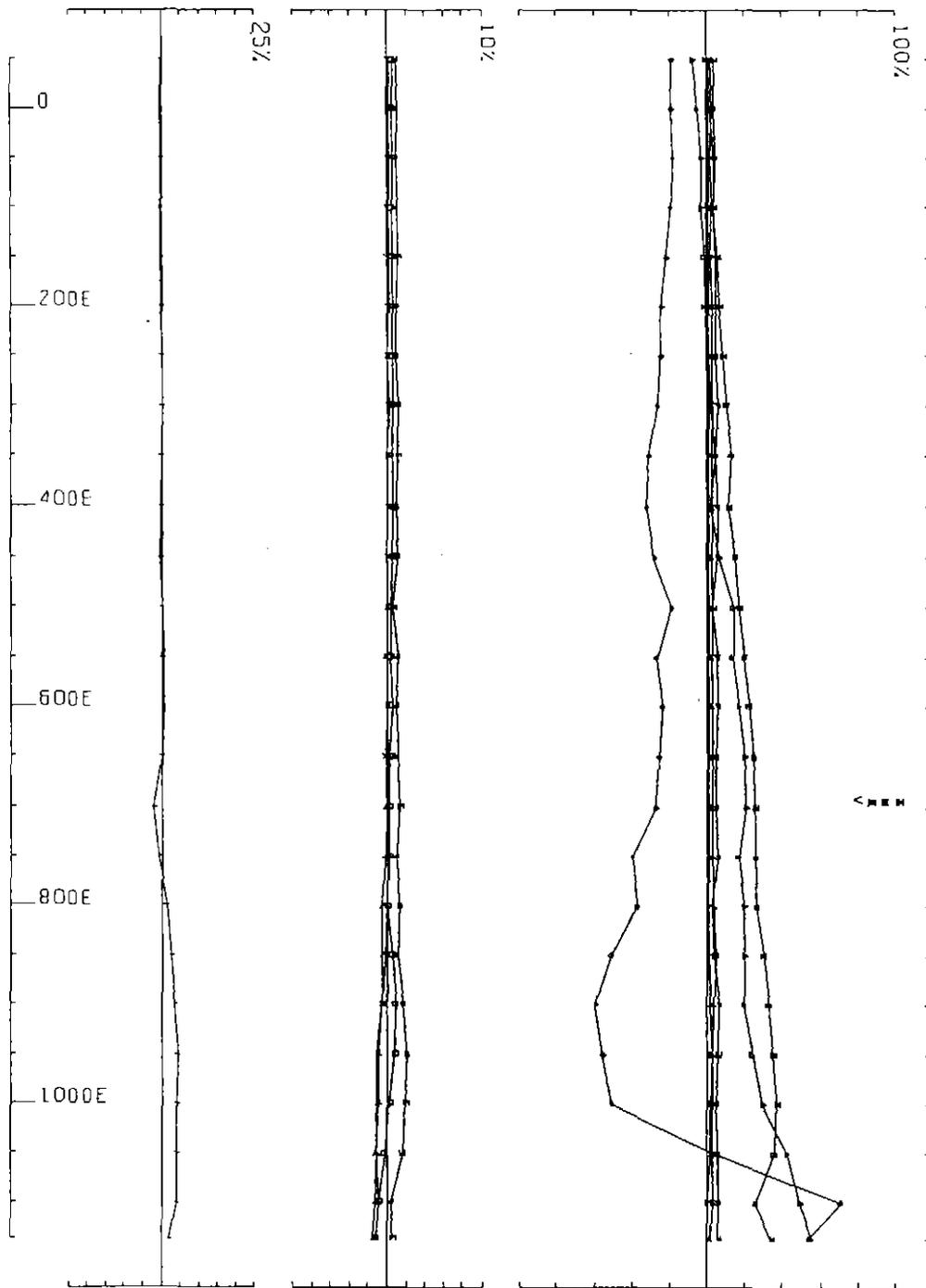
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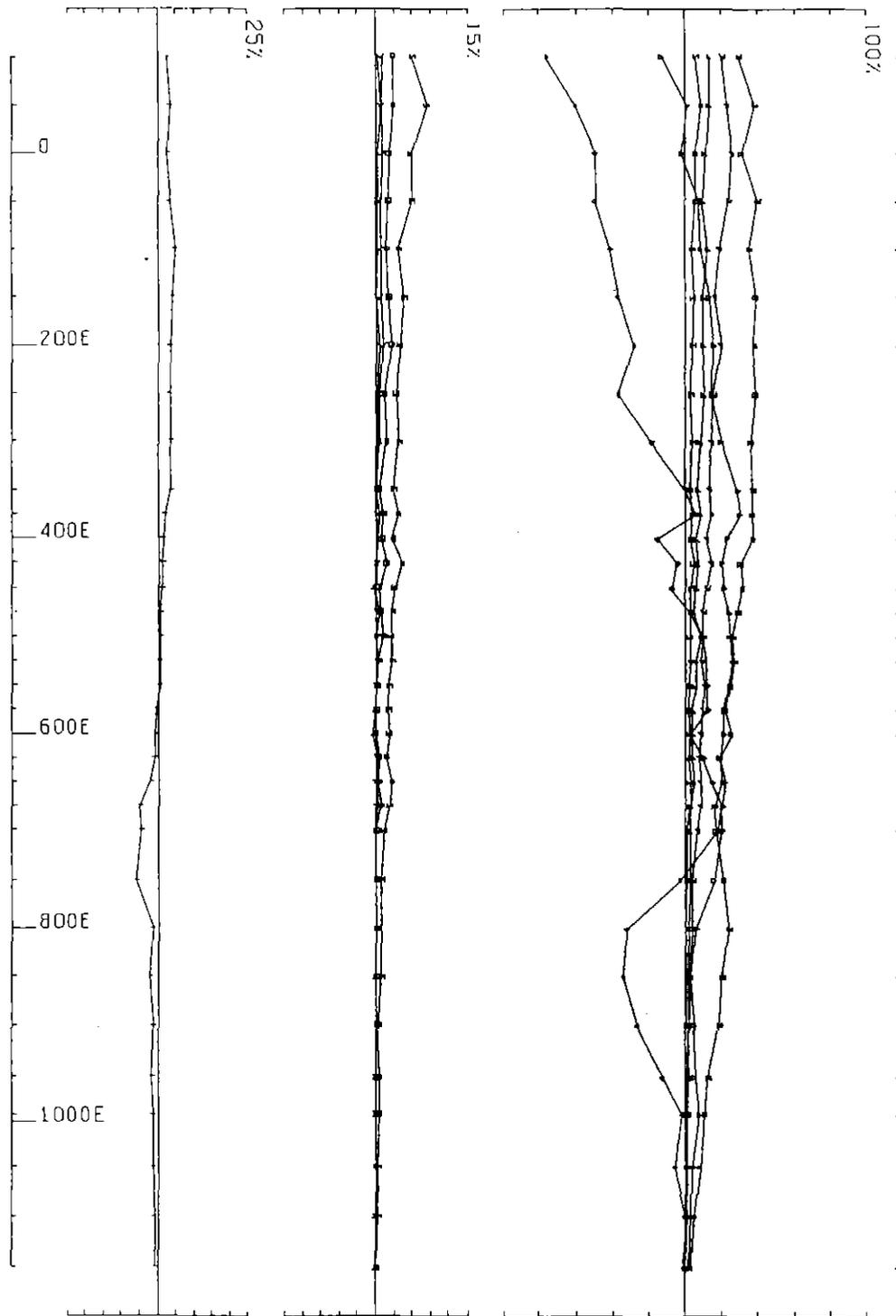
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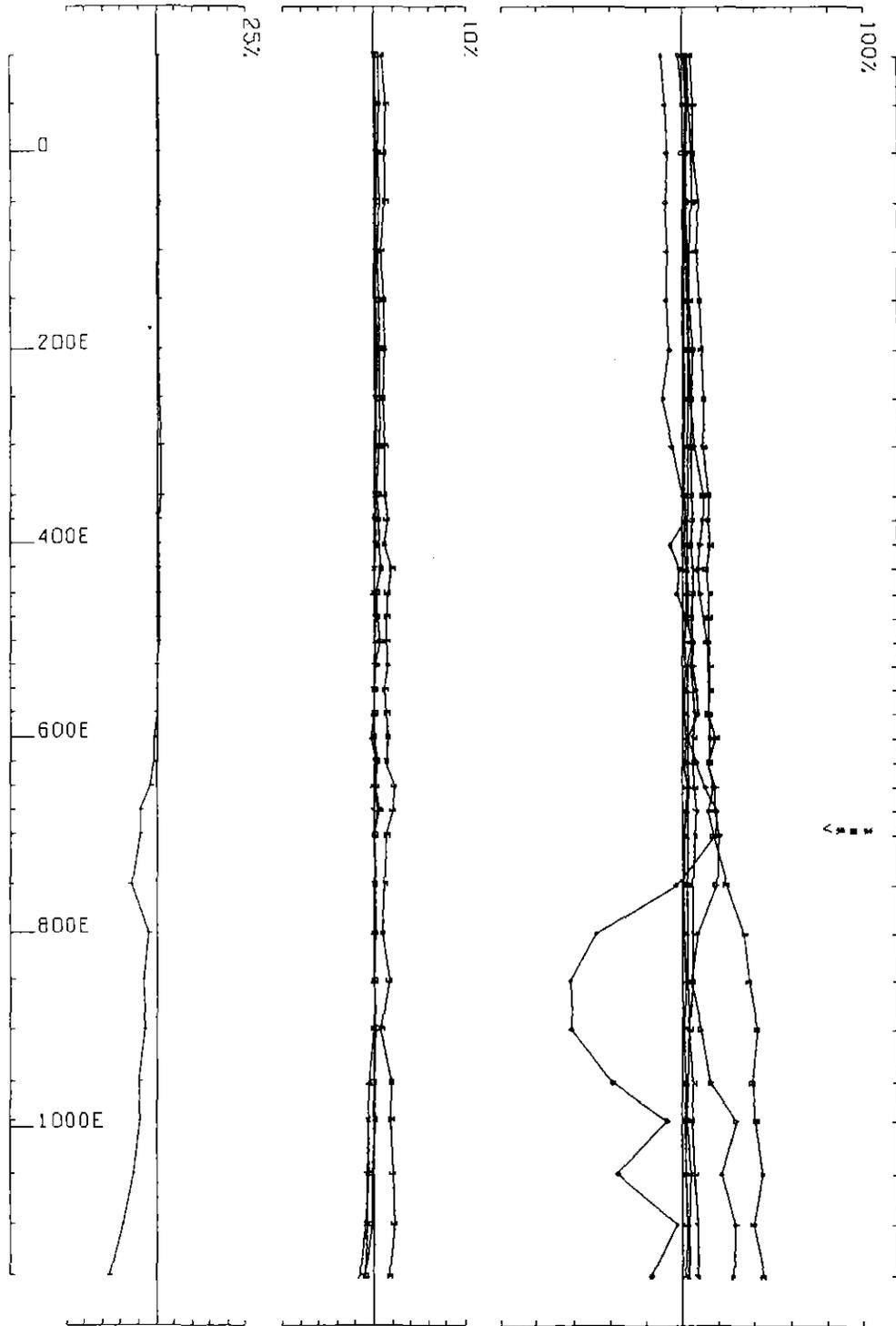
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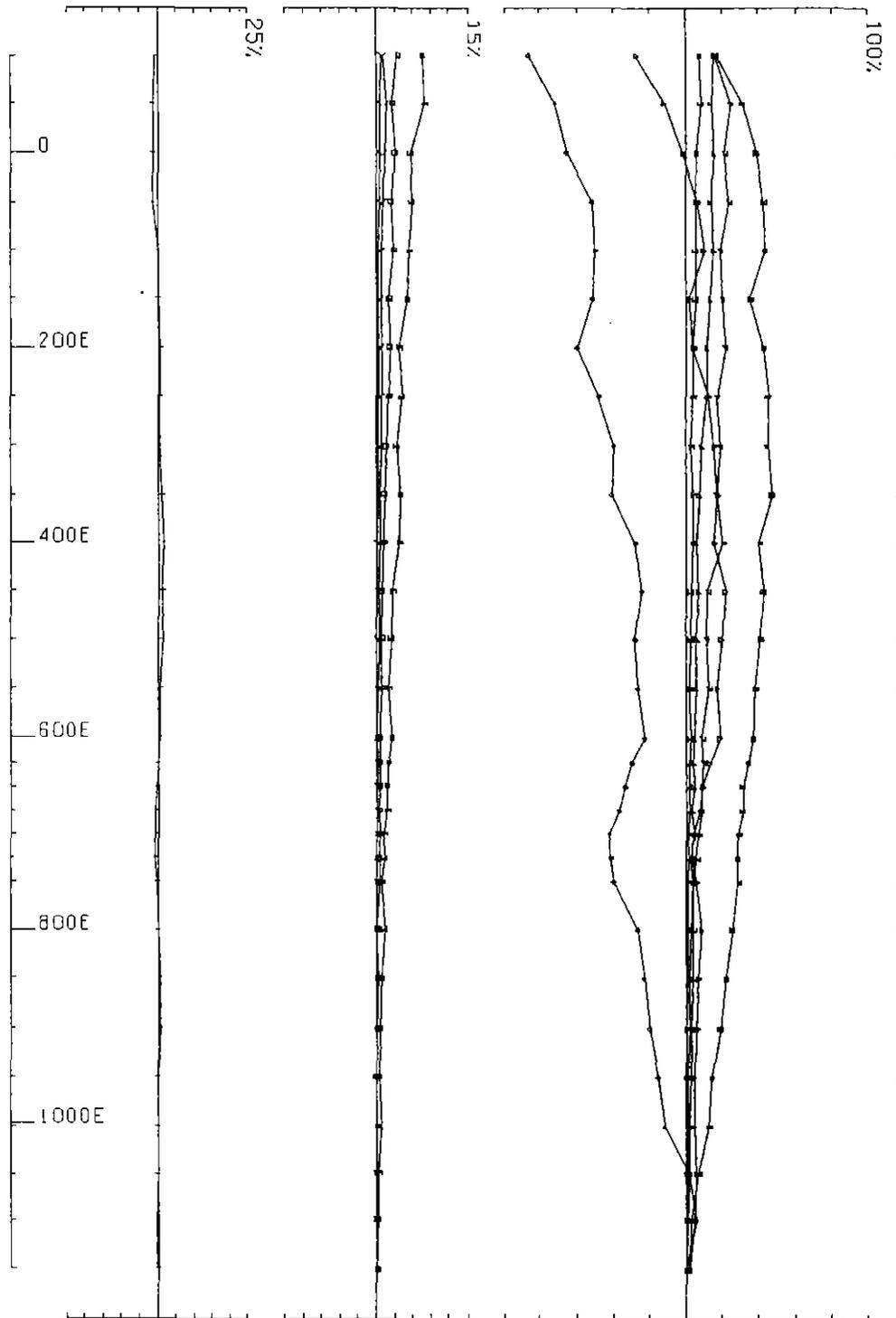
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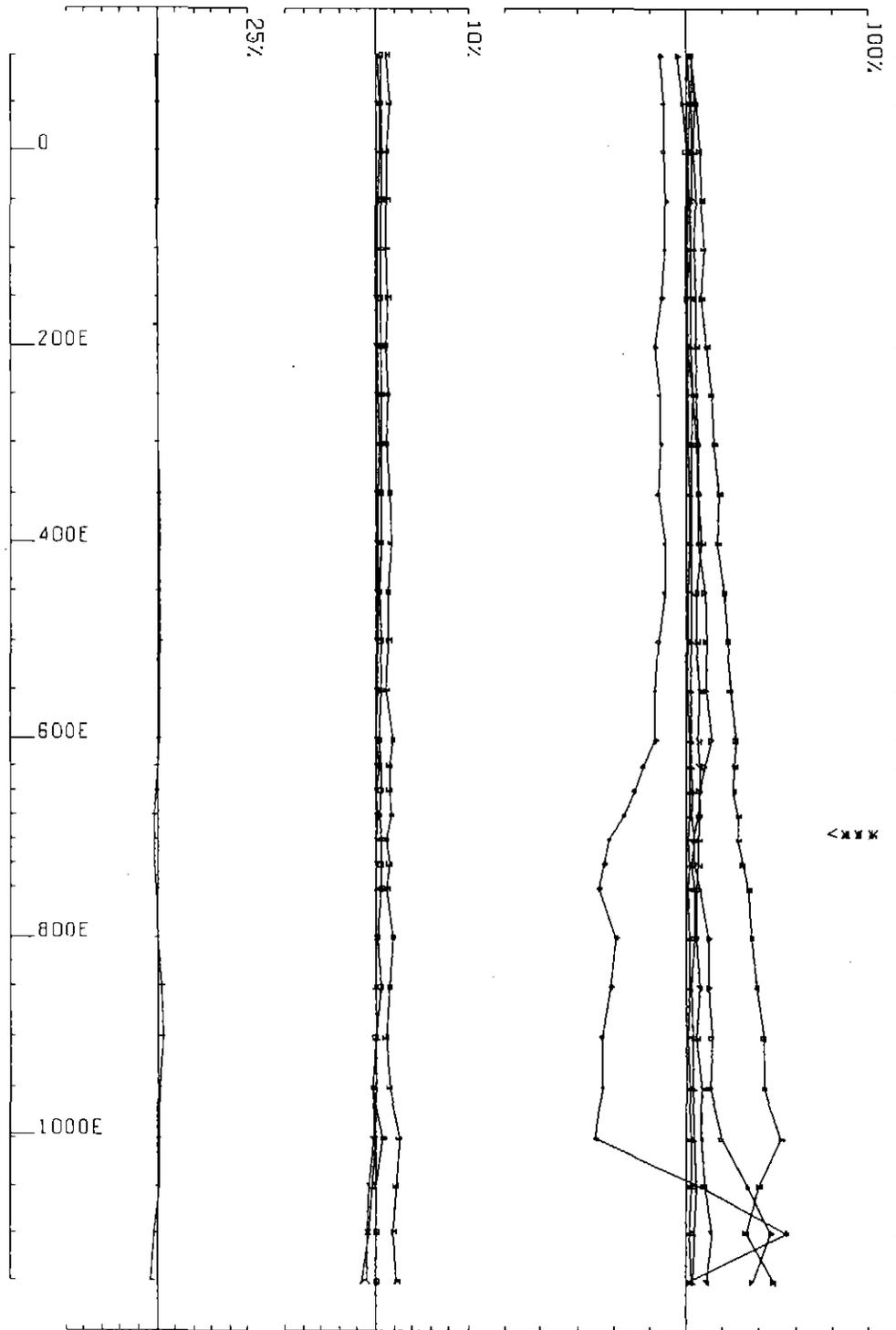
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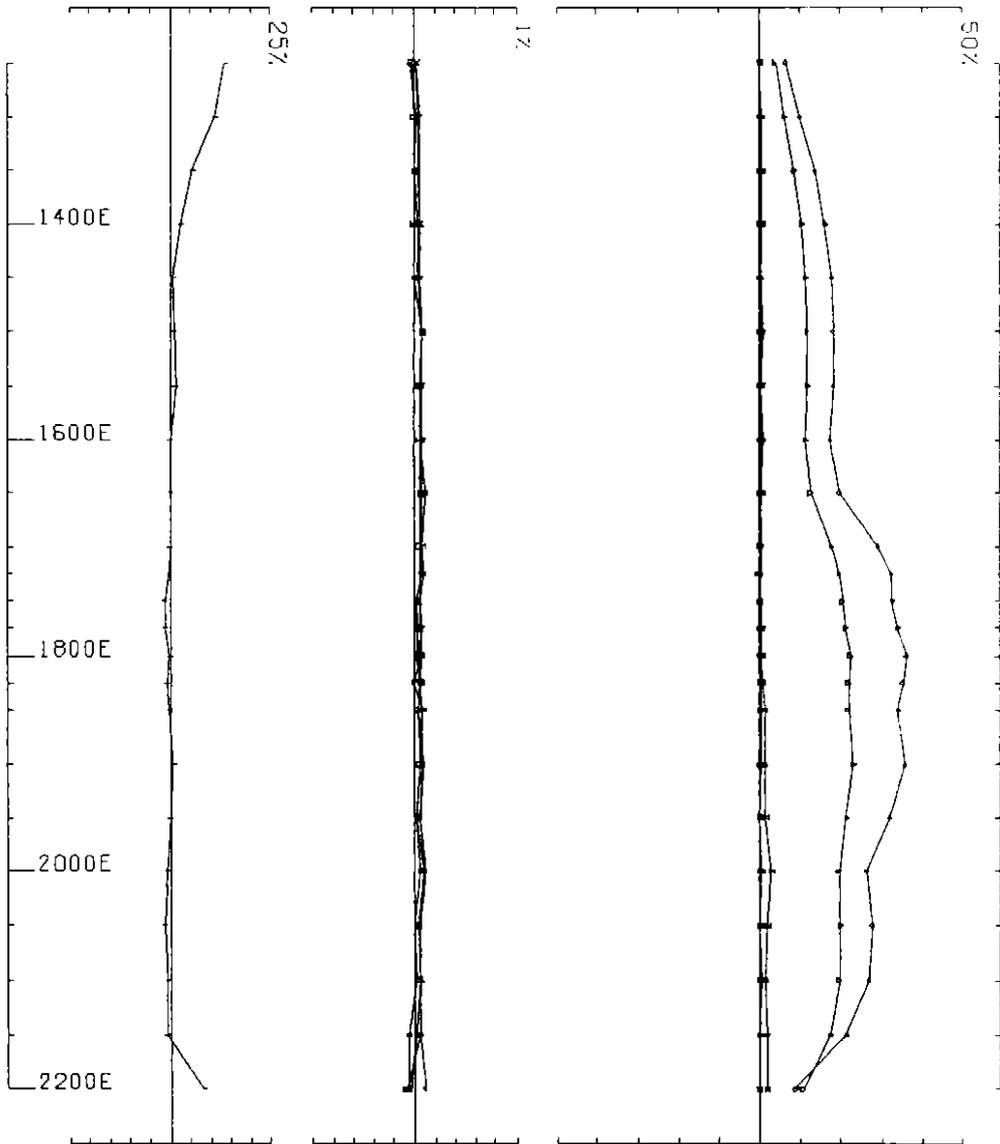
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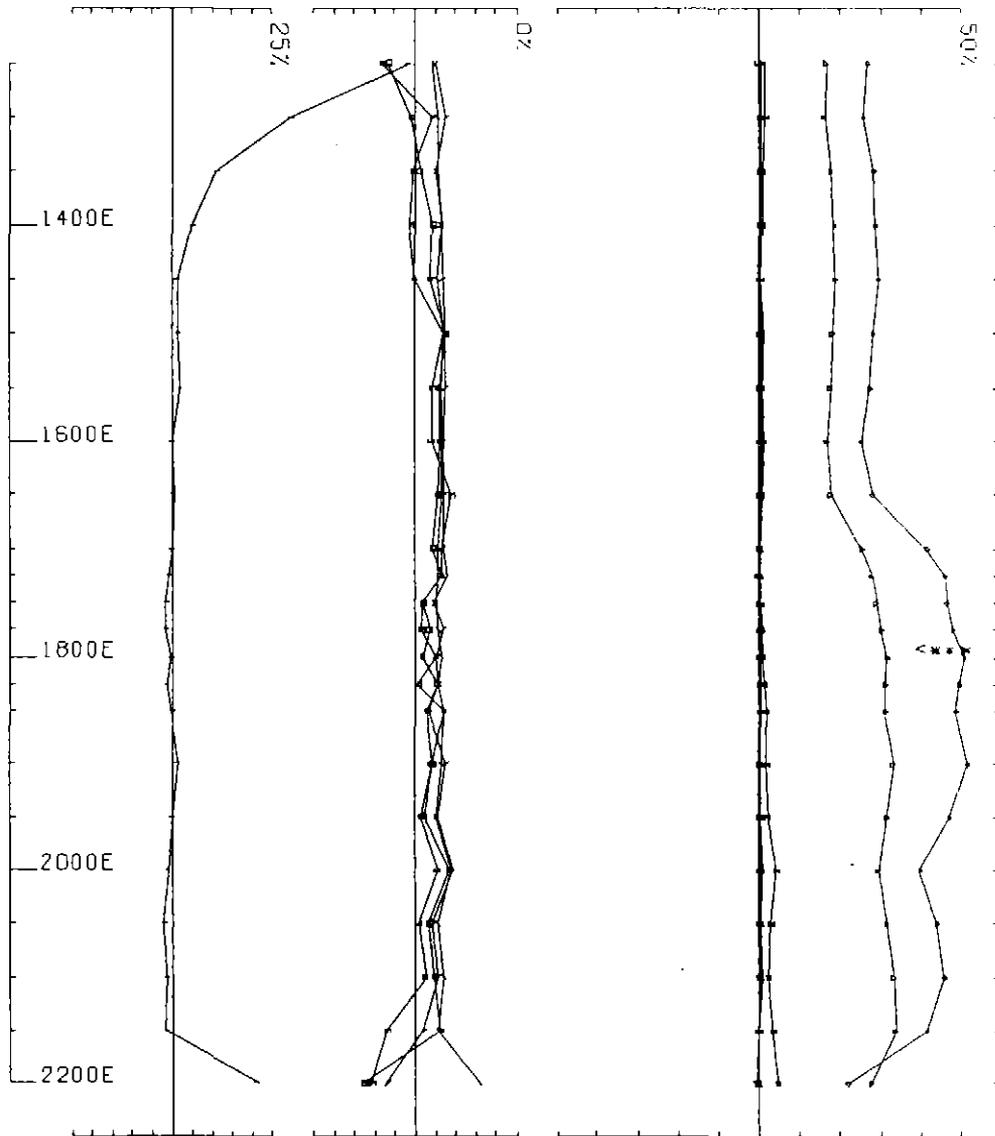
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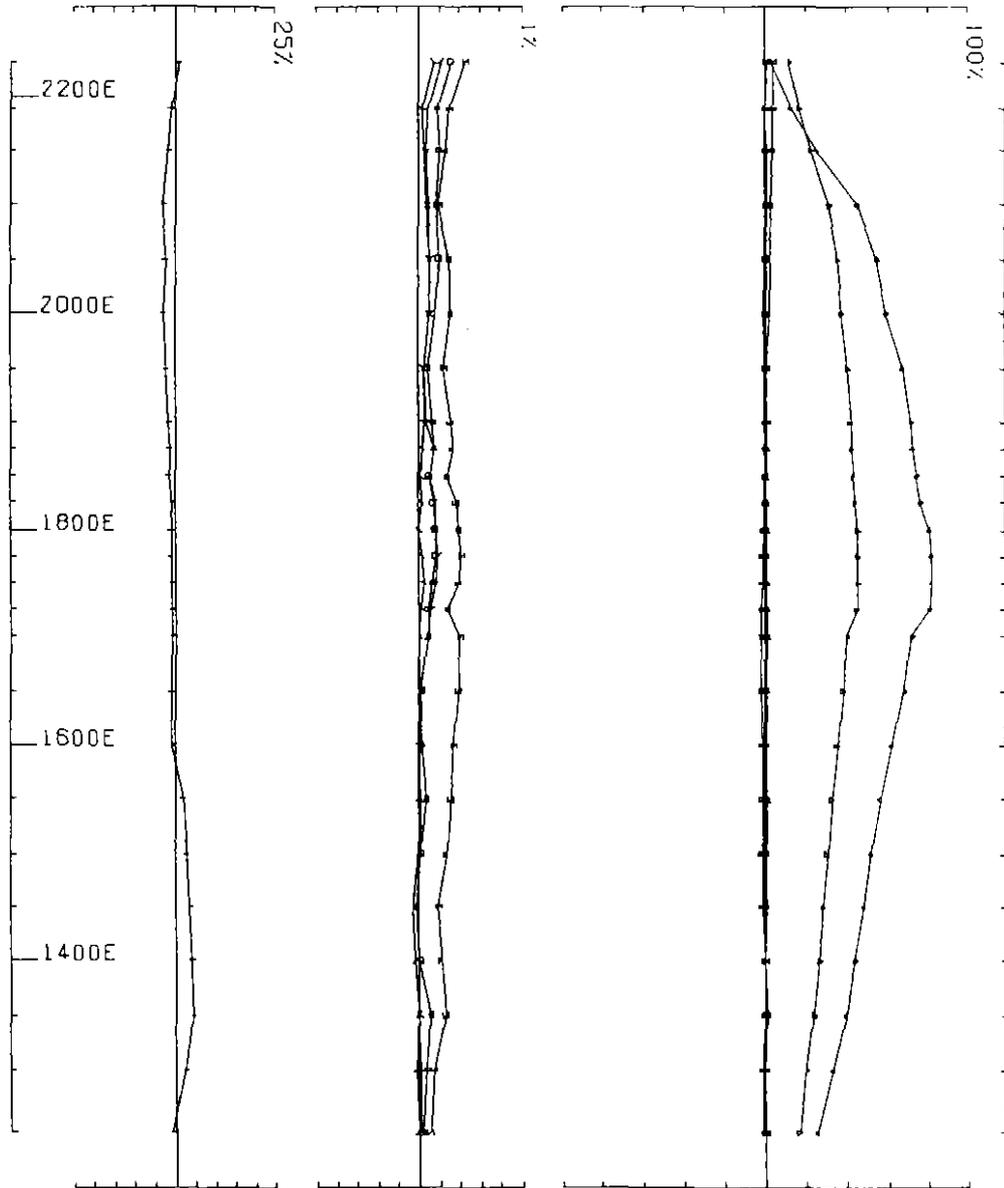
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 LOOP NO 190 LINE 22000 N COMPONENT HZ SECONDARY FIELD CH1 POINT NORM.



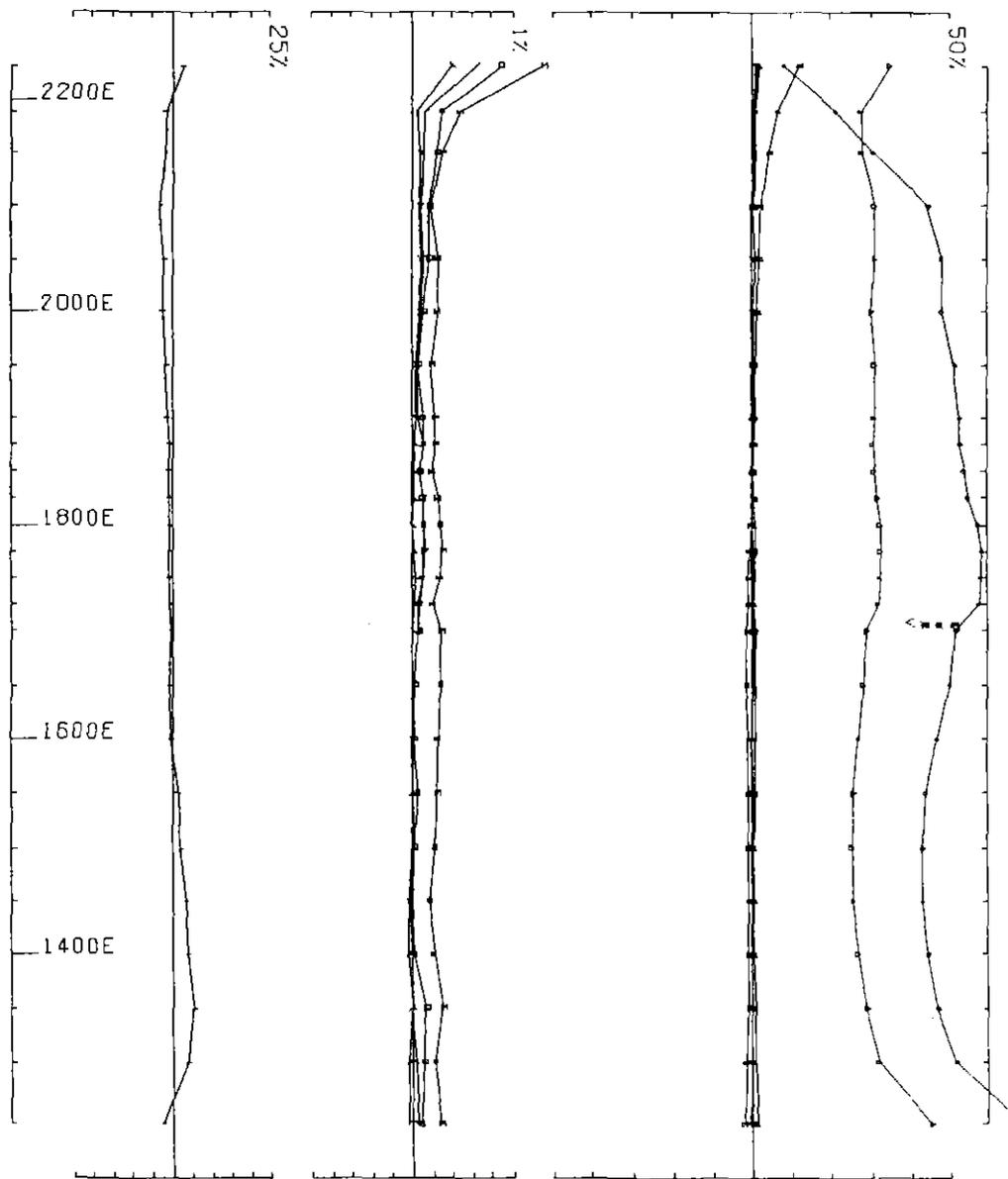
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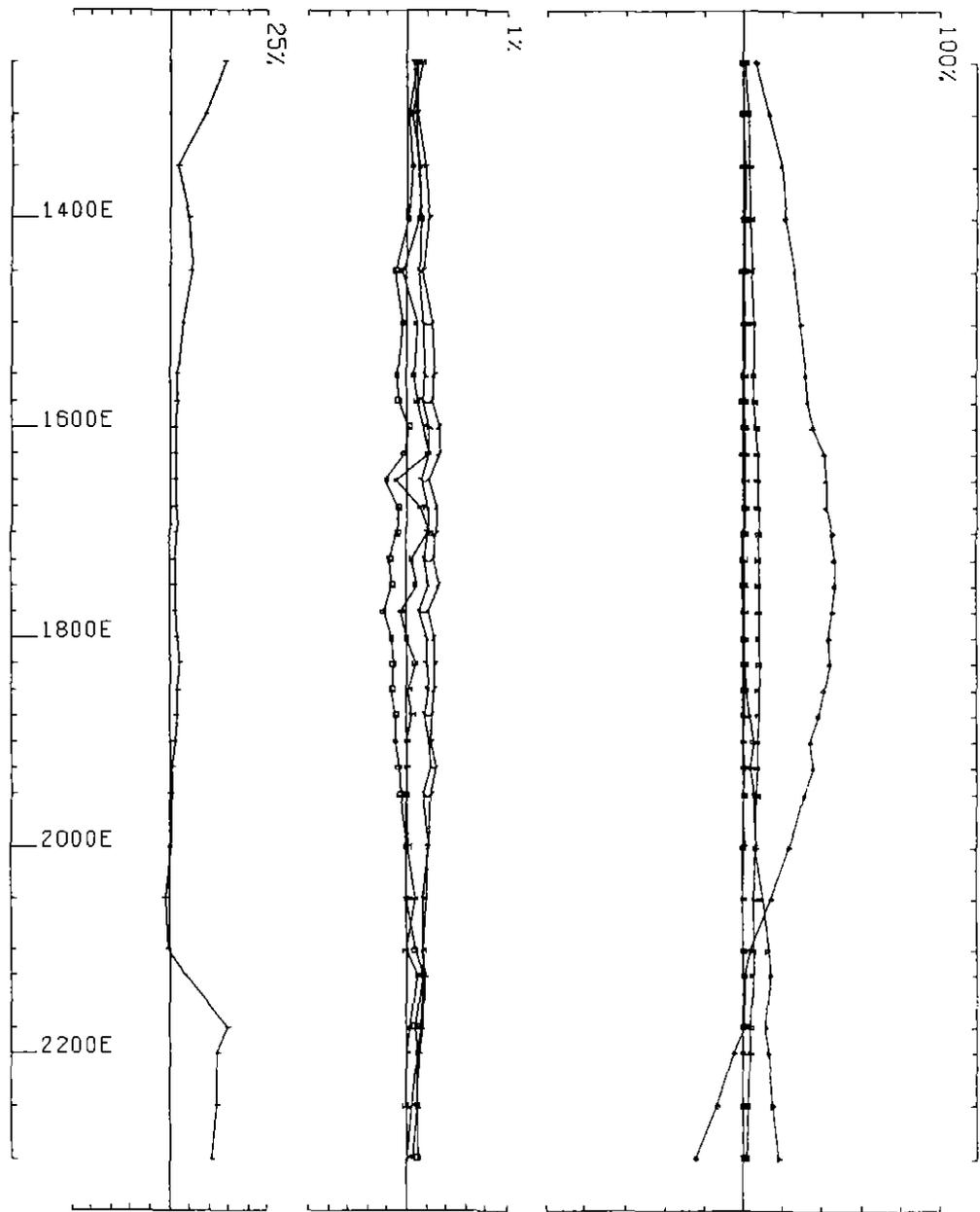
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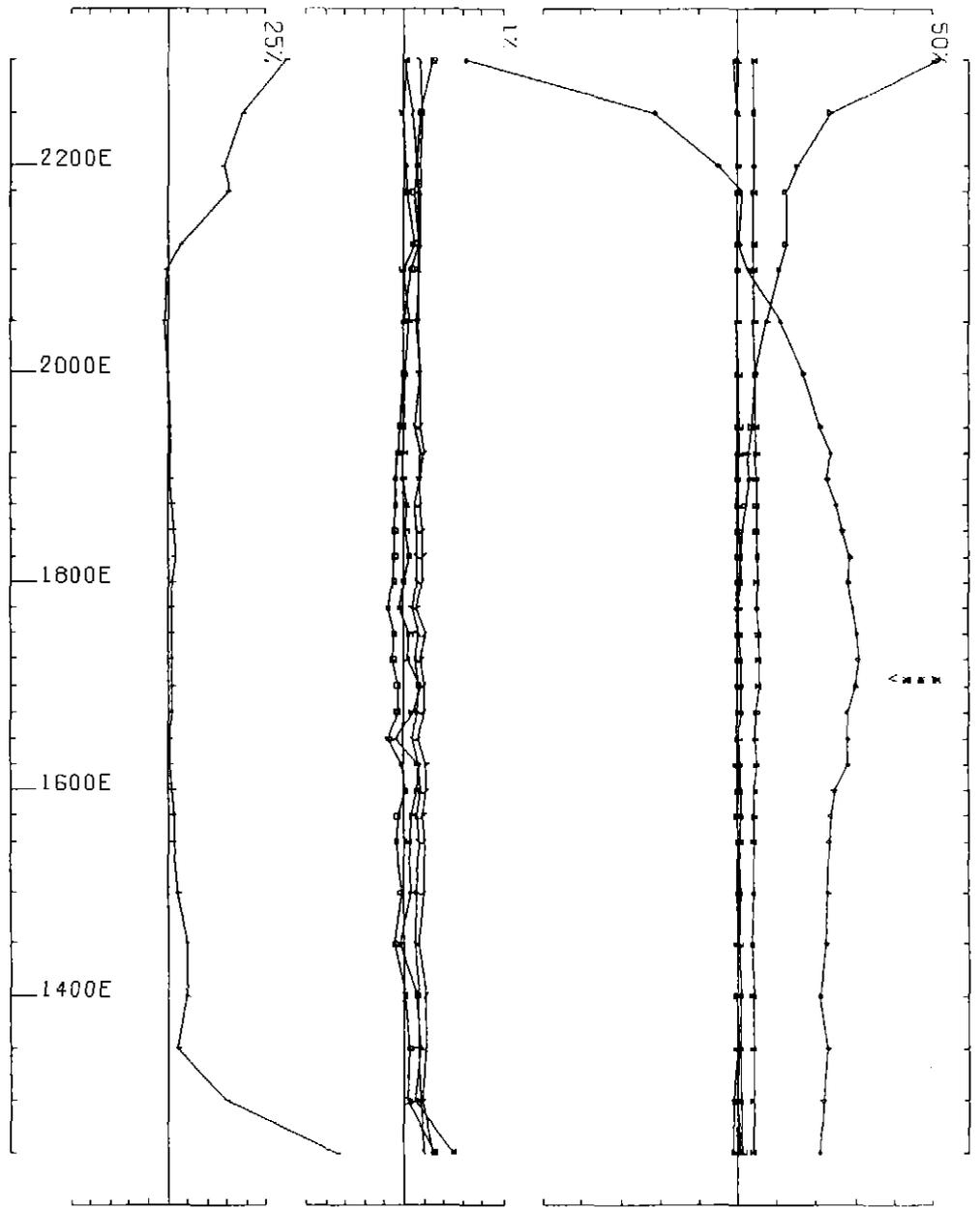
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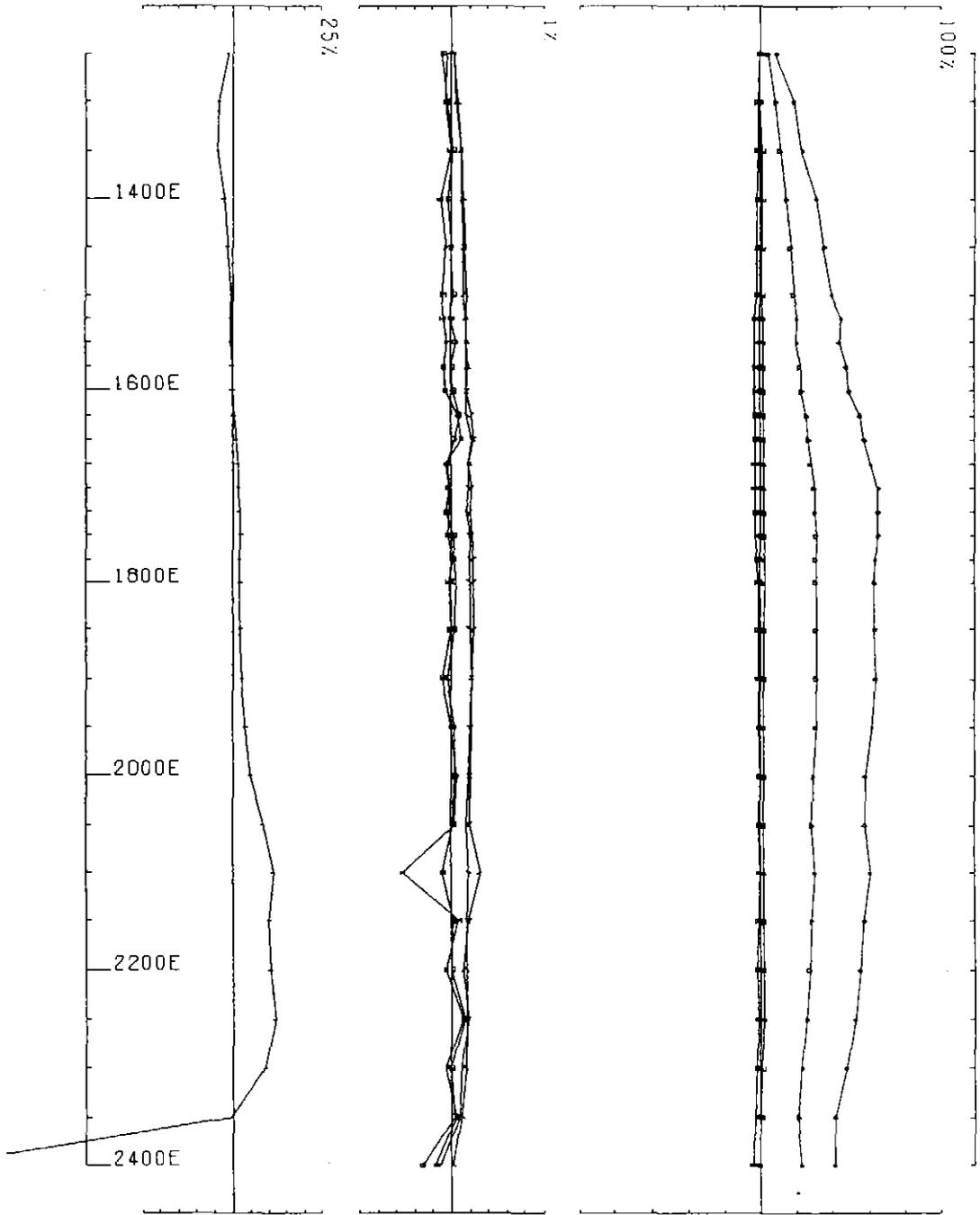
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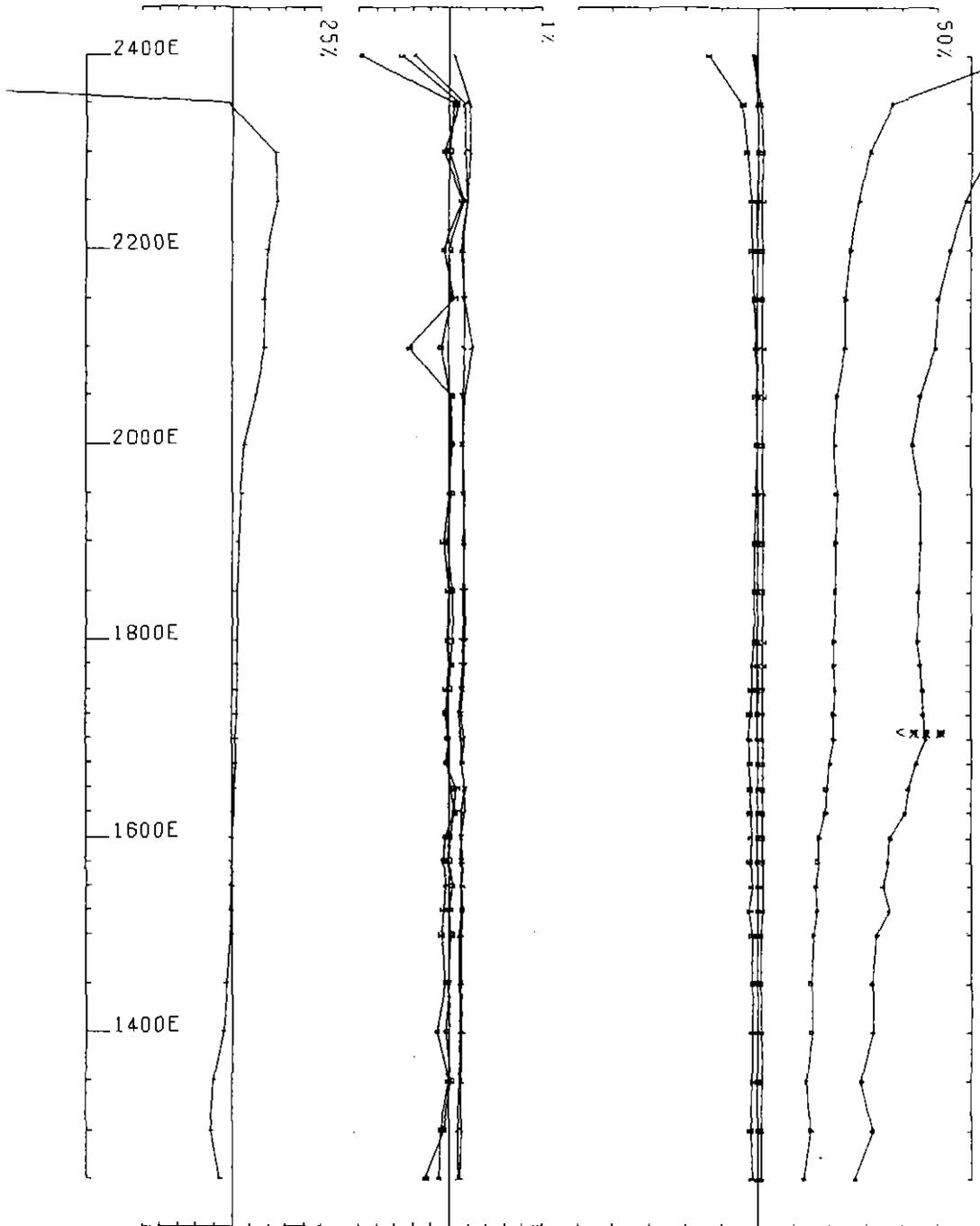
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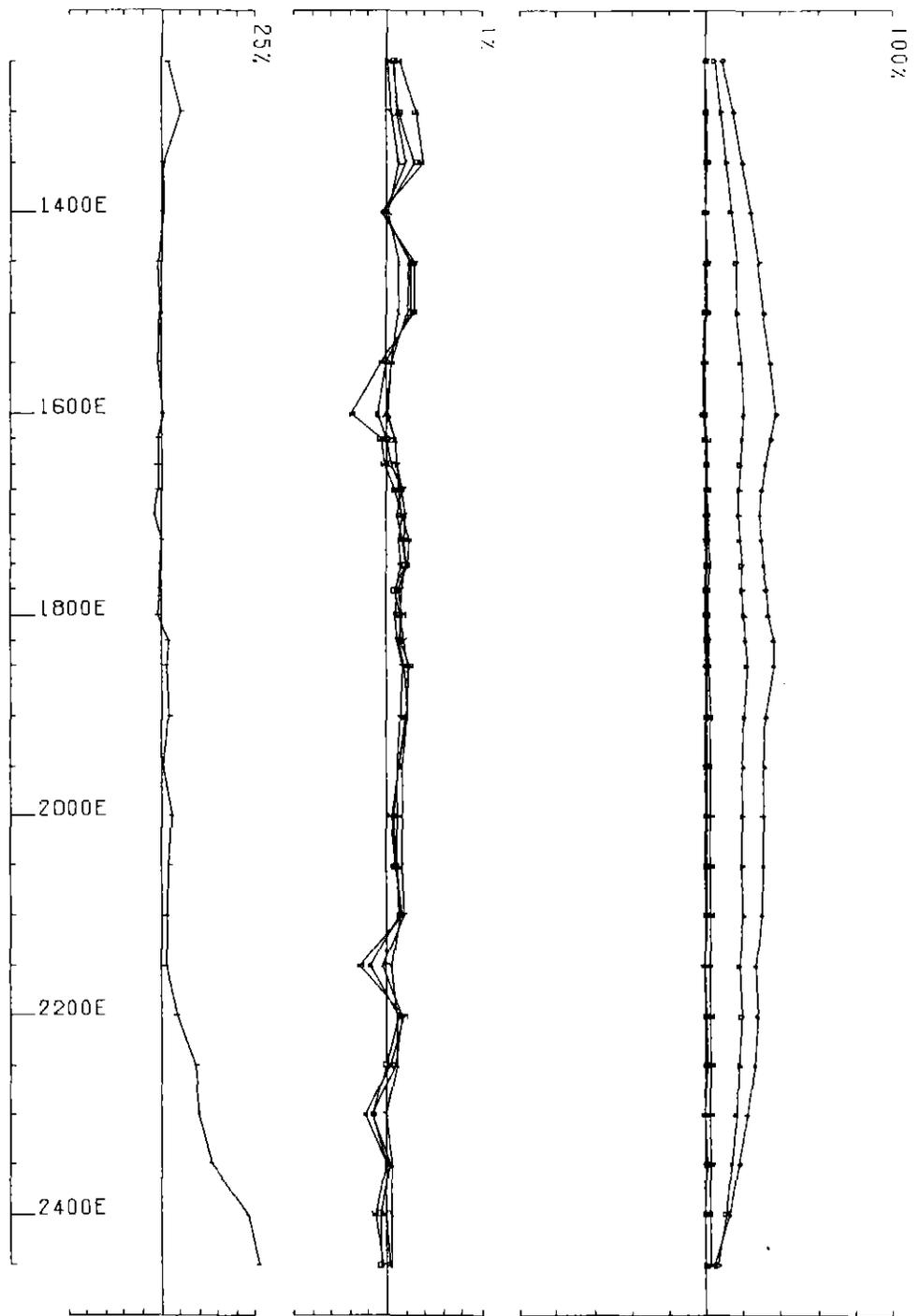
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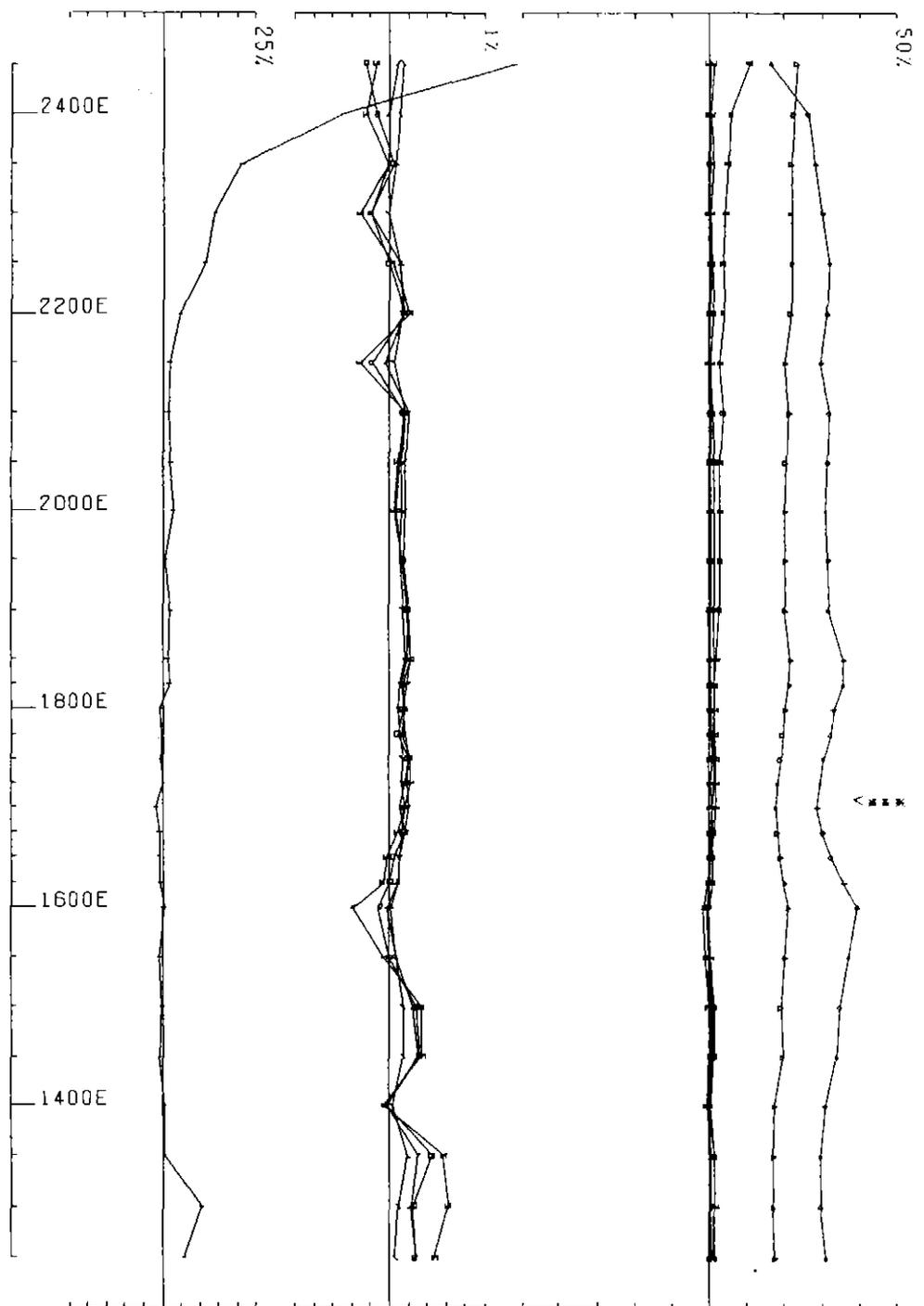
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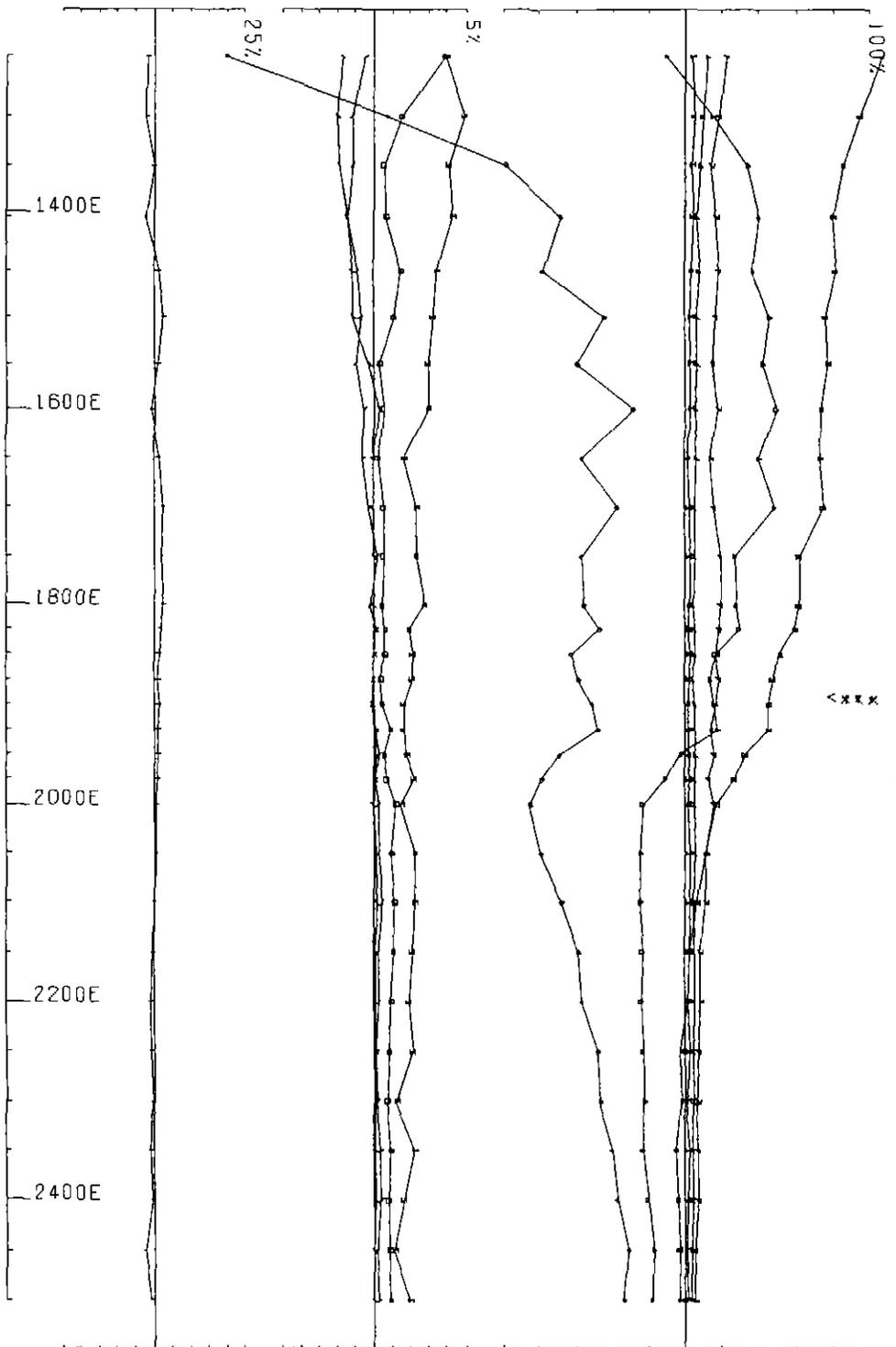
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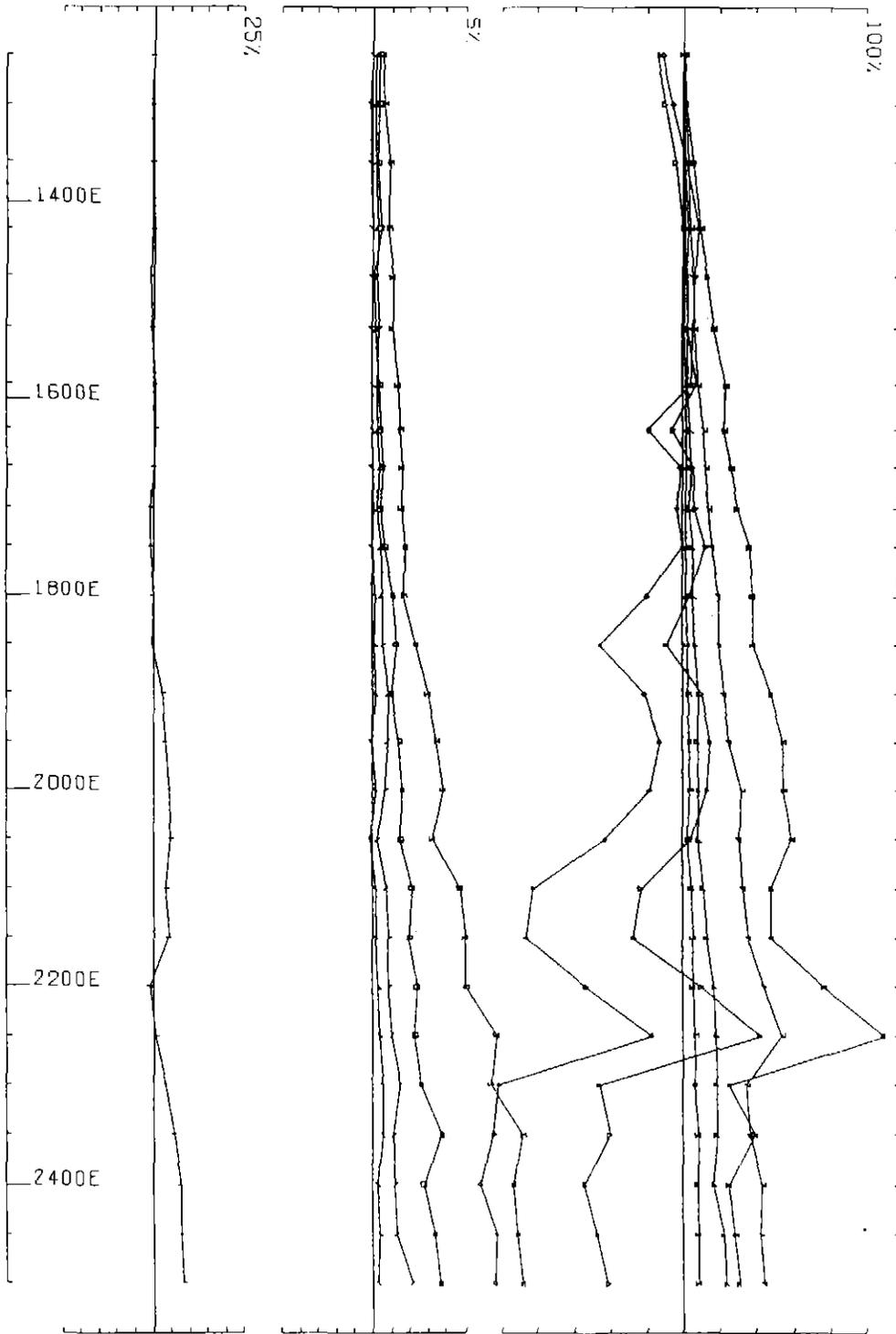
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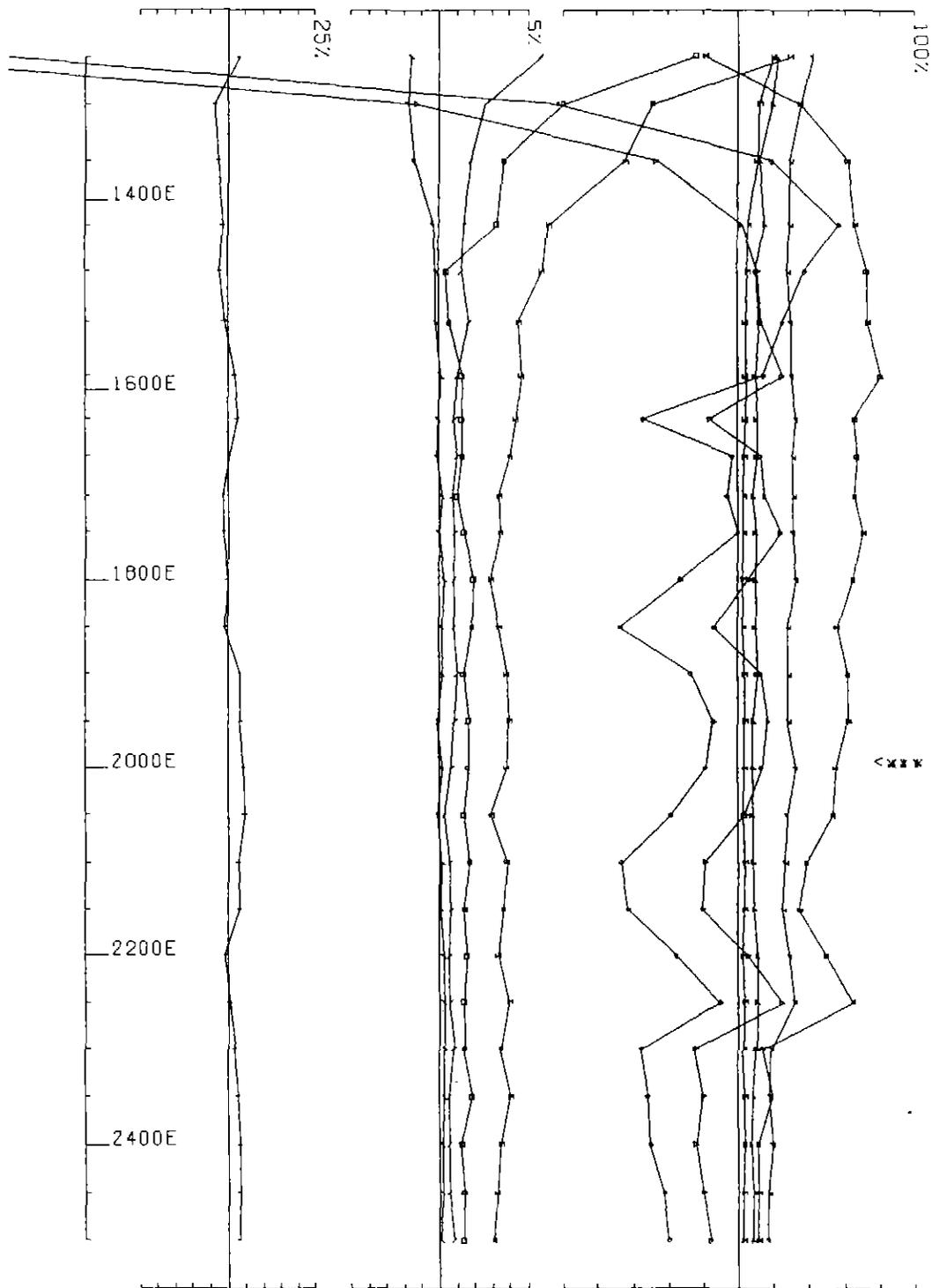
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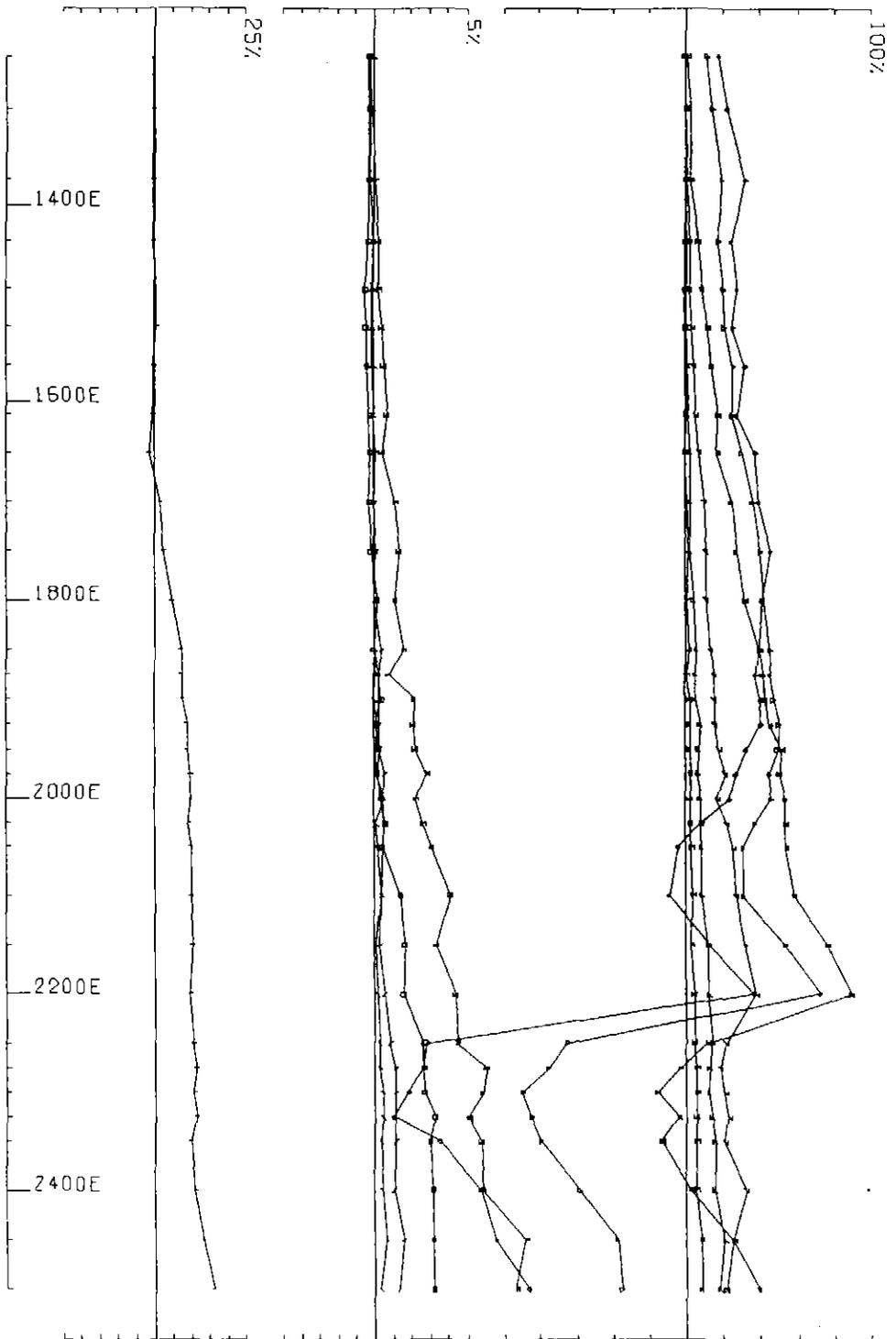
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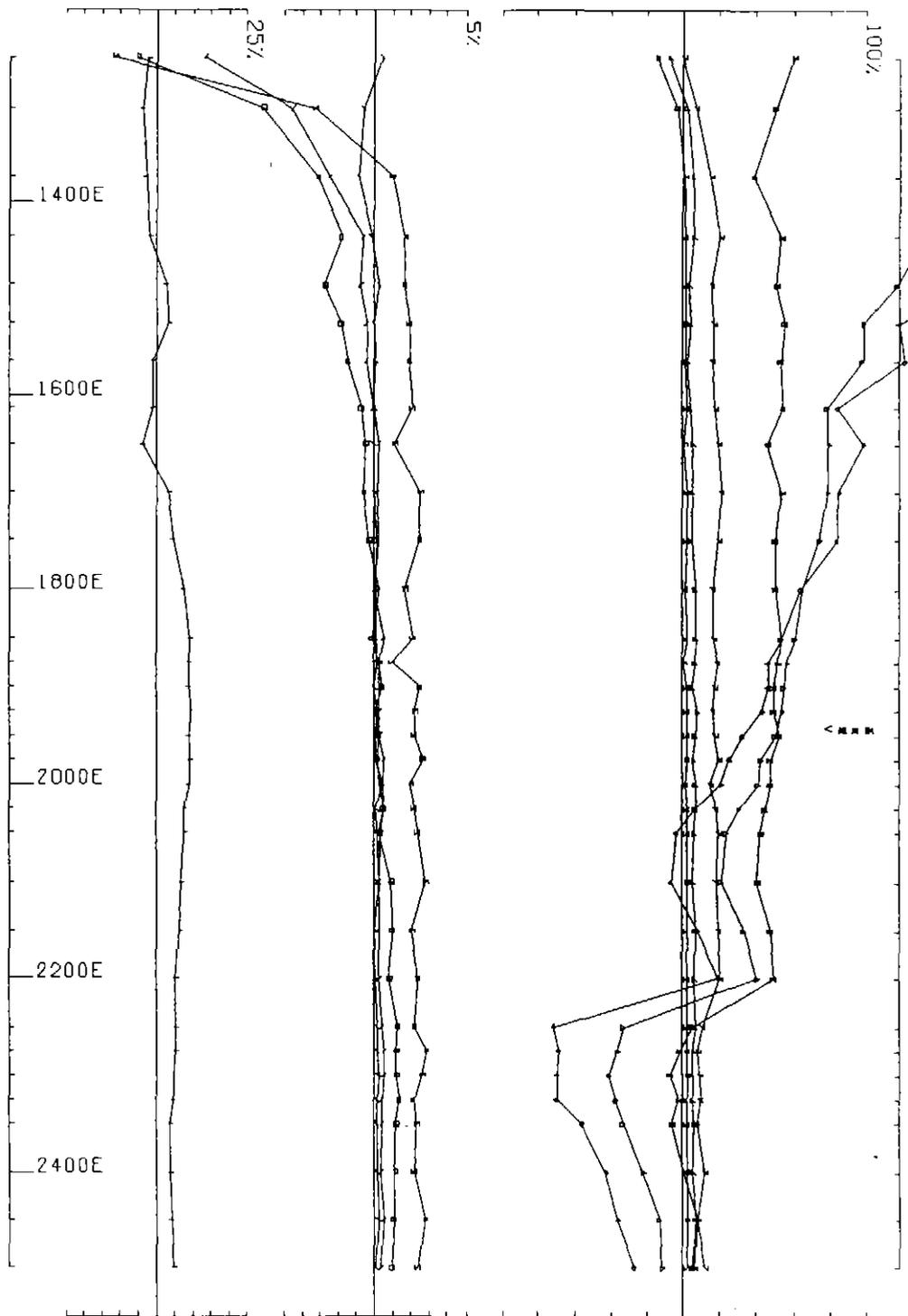
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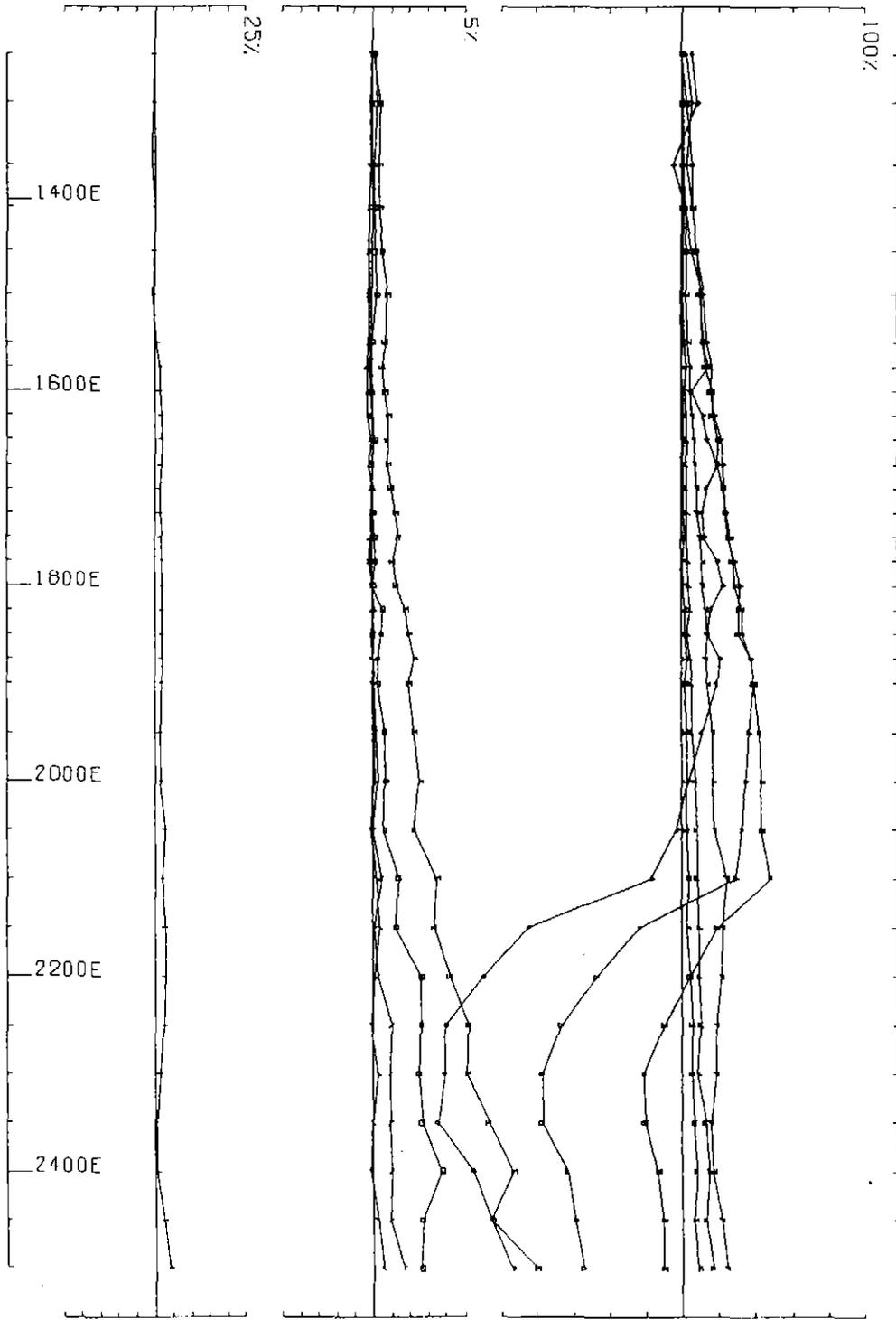
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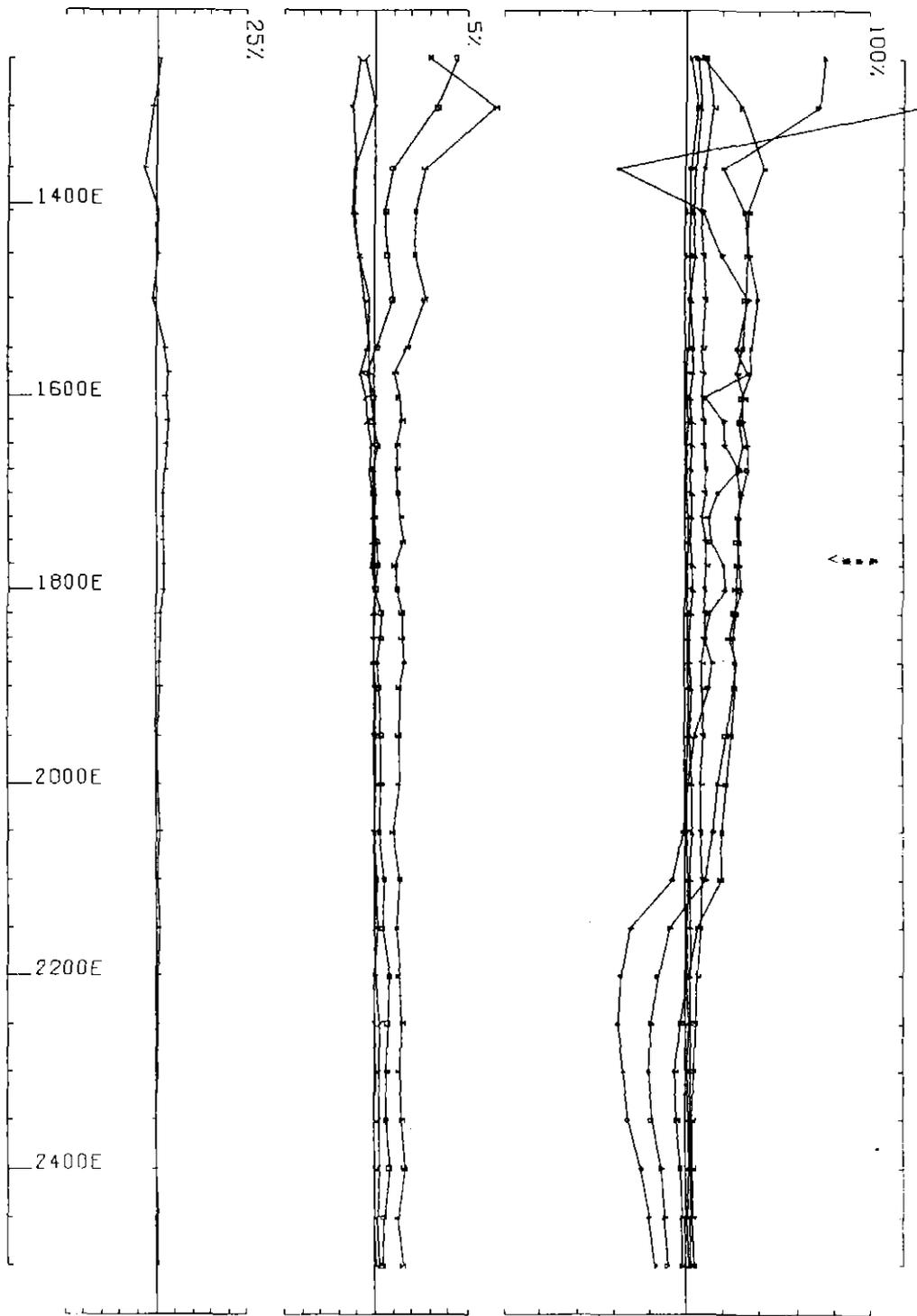
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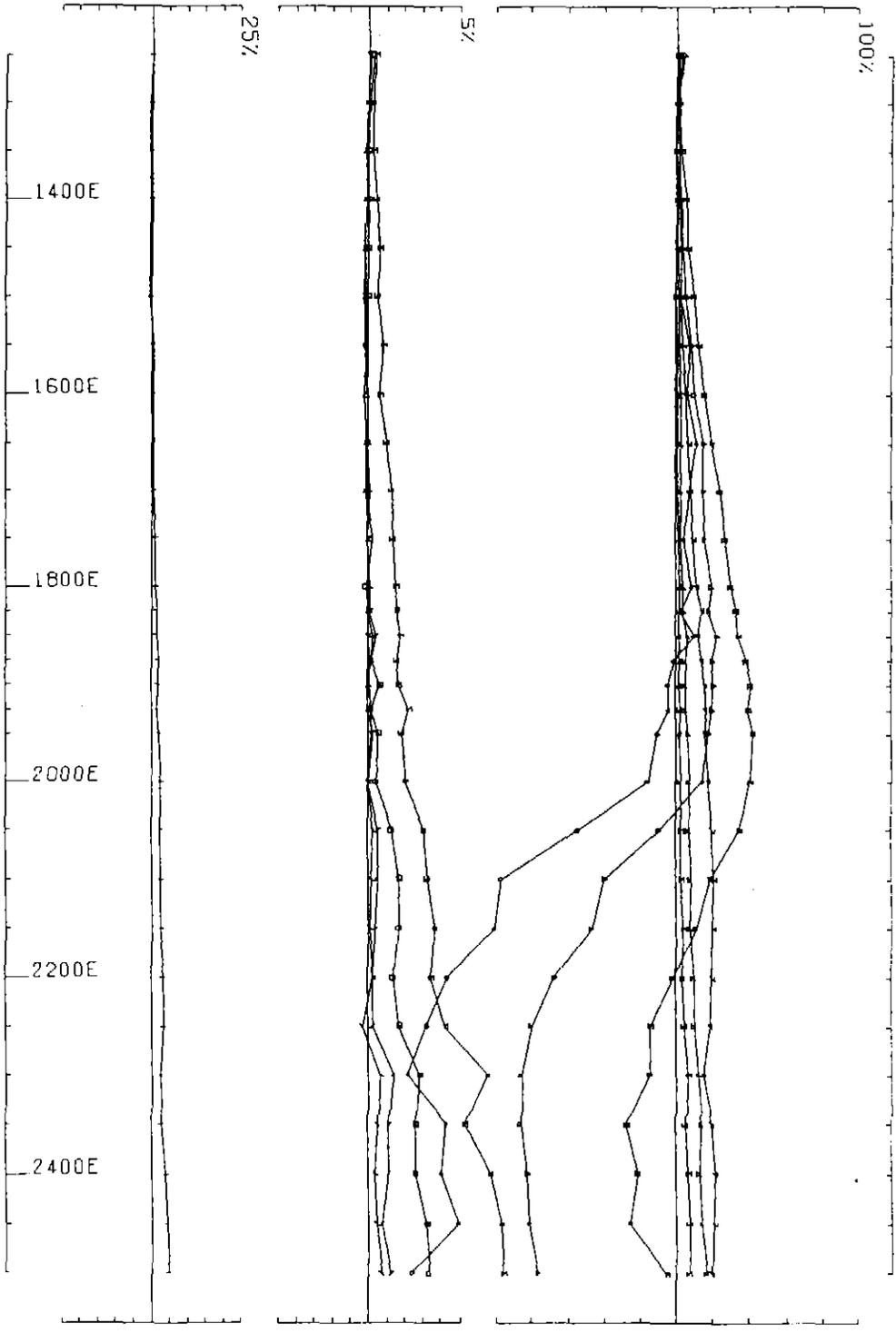
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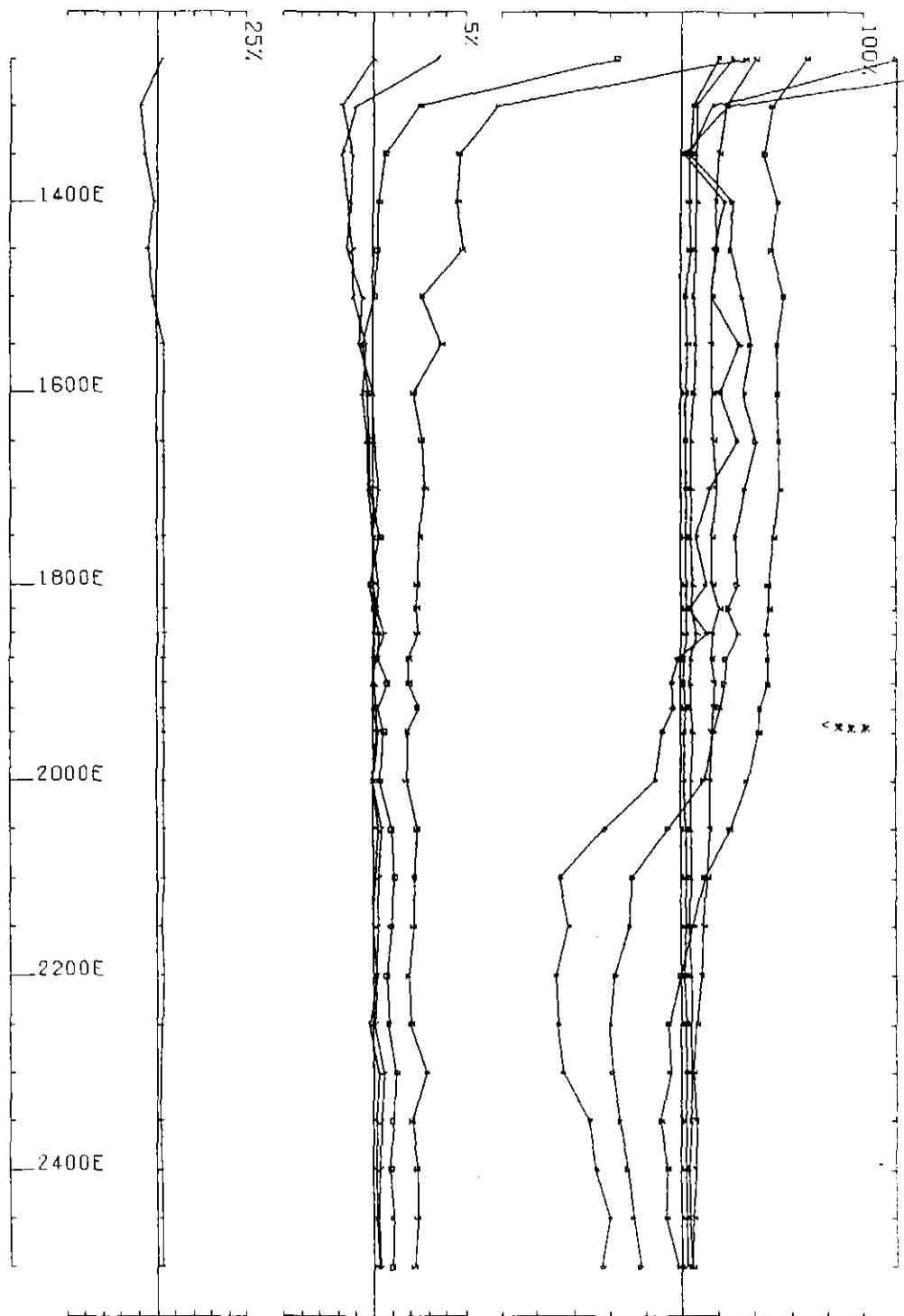
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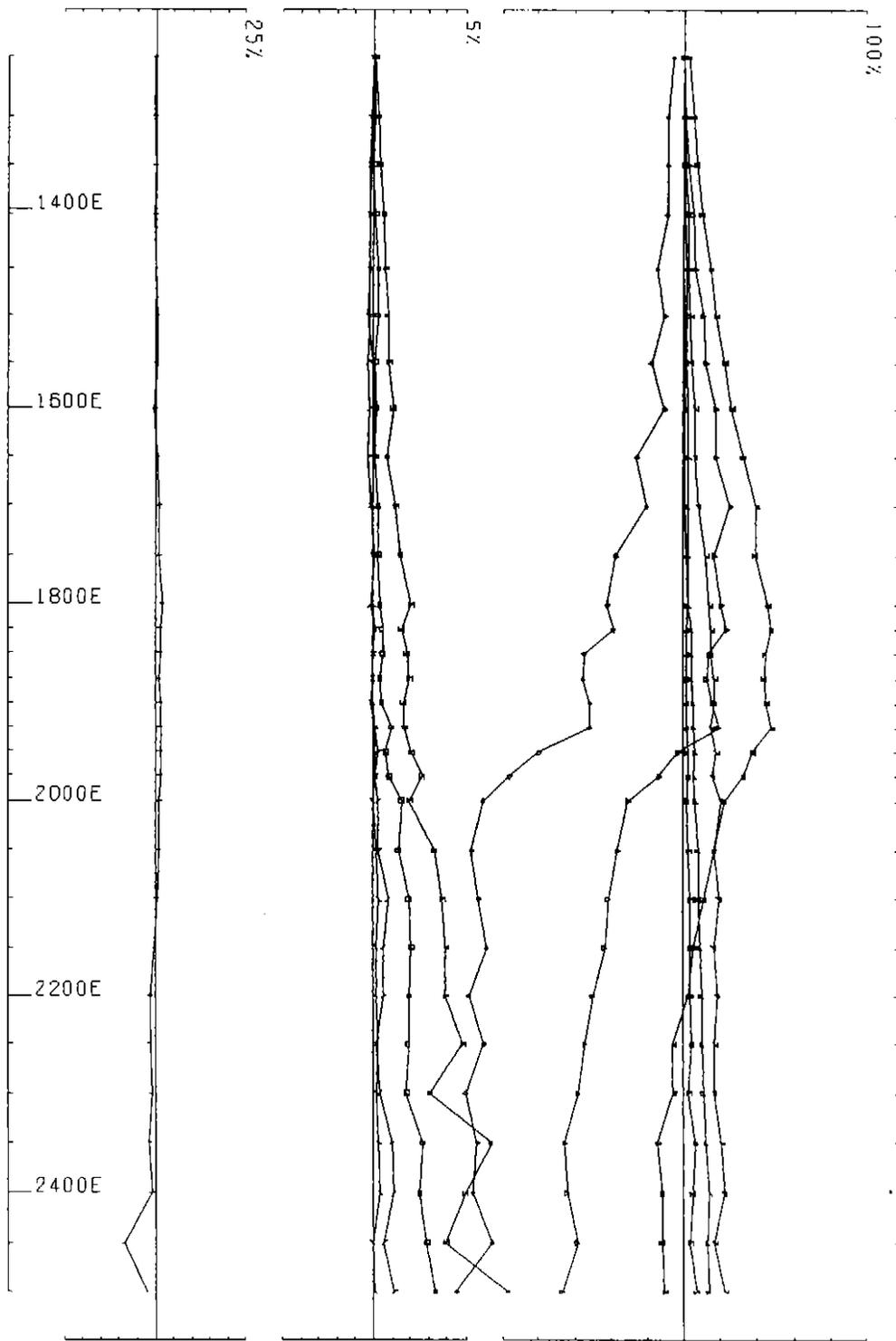
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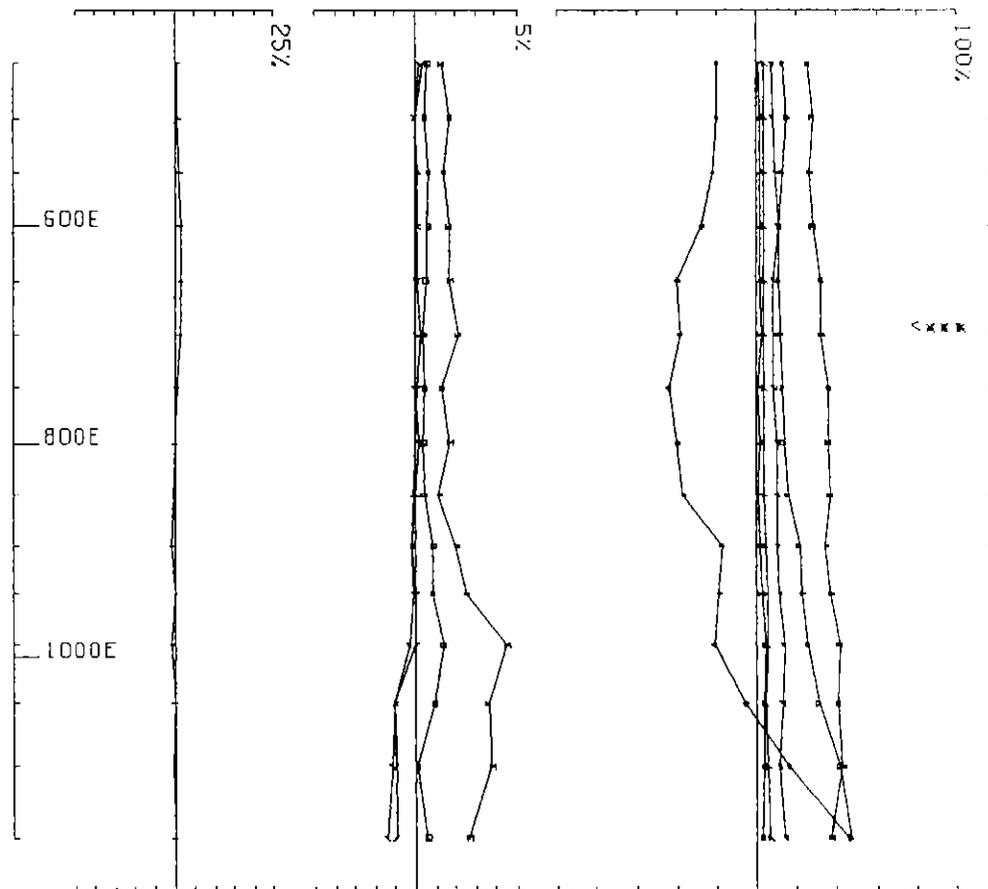
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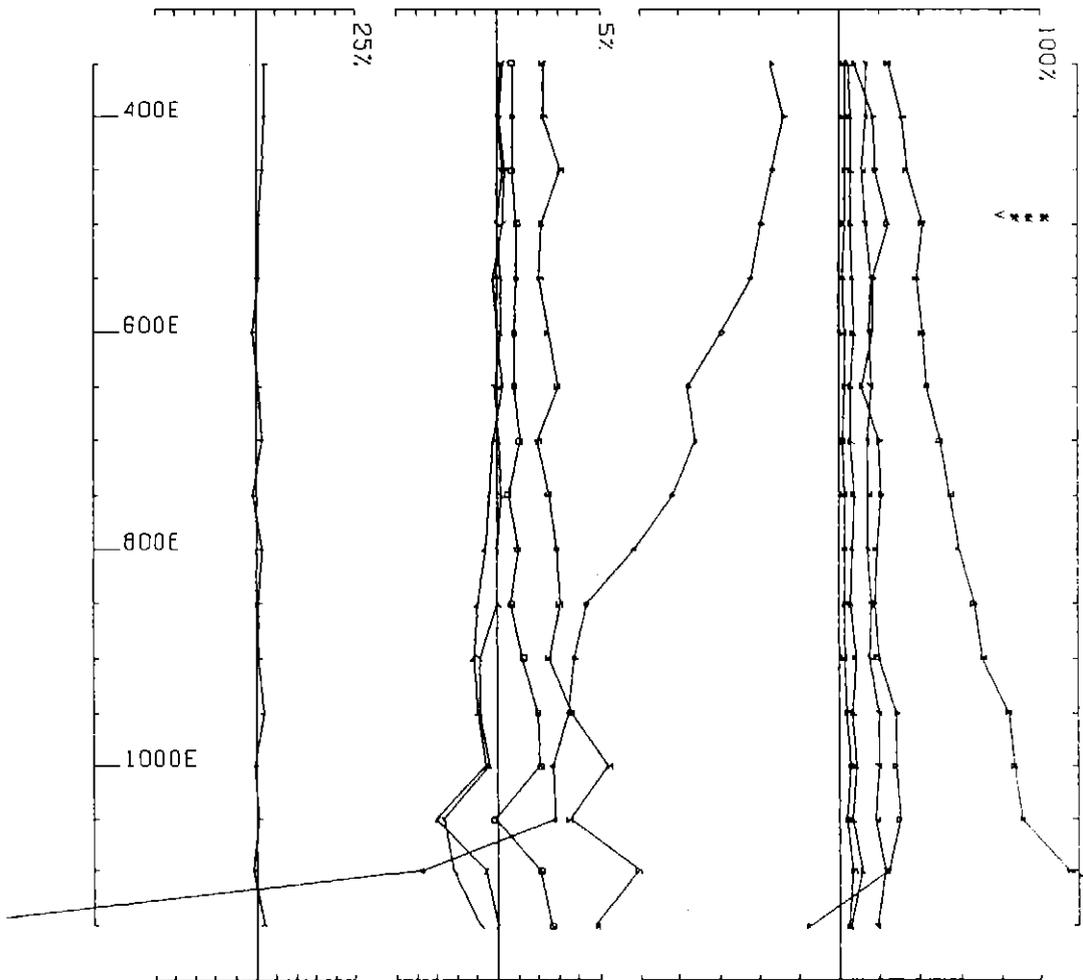


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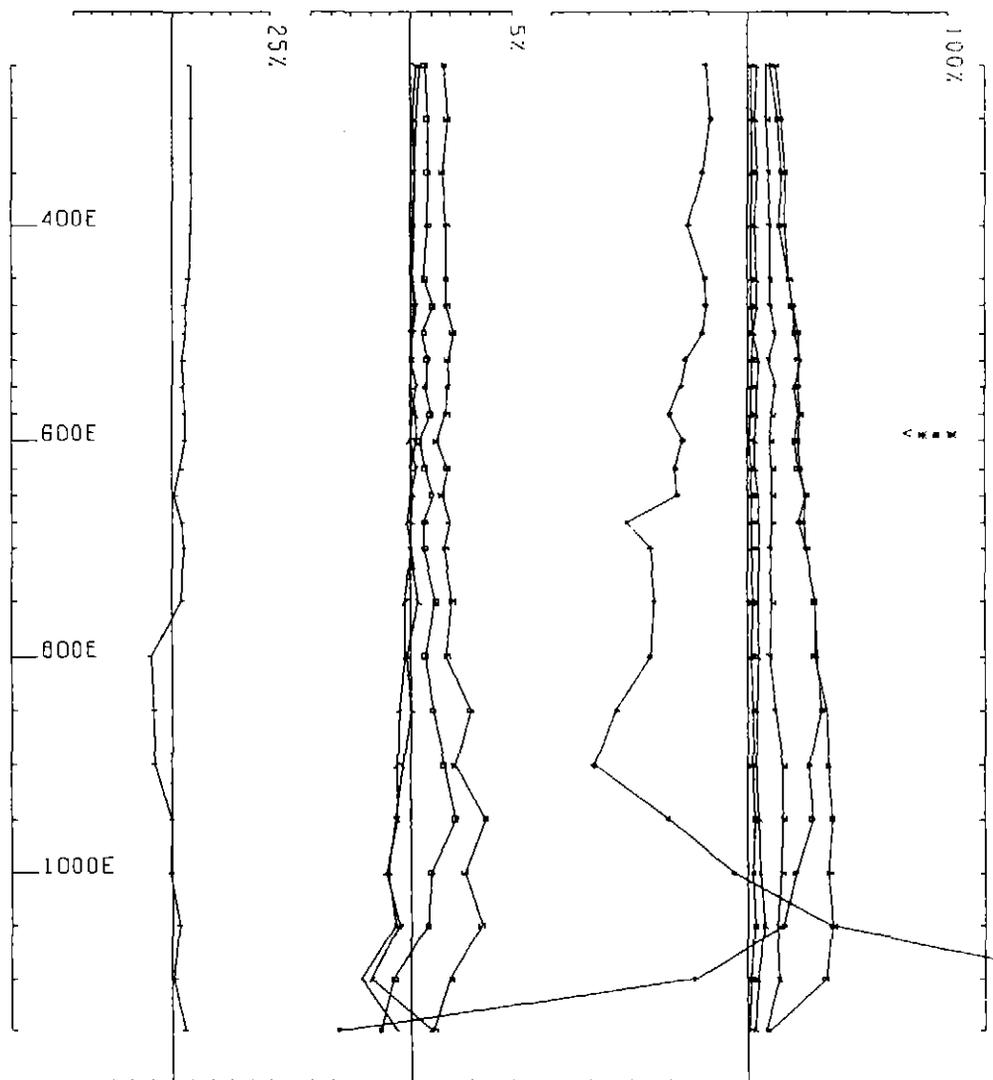


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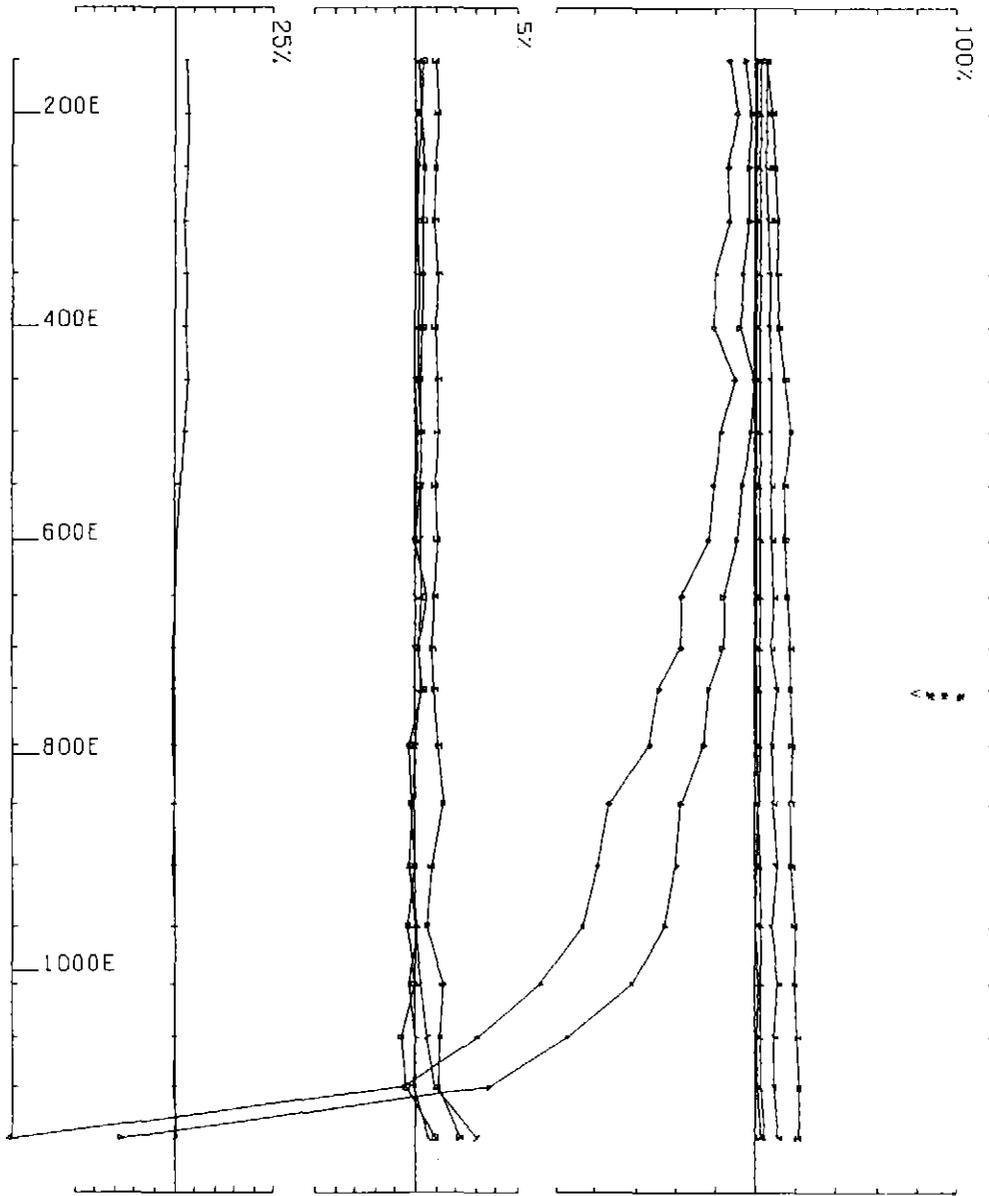
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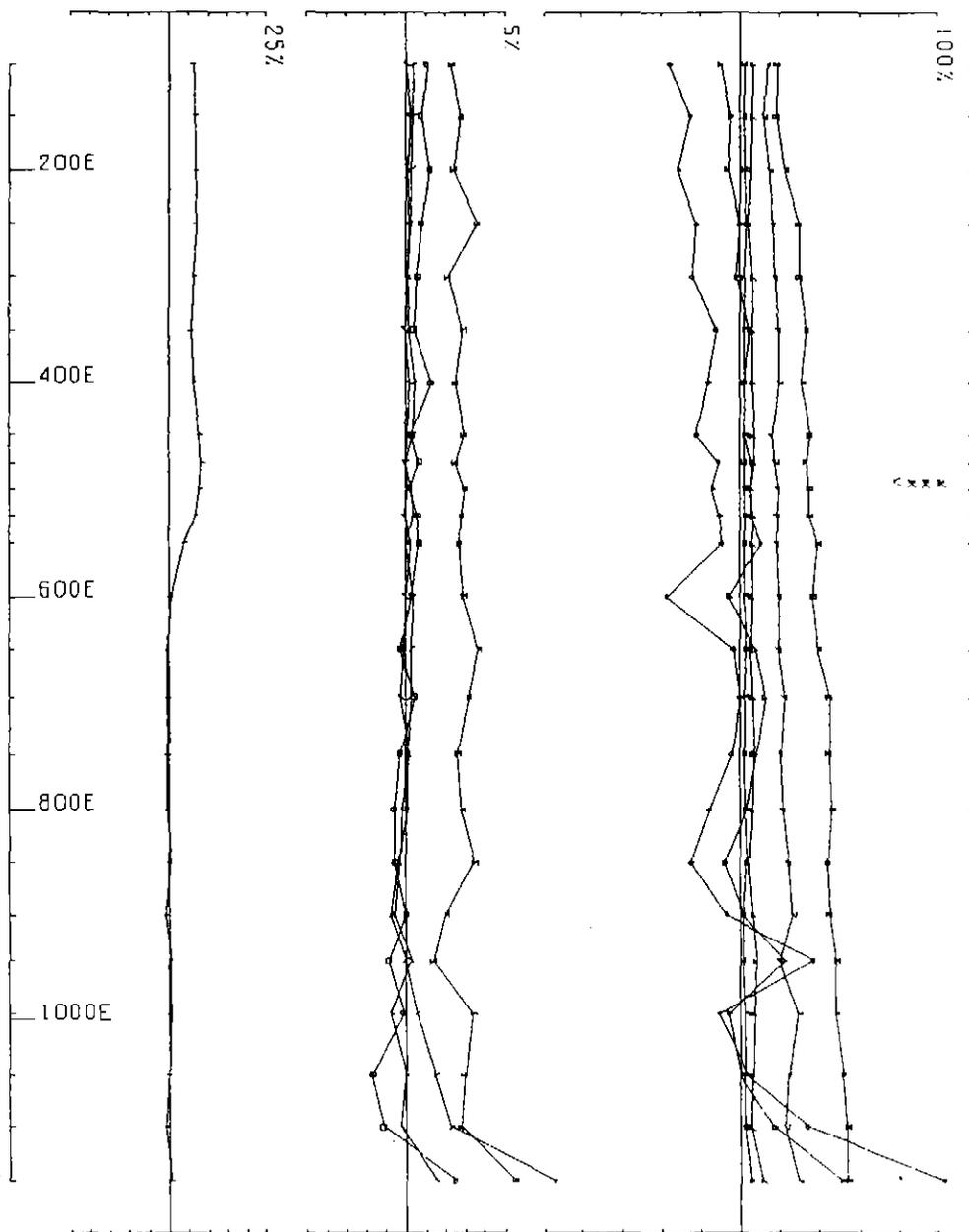
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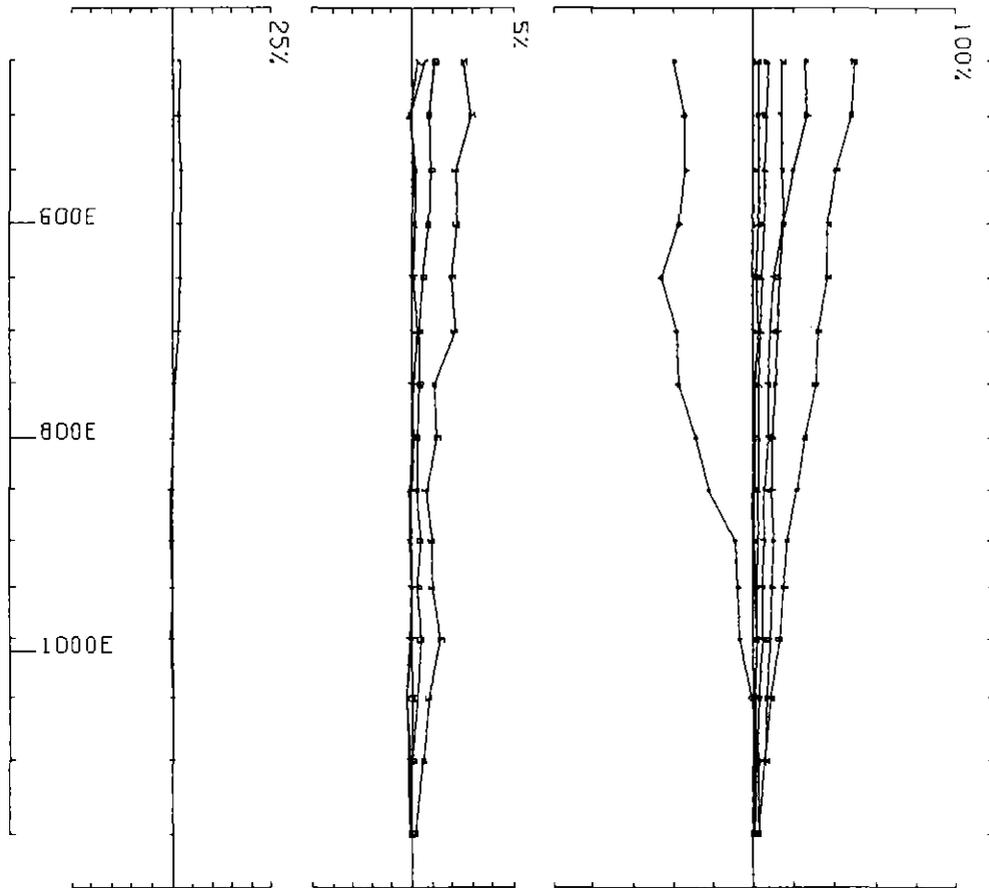
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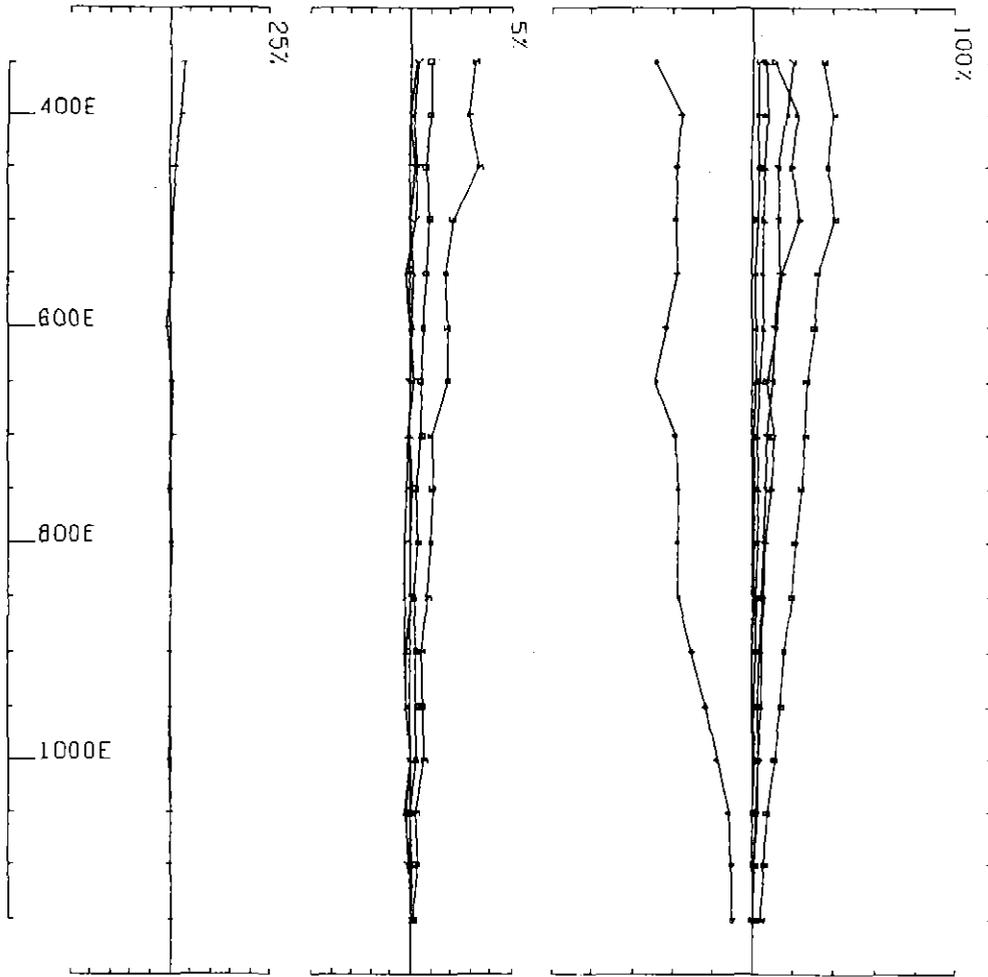
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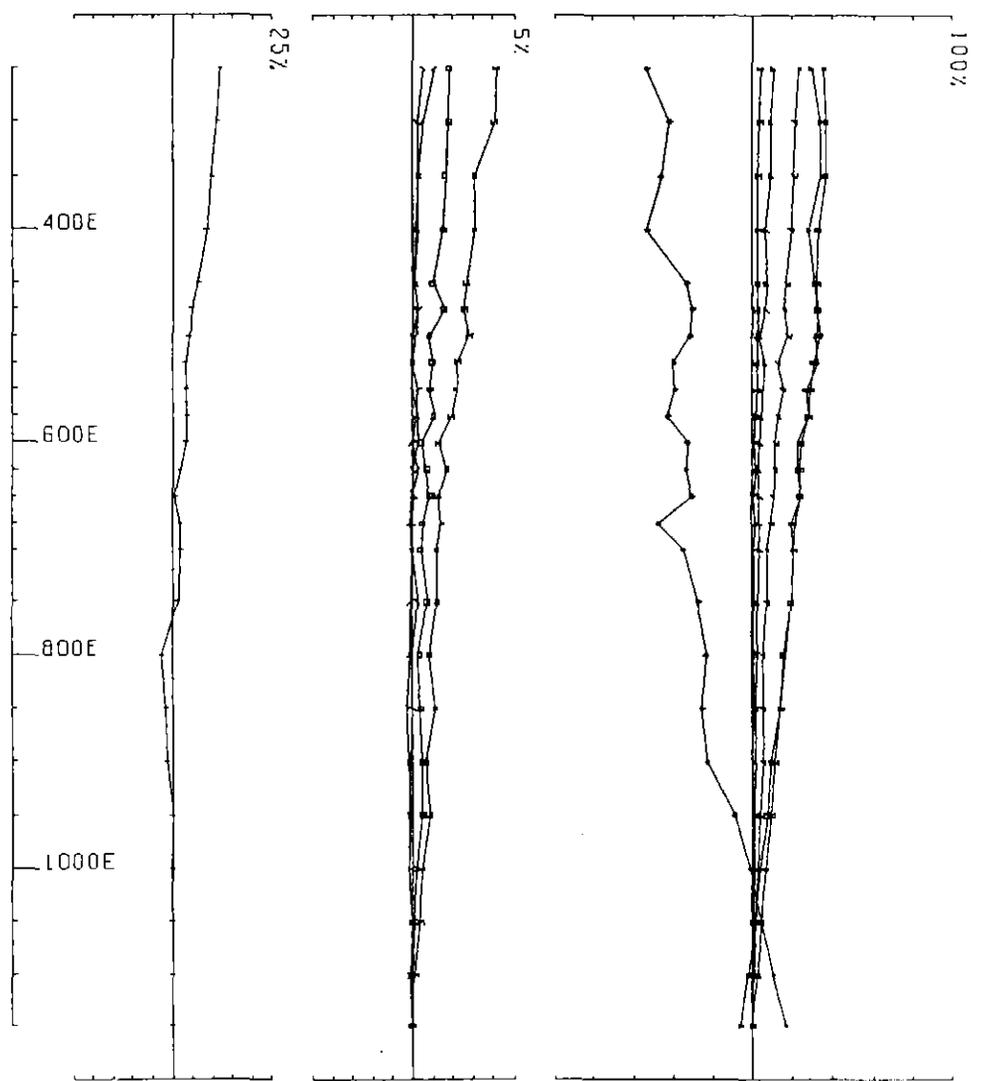
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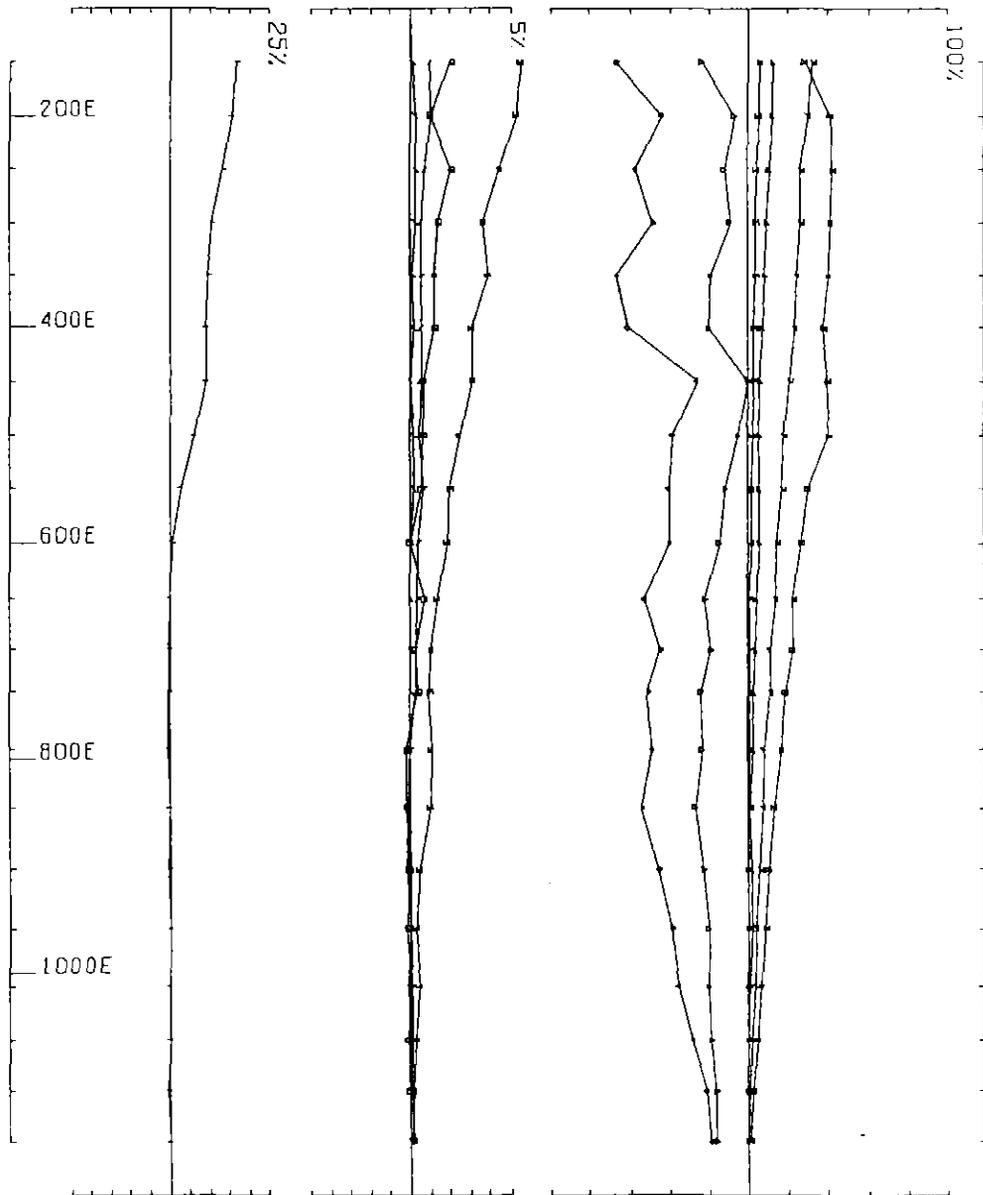
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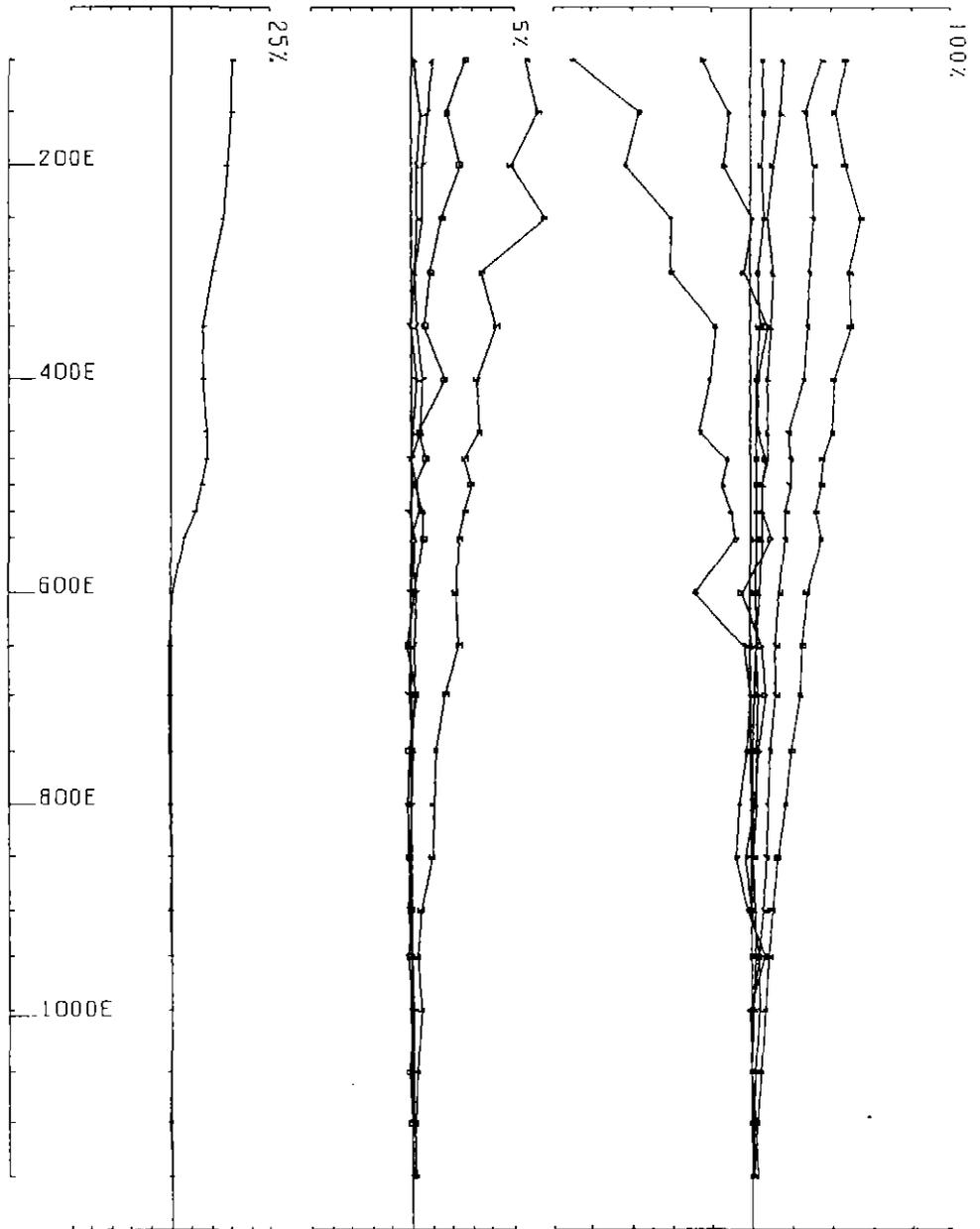
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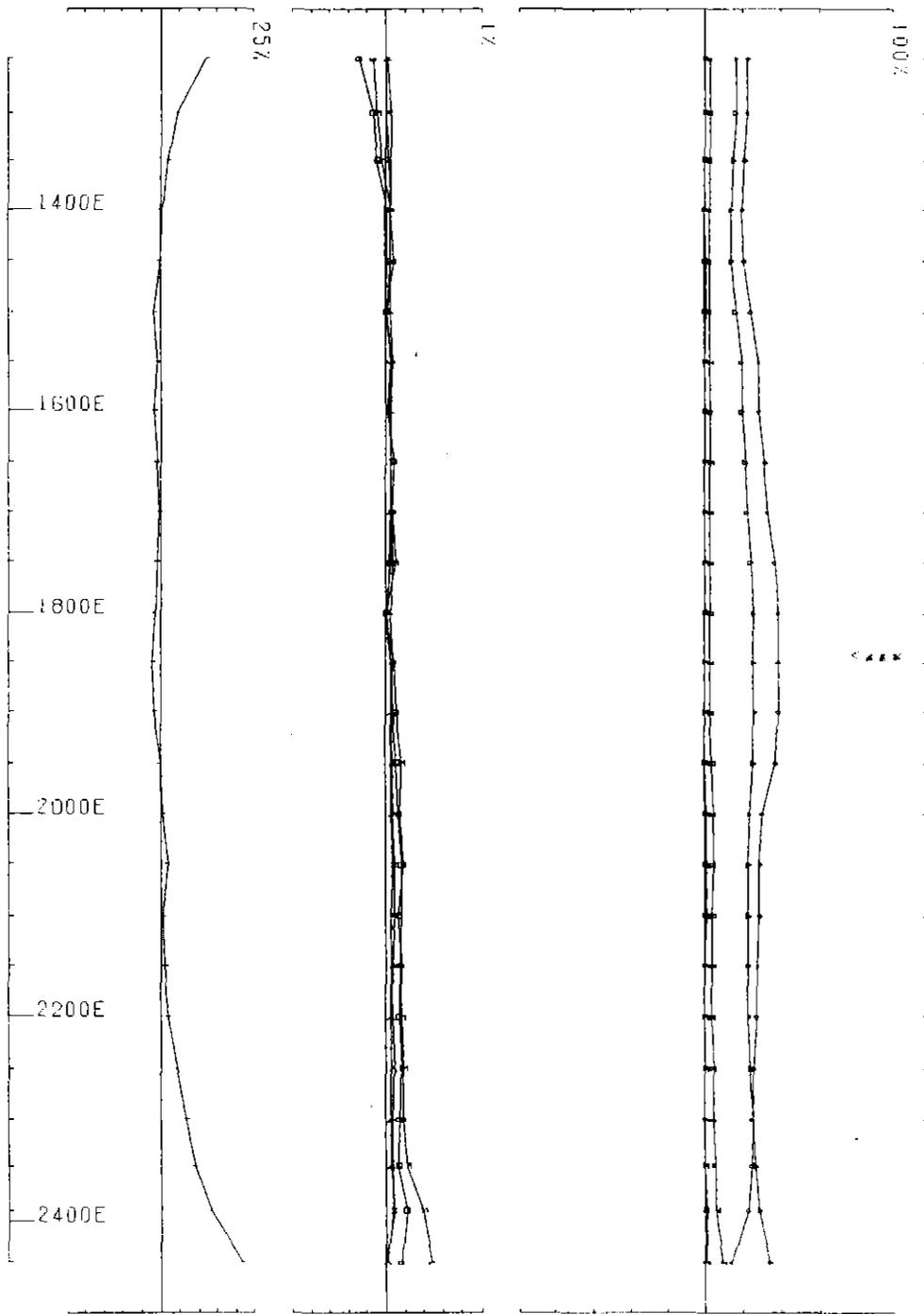
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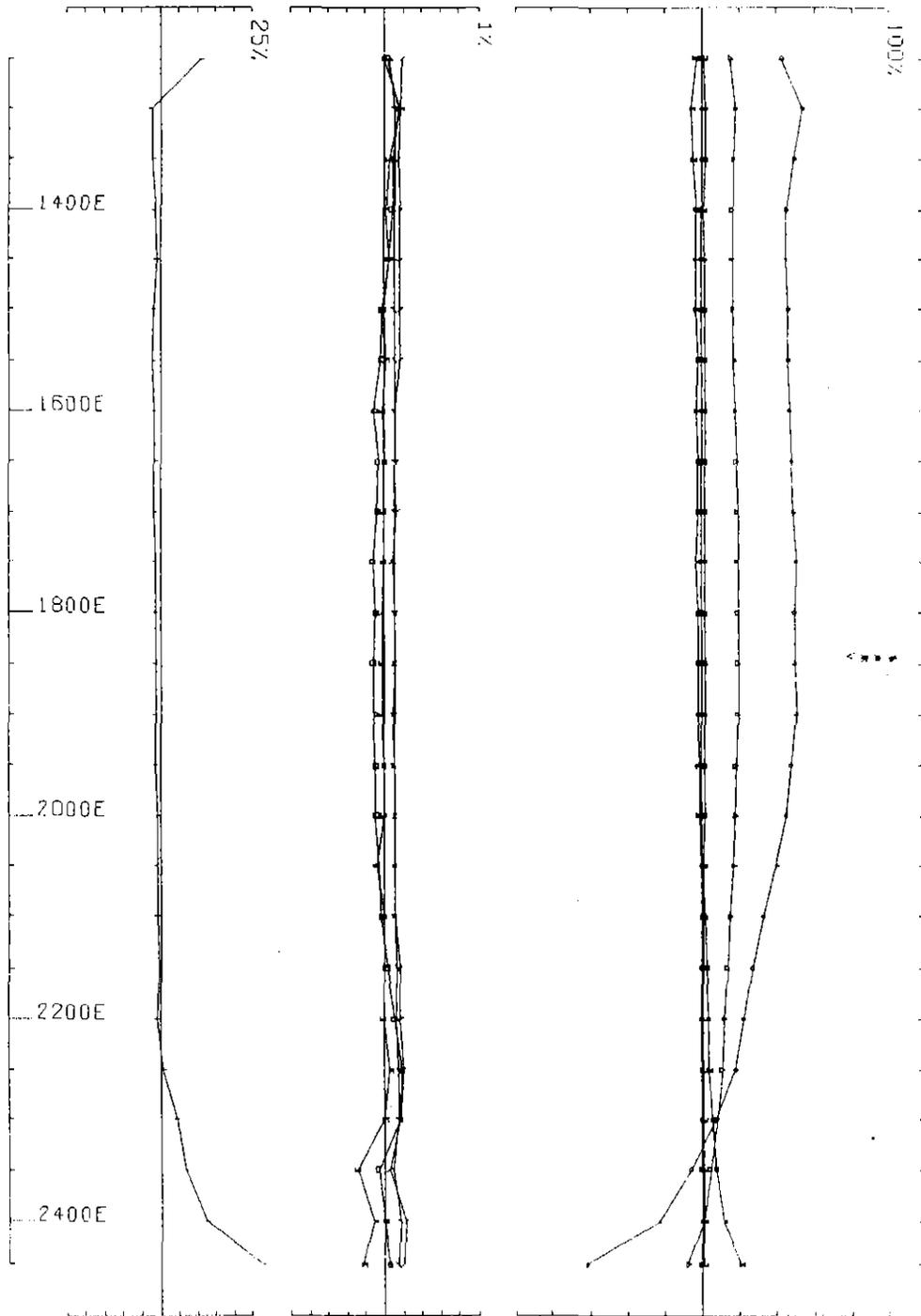
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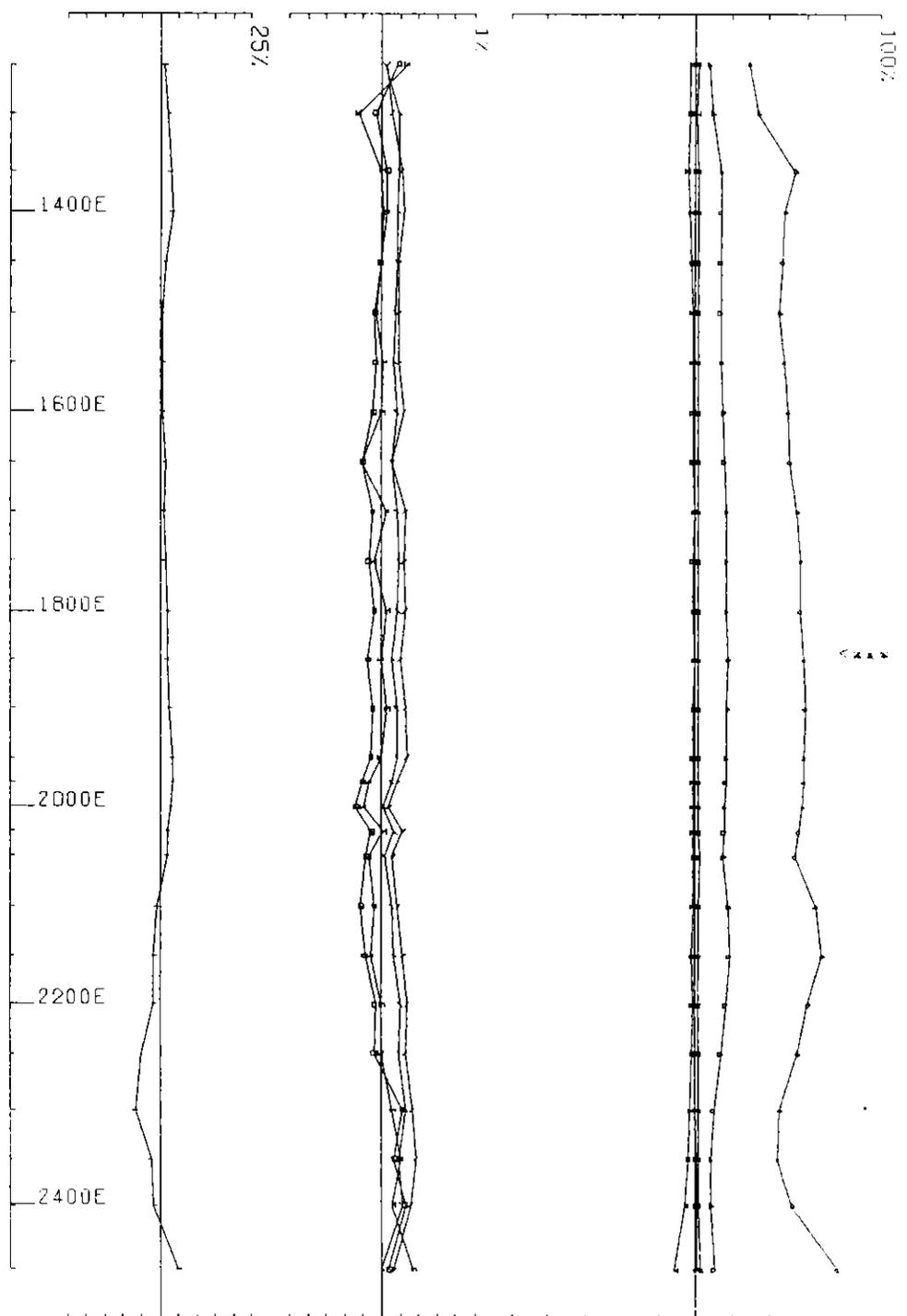
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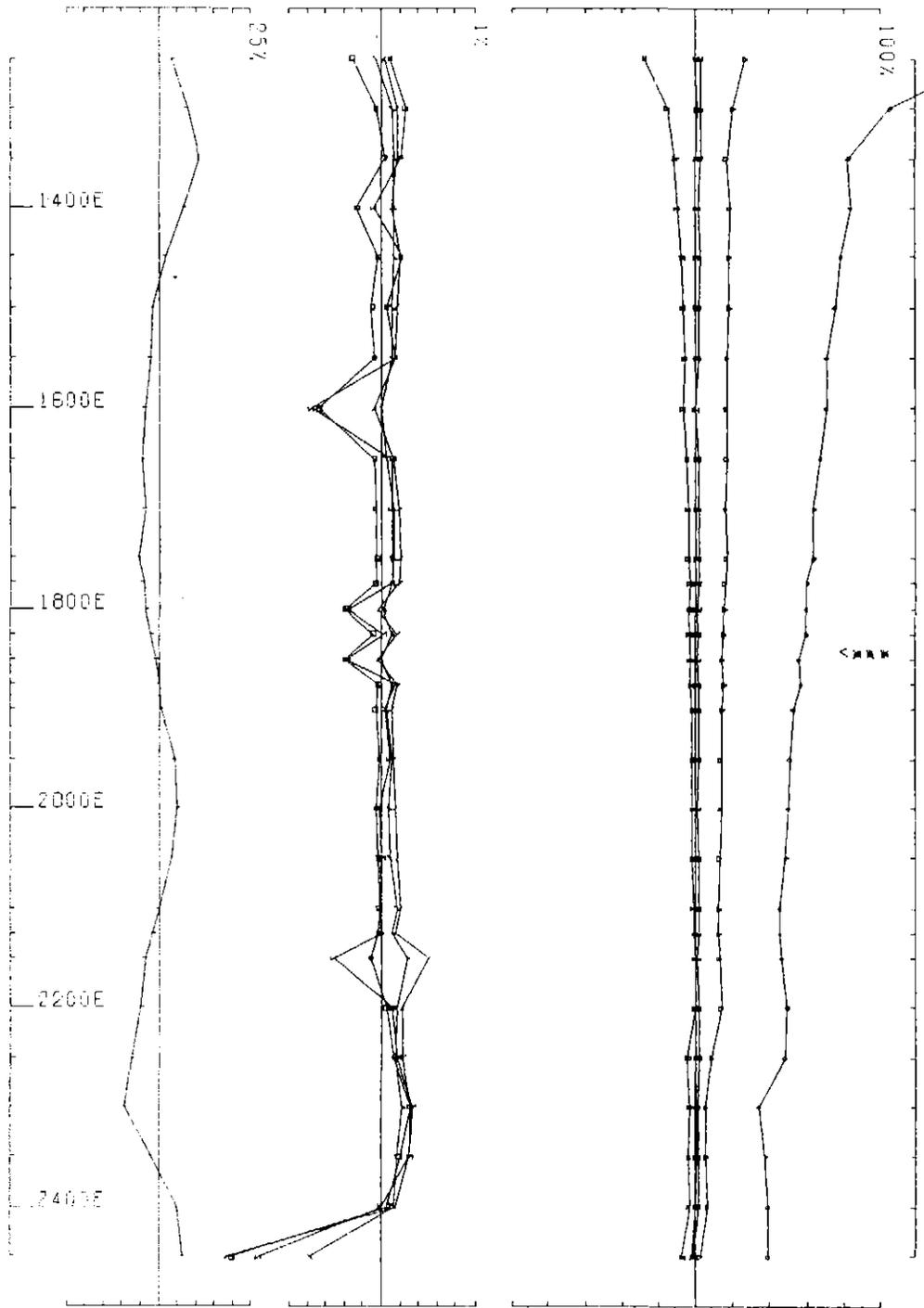
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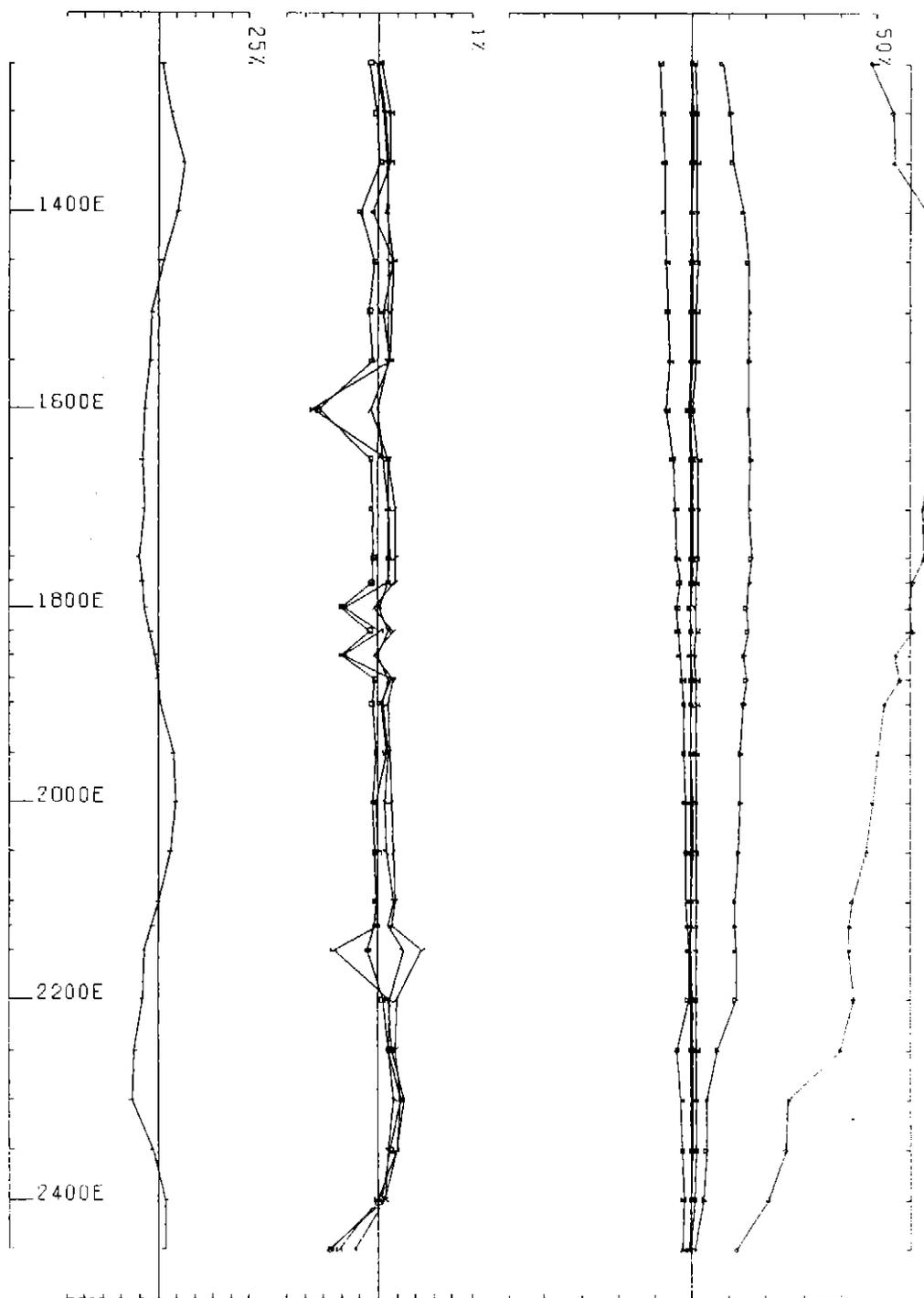
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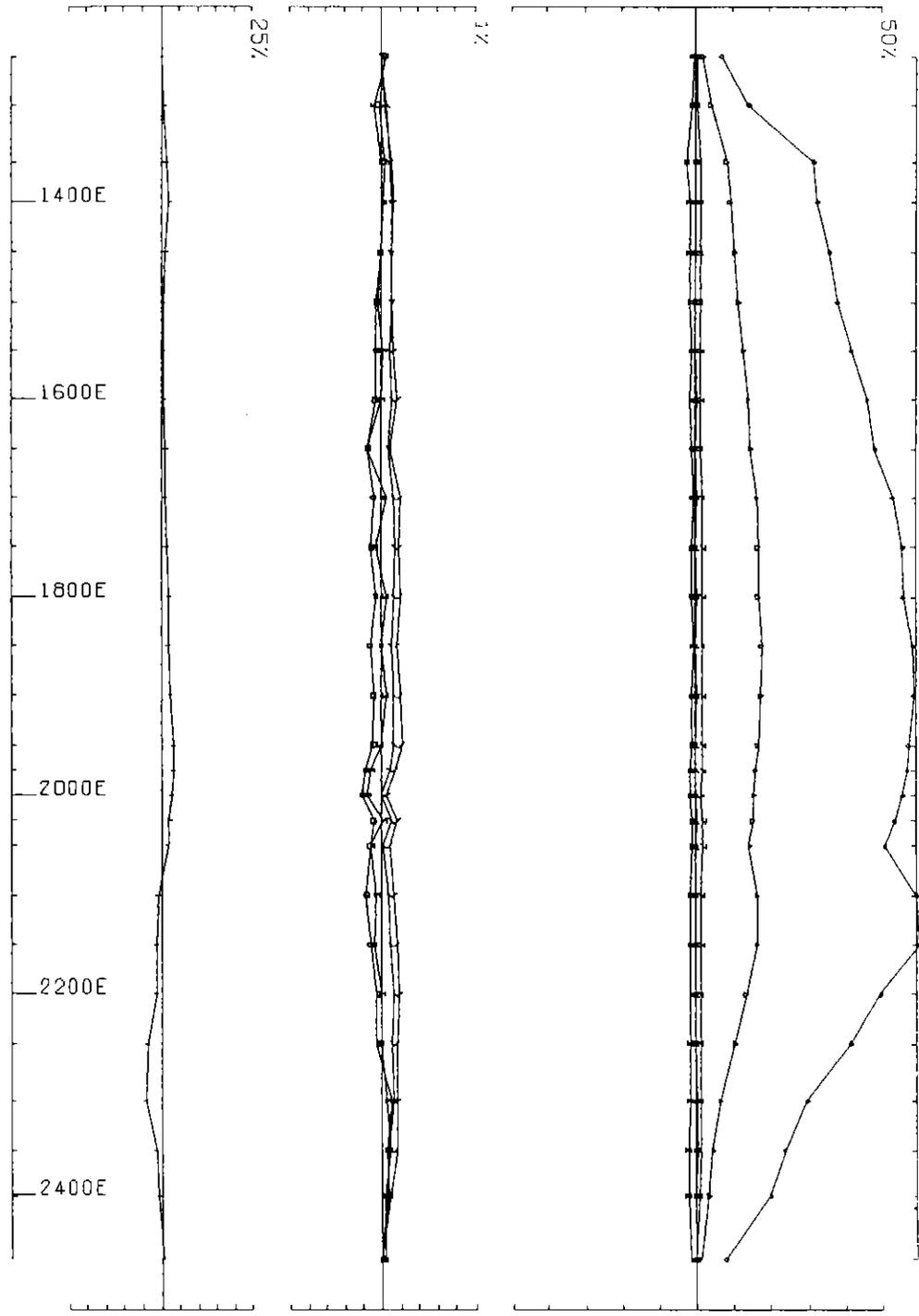
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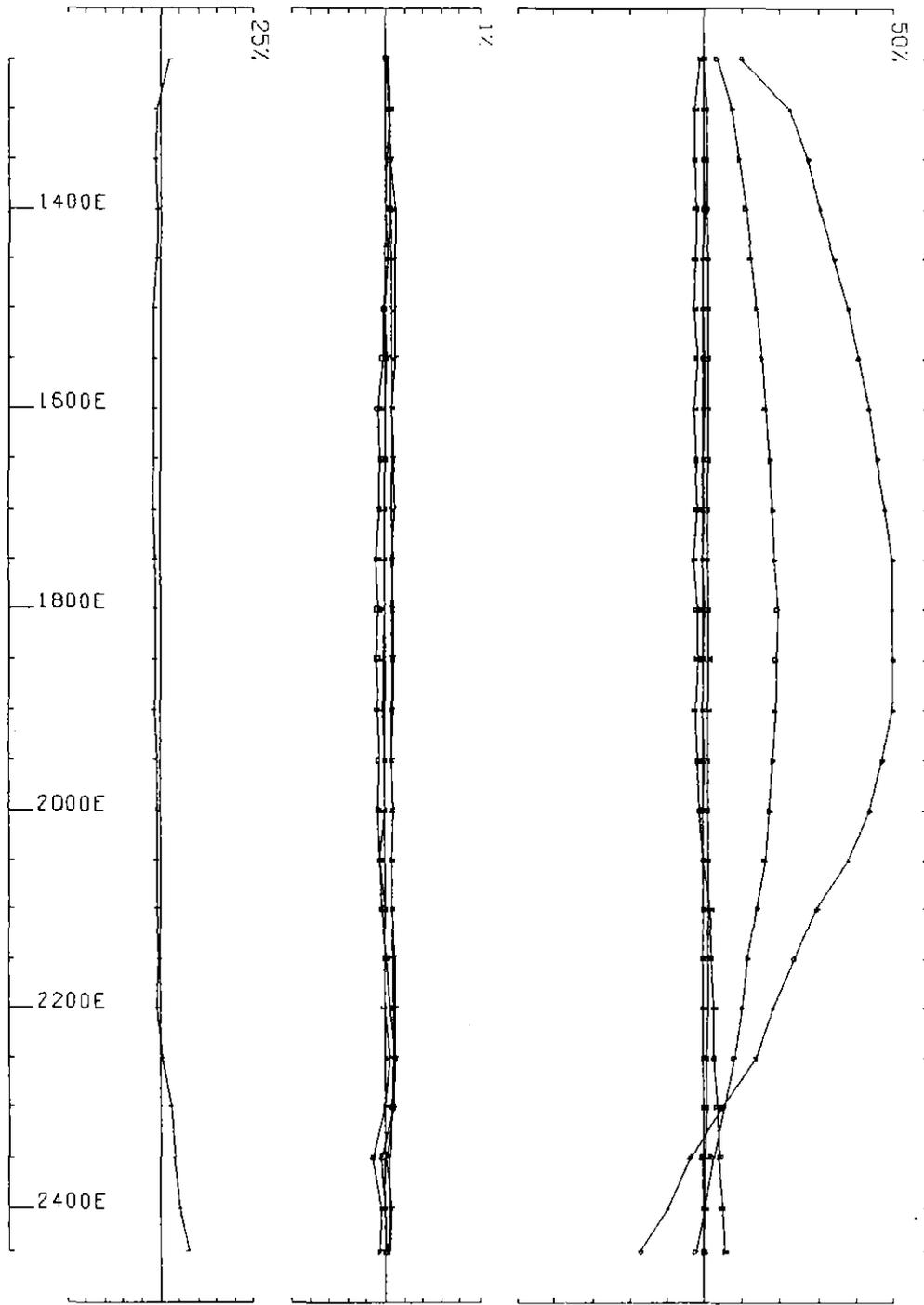
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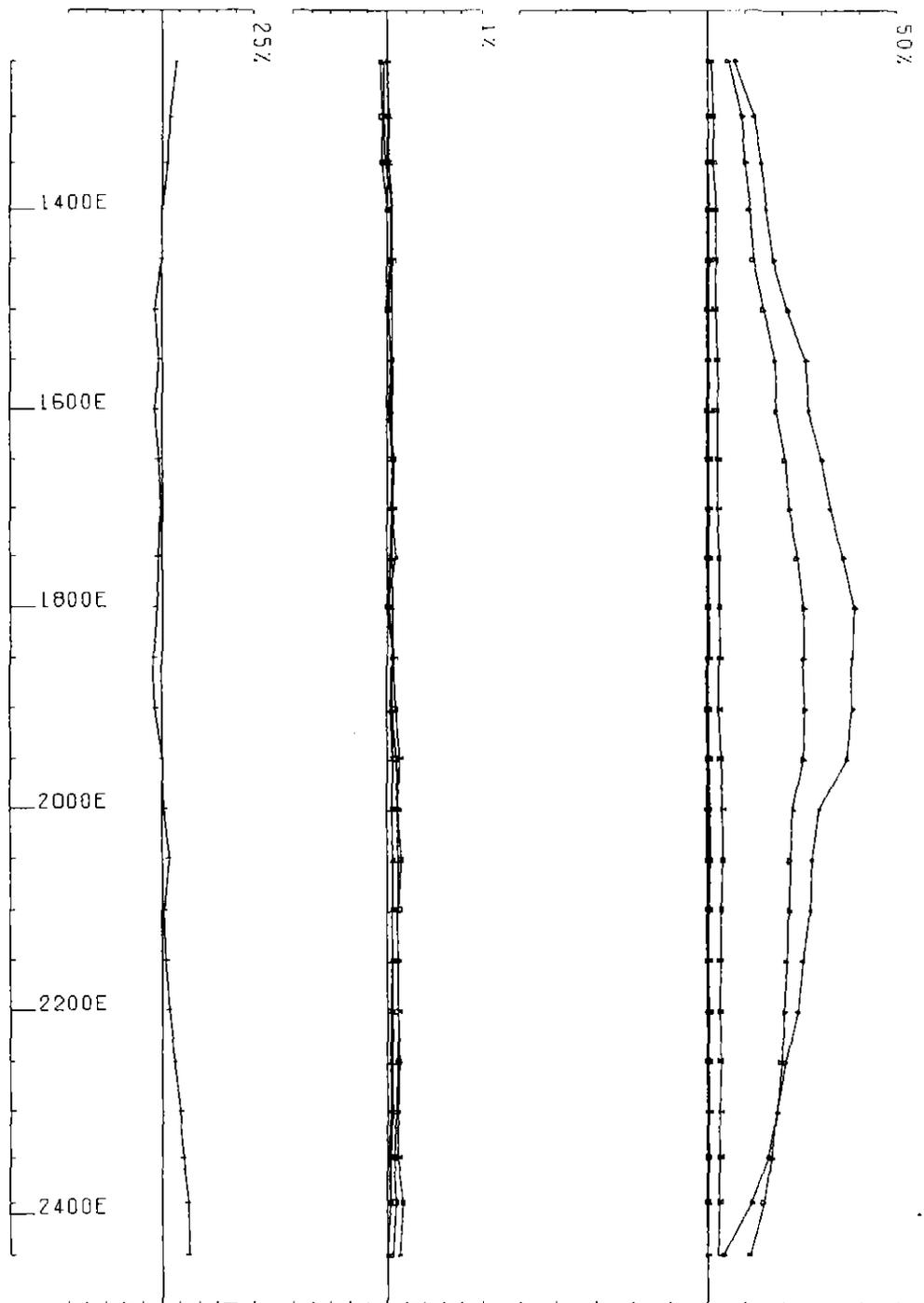
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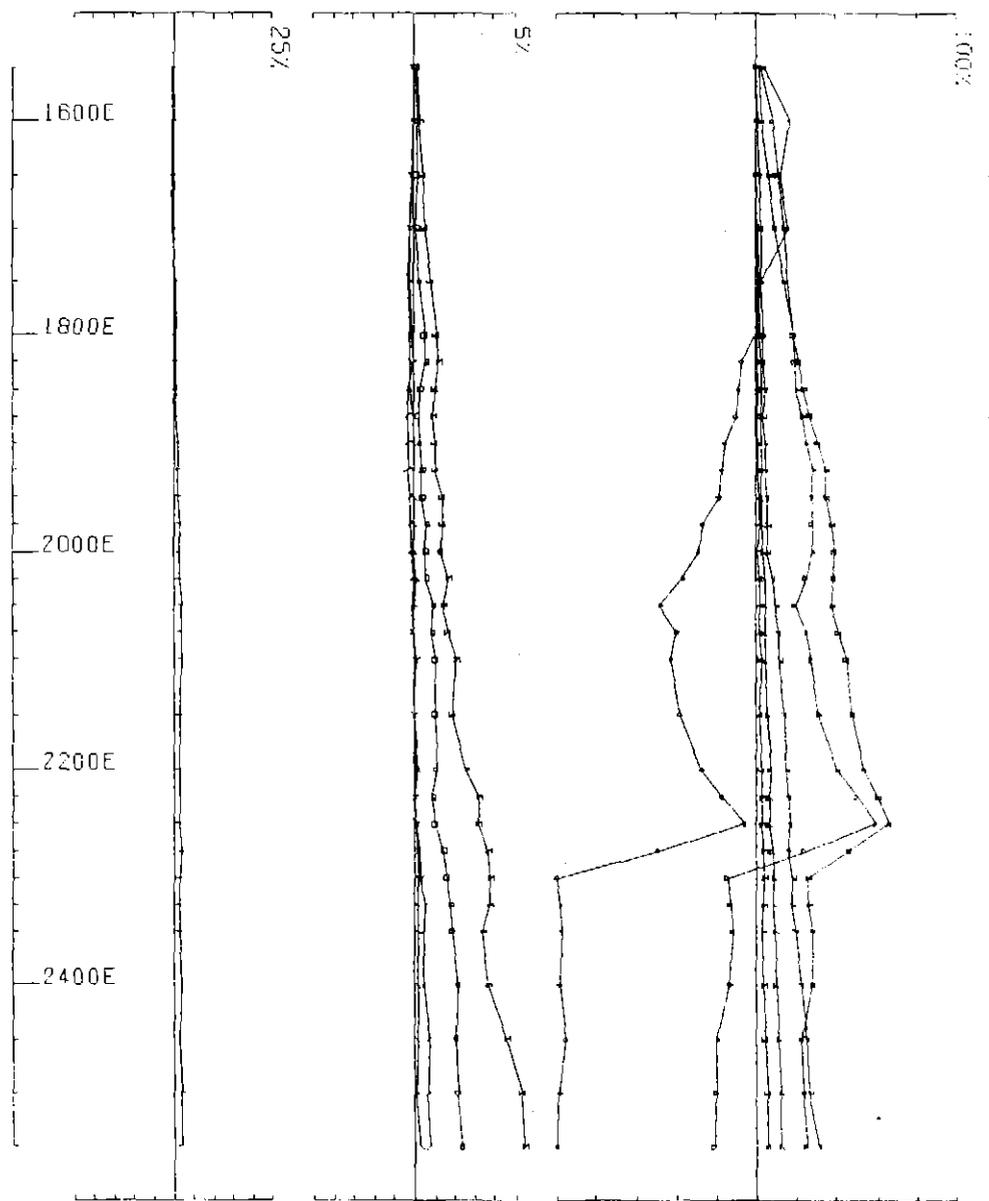
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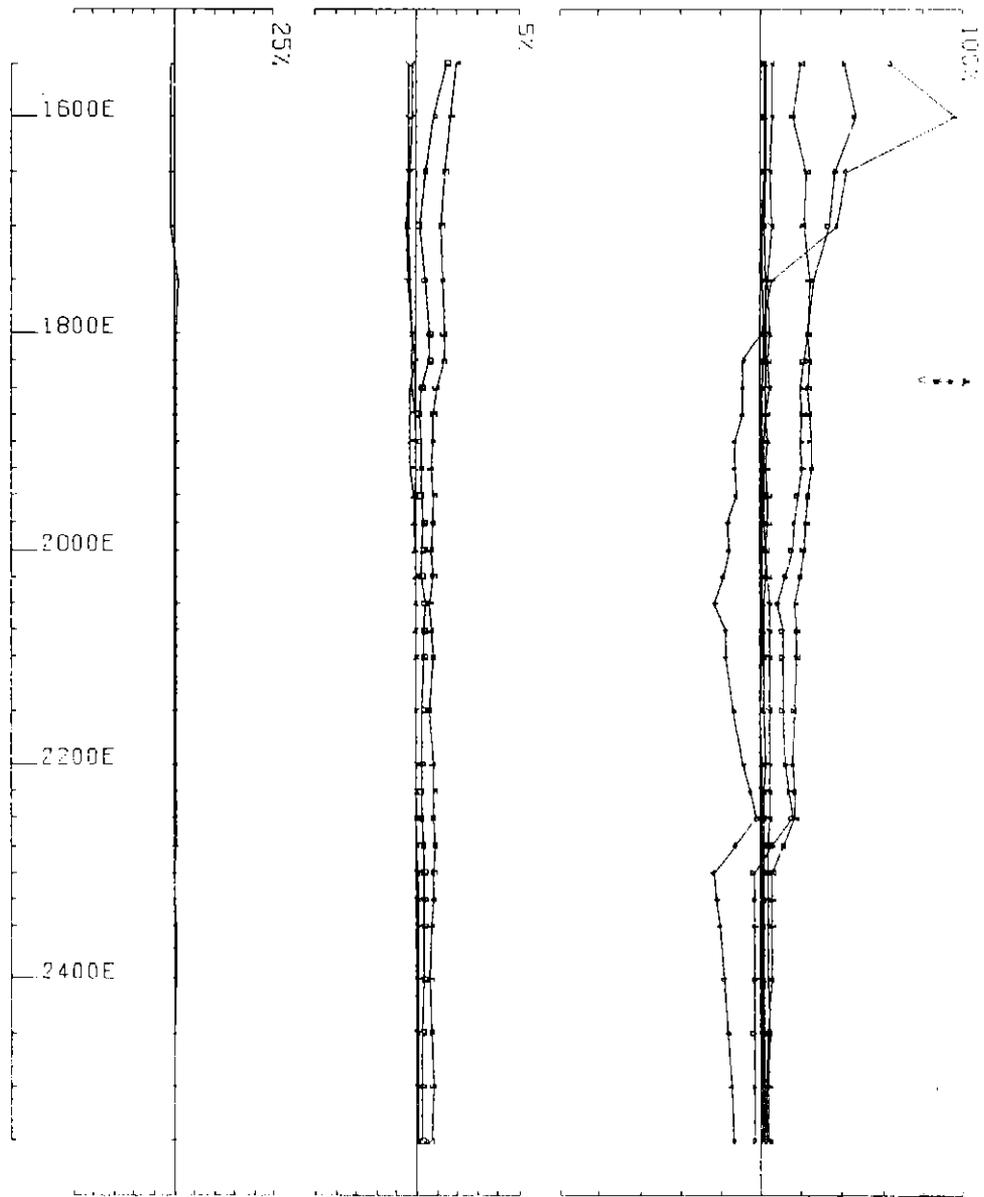
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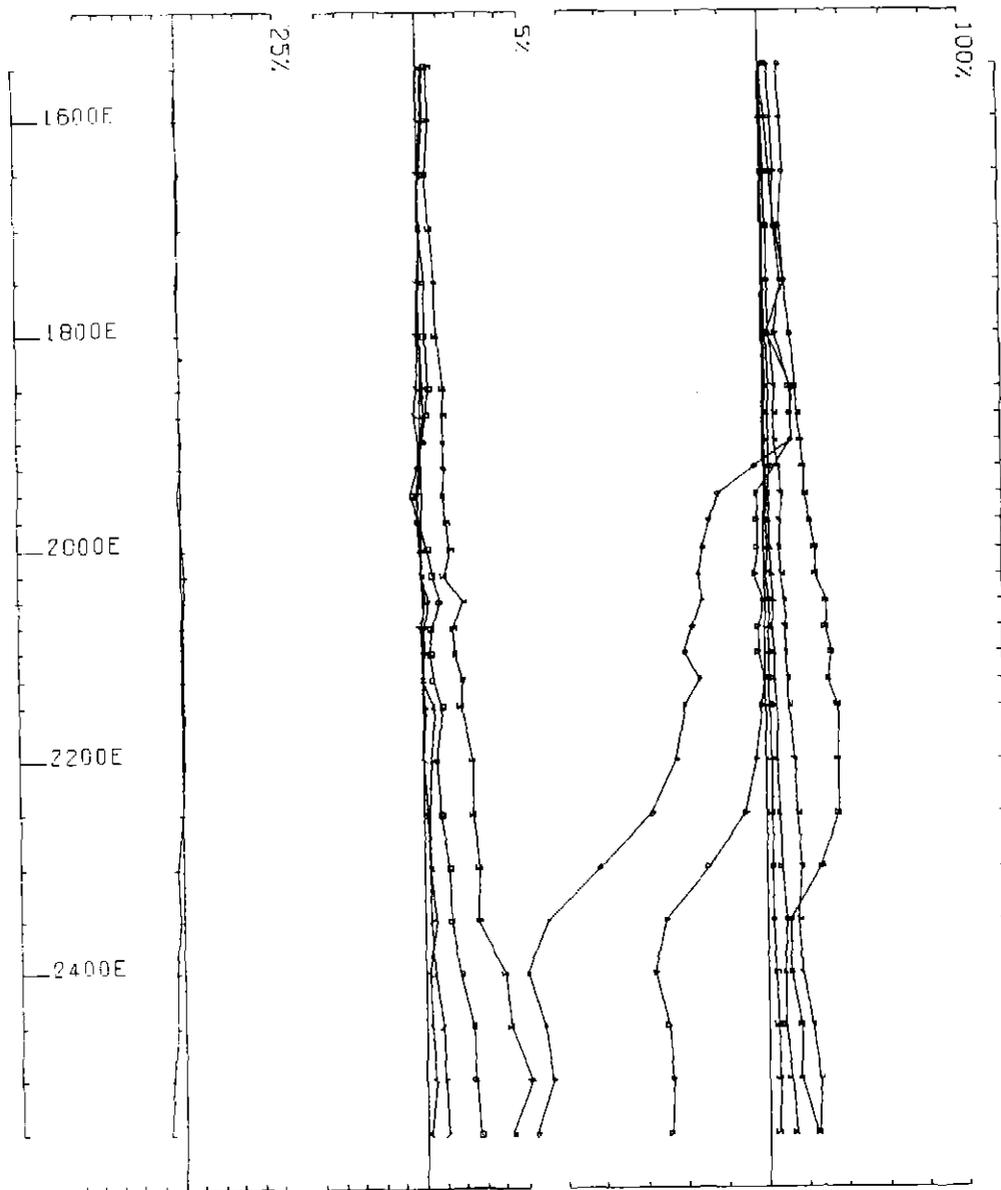
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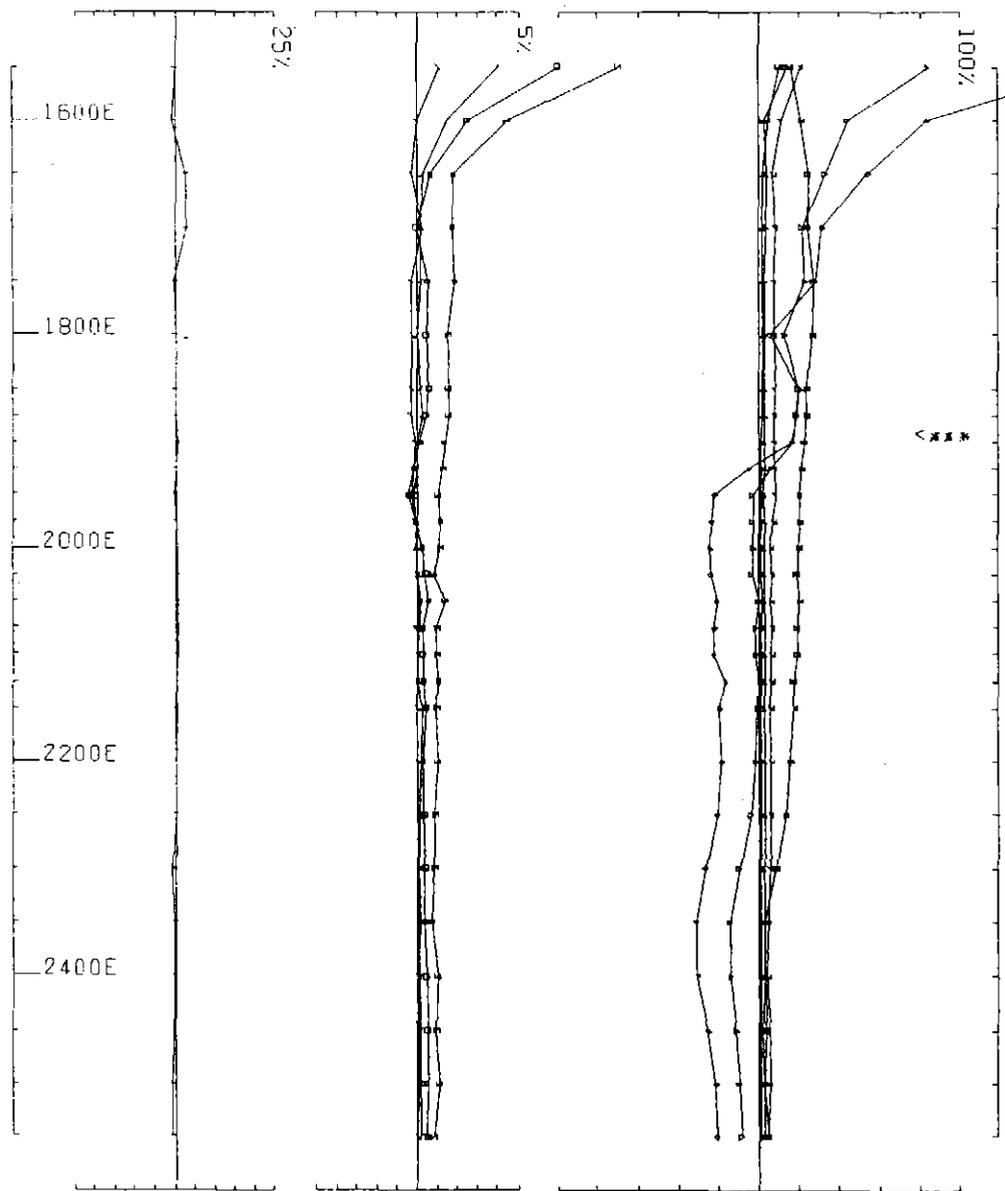
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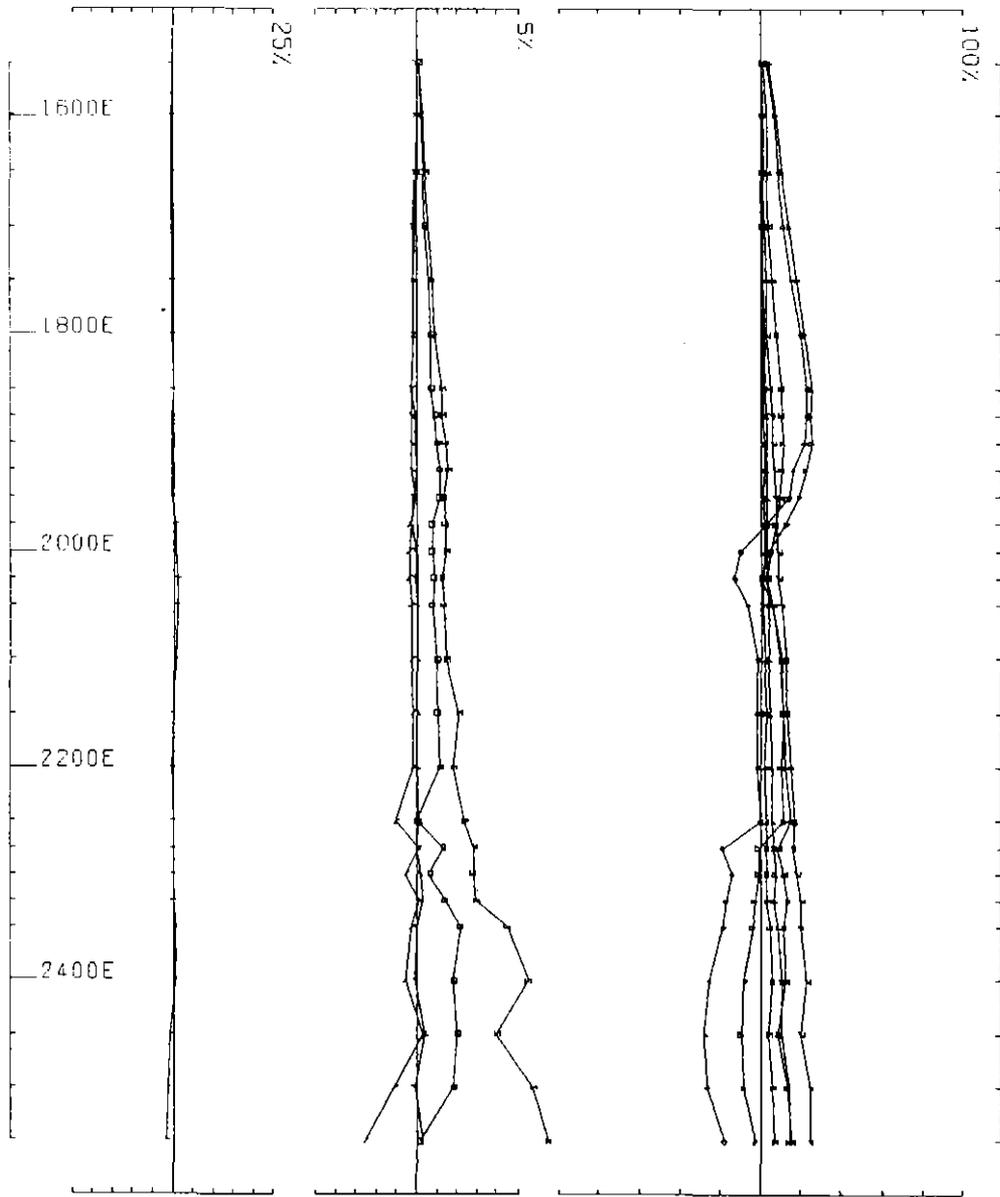
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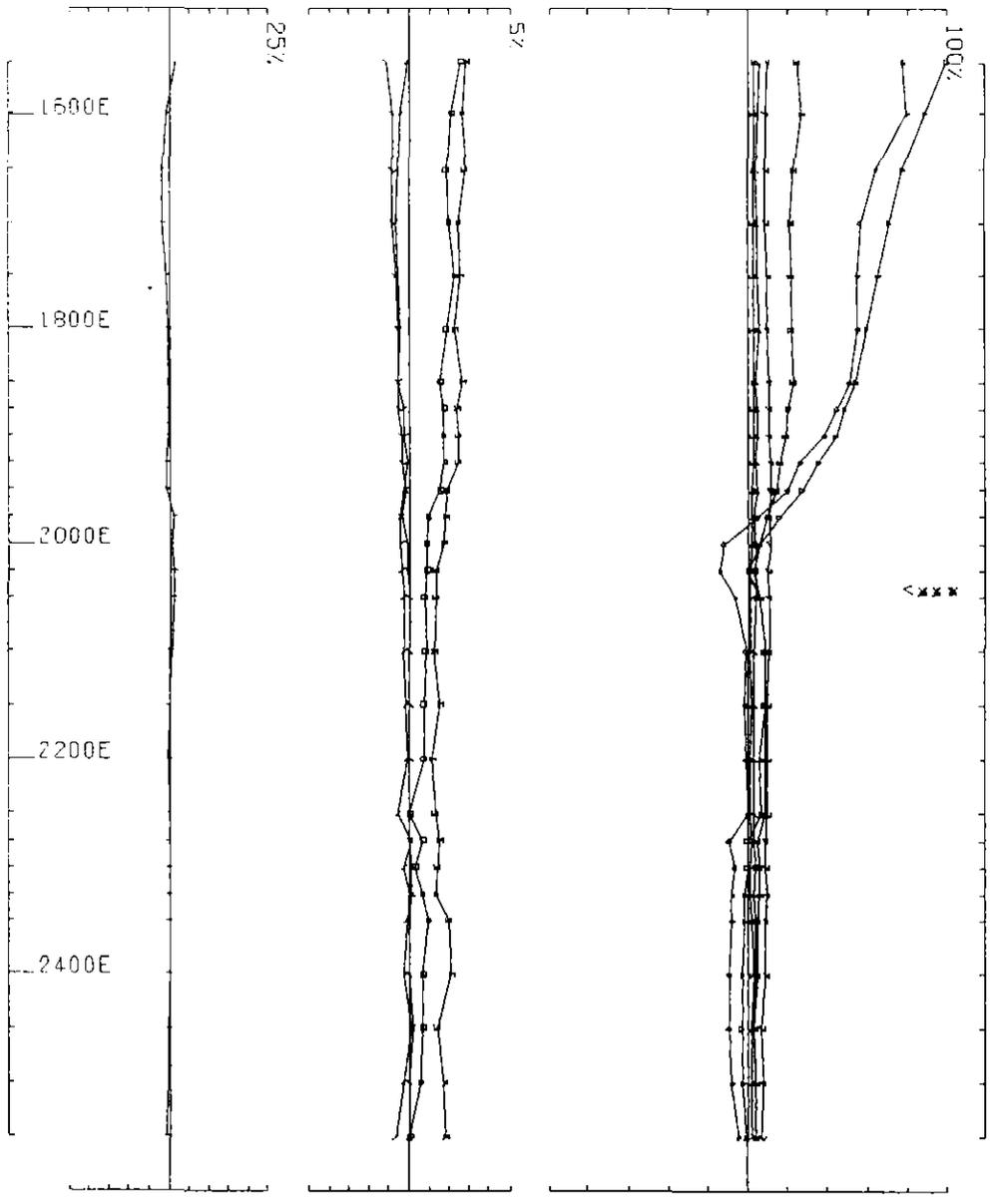
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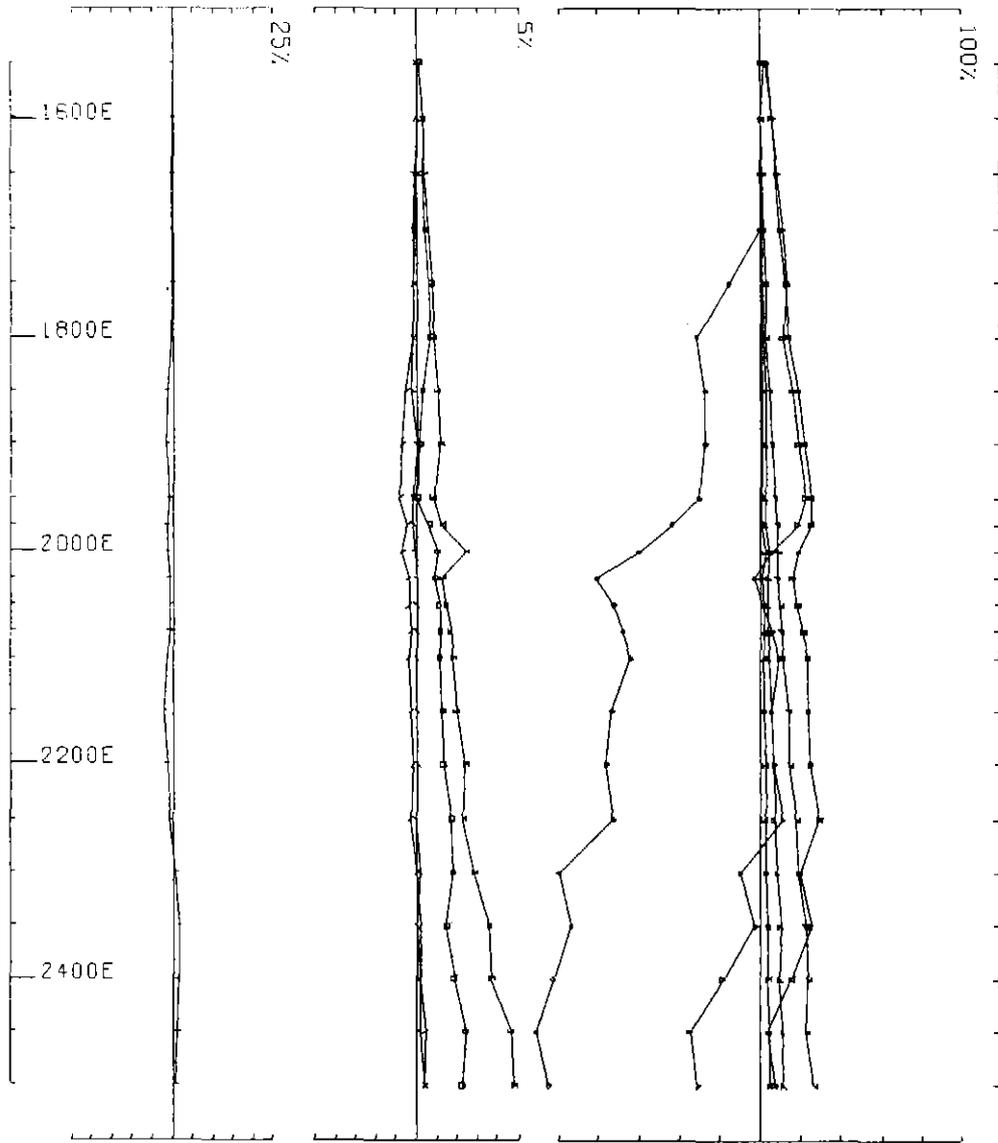
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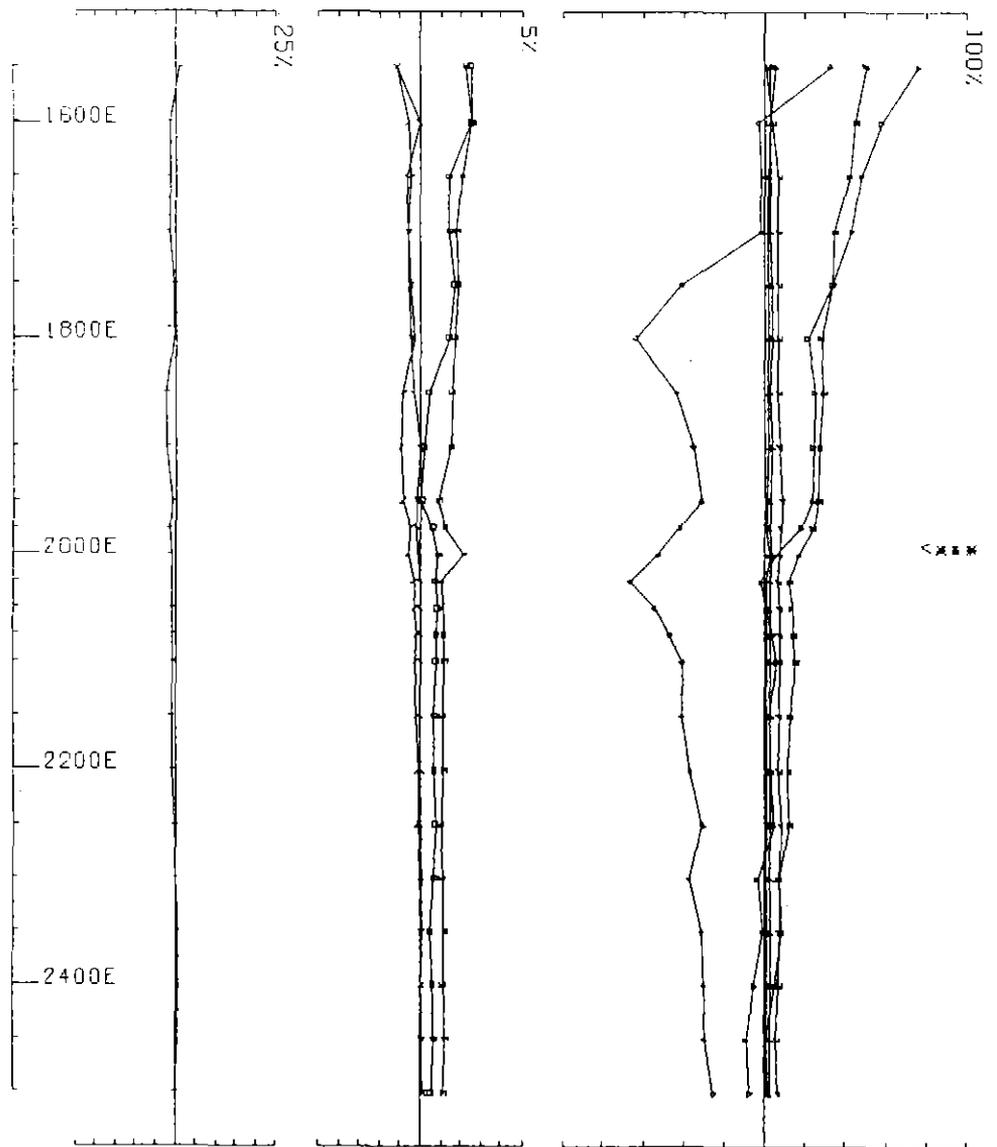
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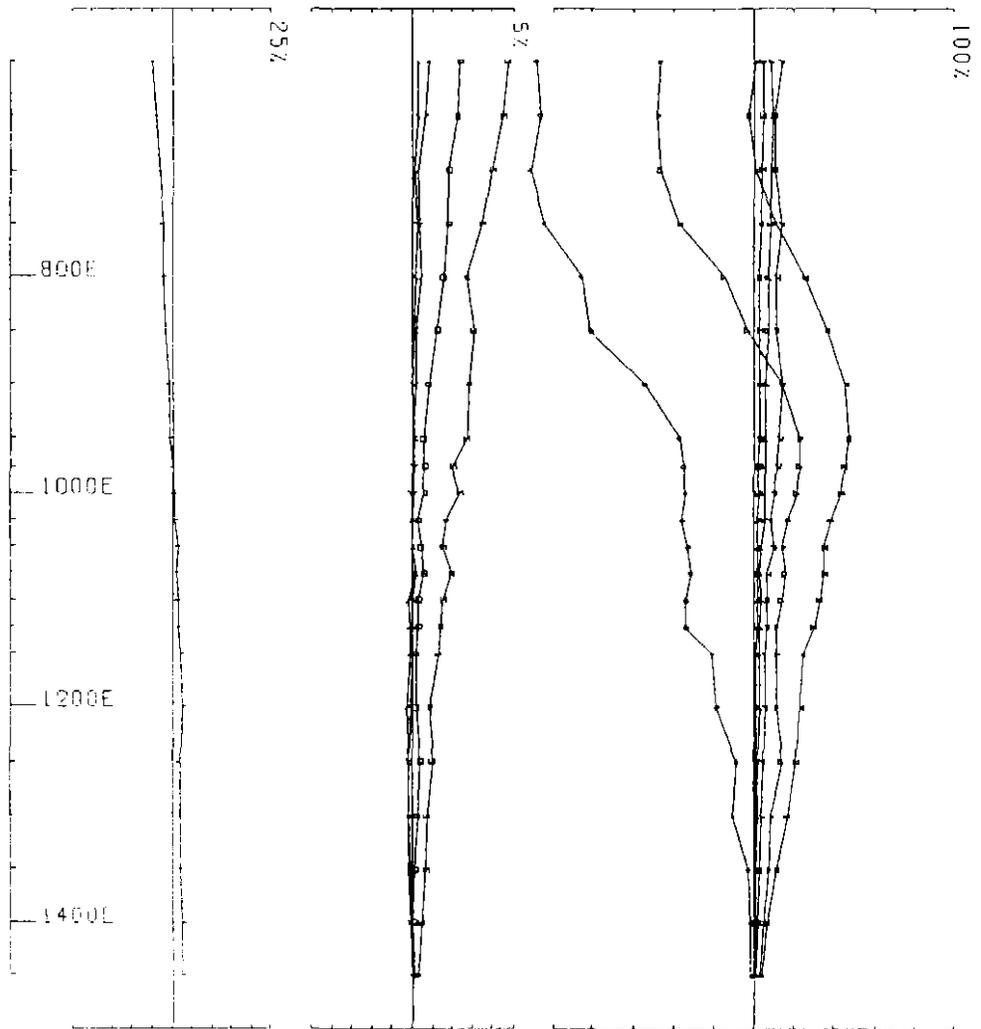
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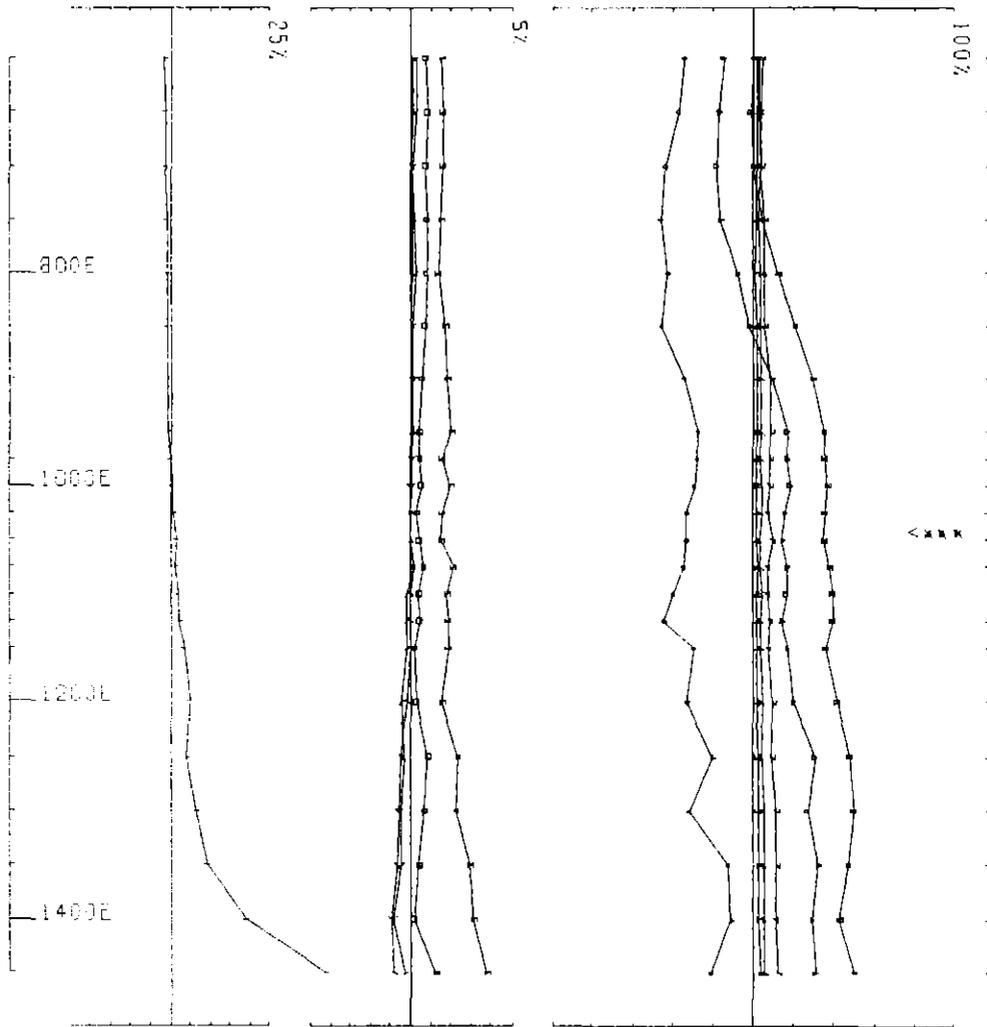
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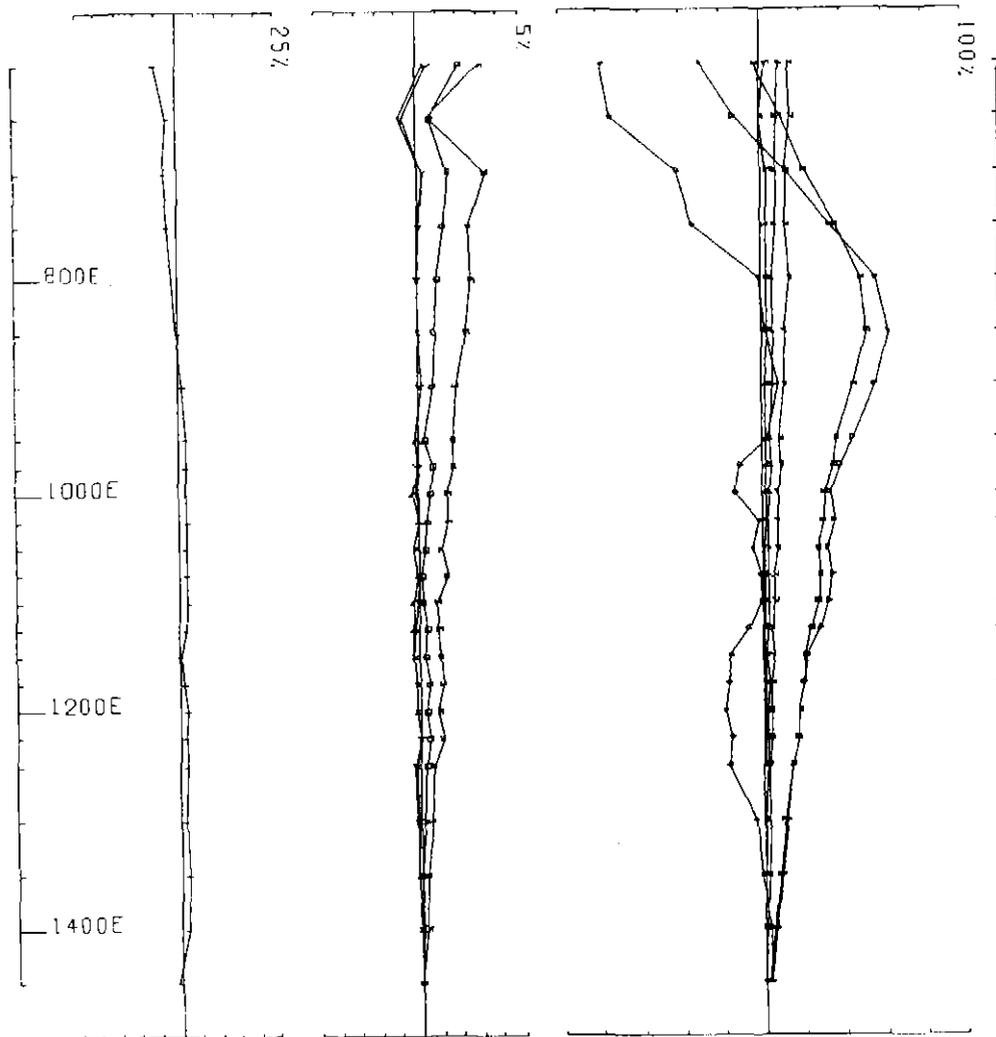
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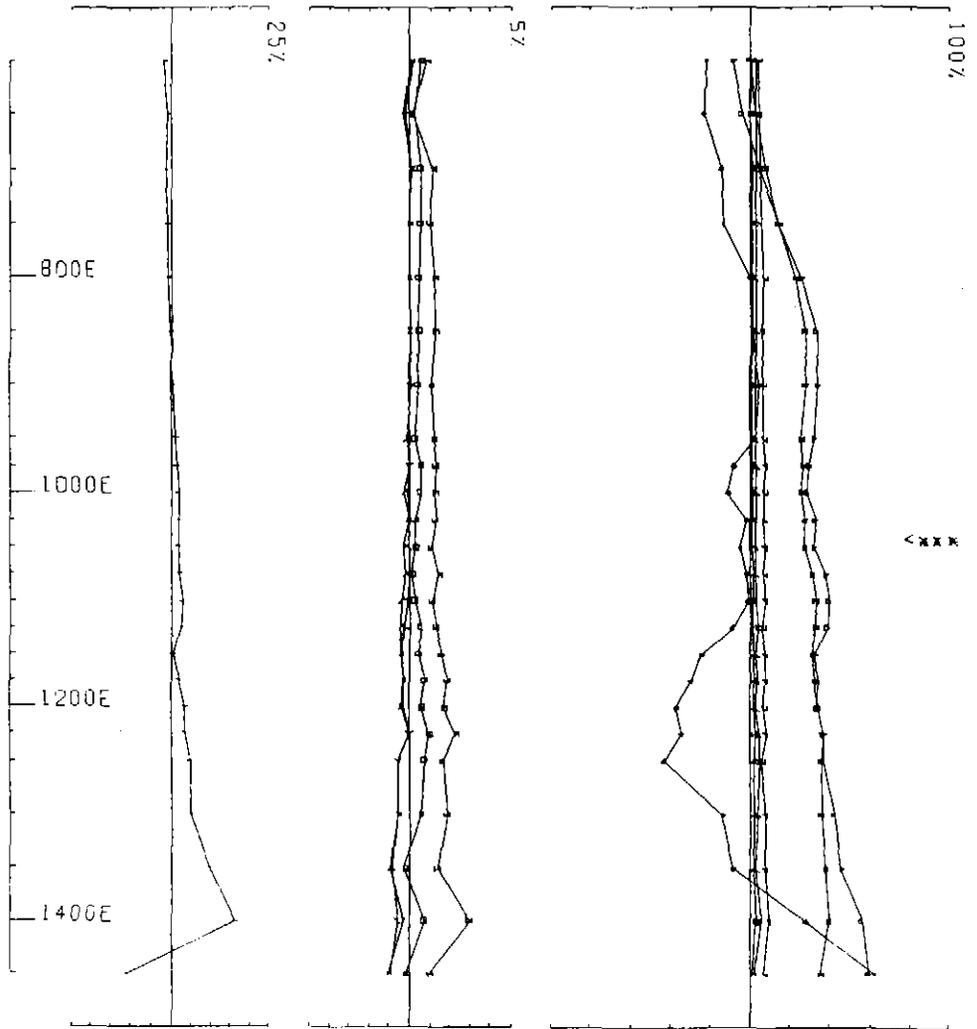
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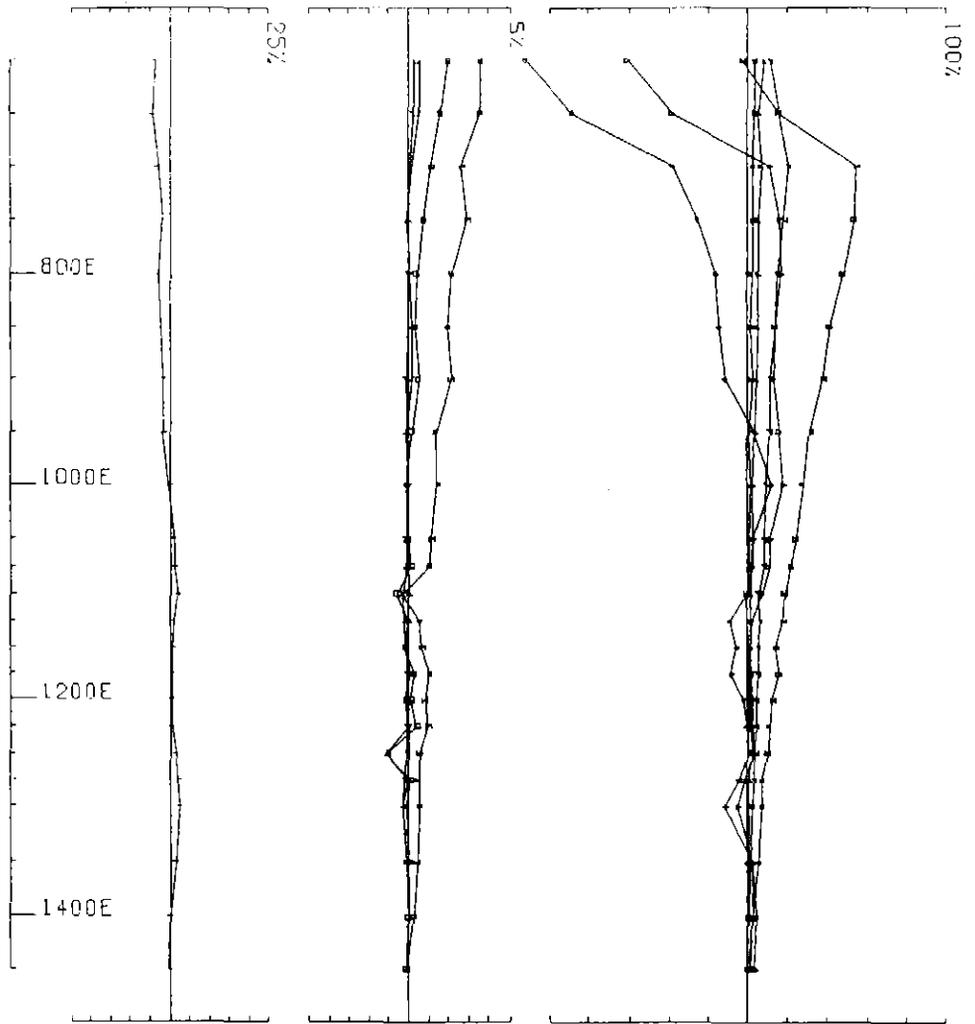
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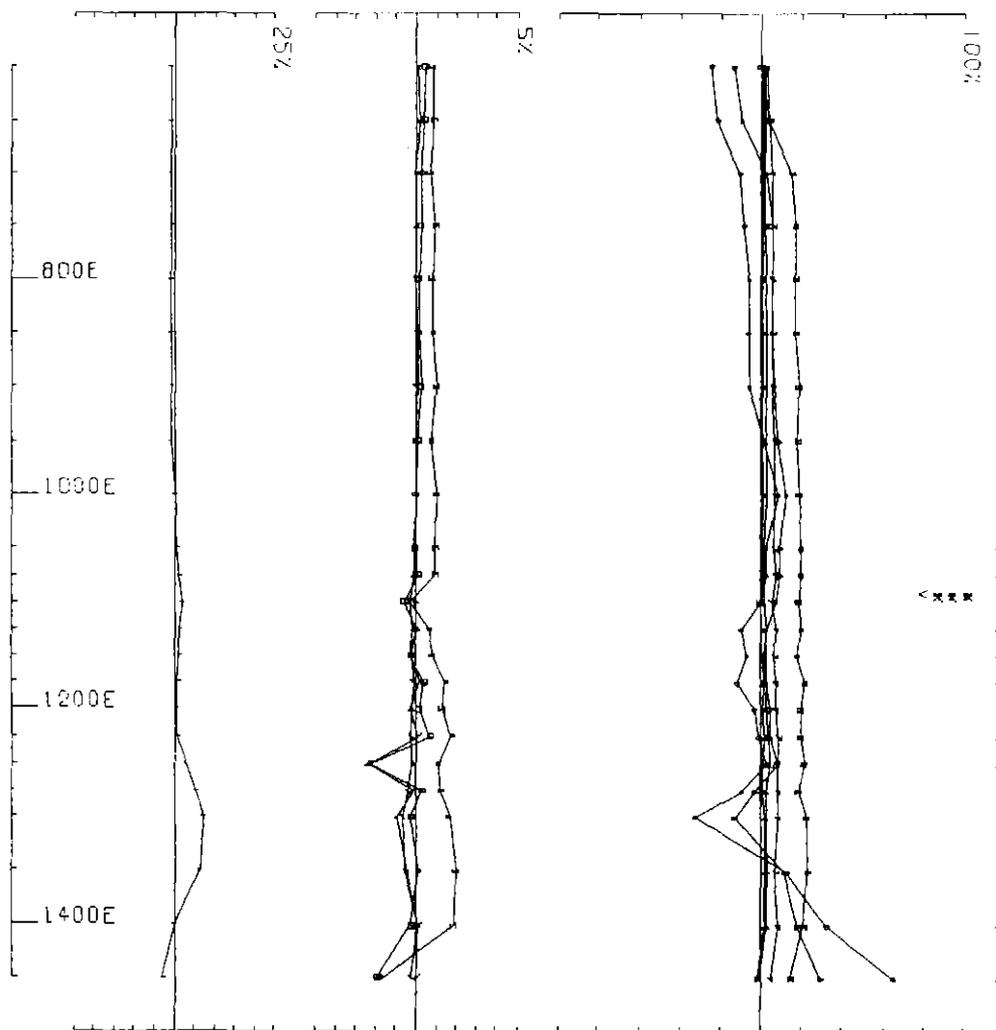
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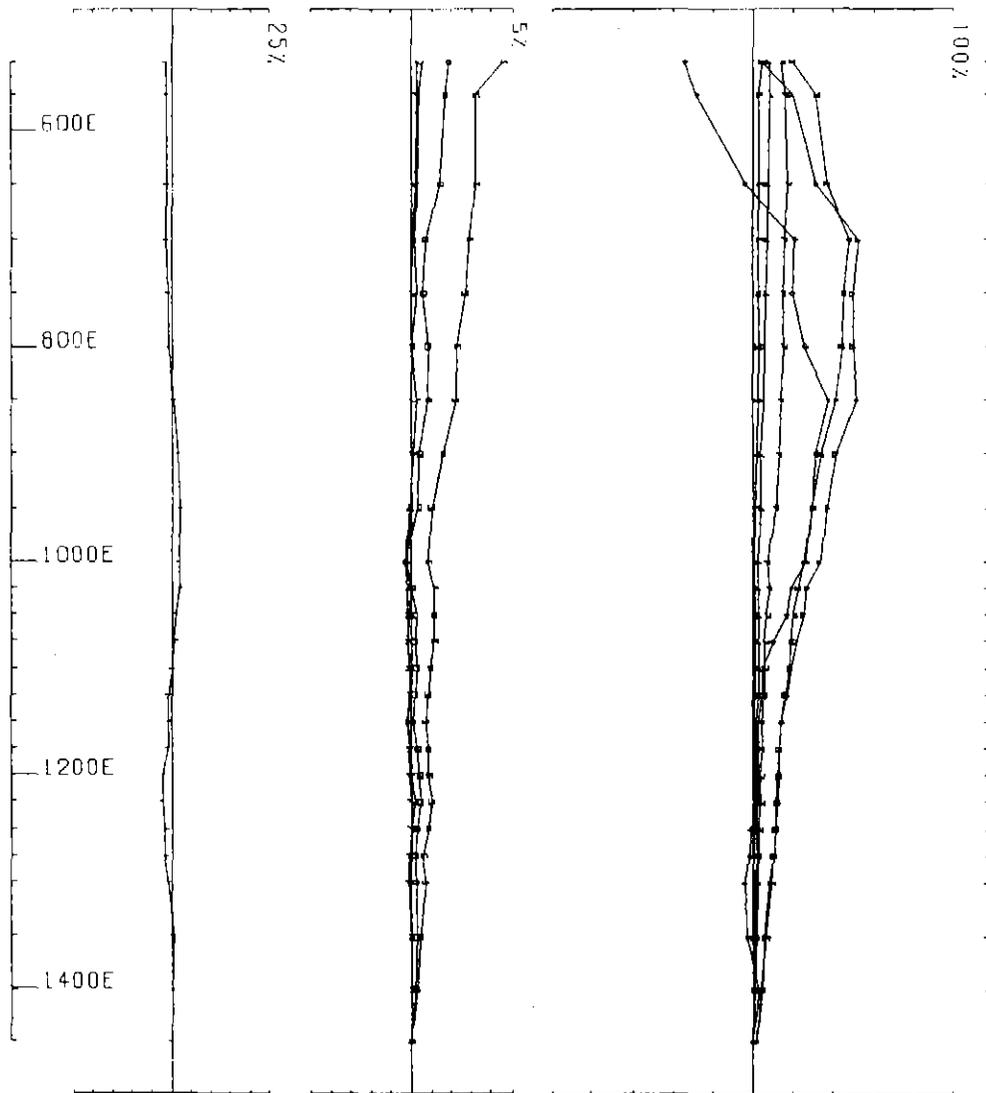
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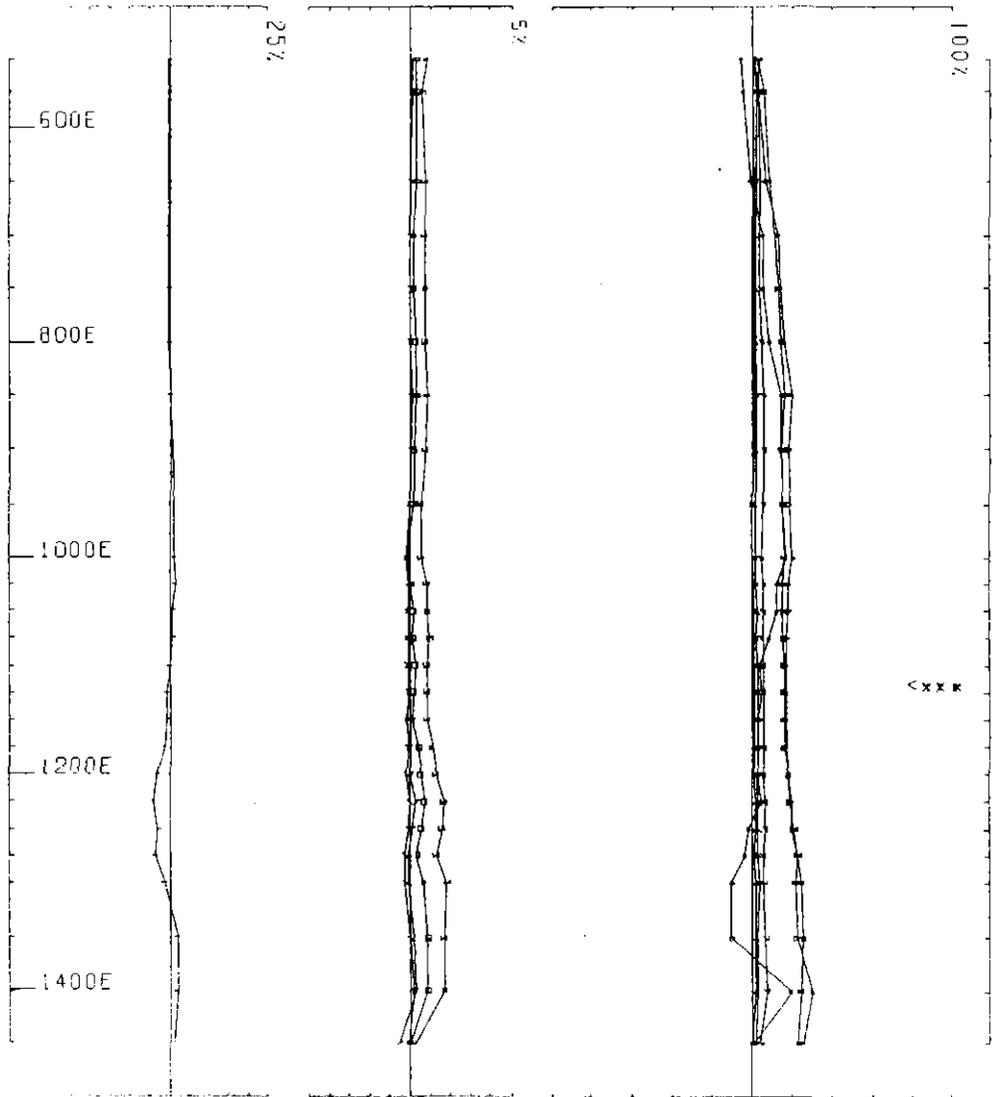
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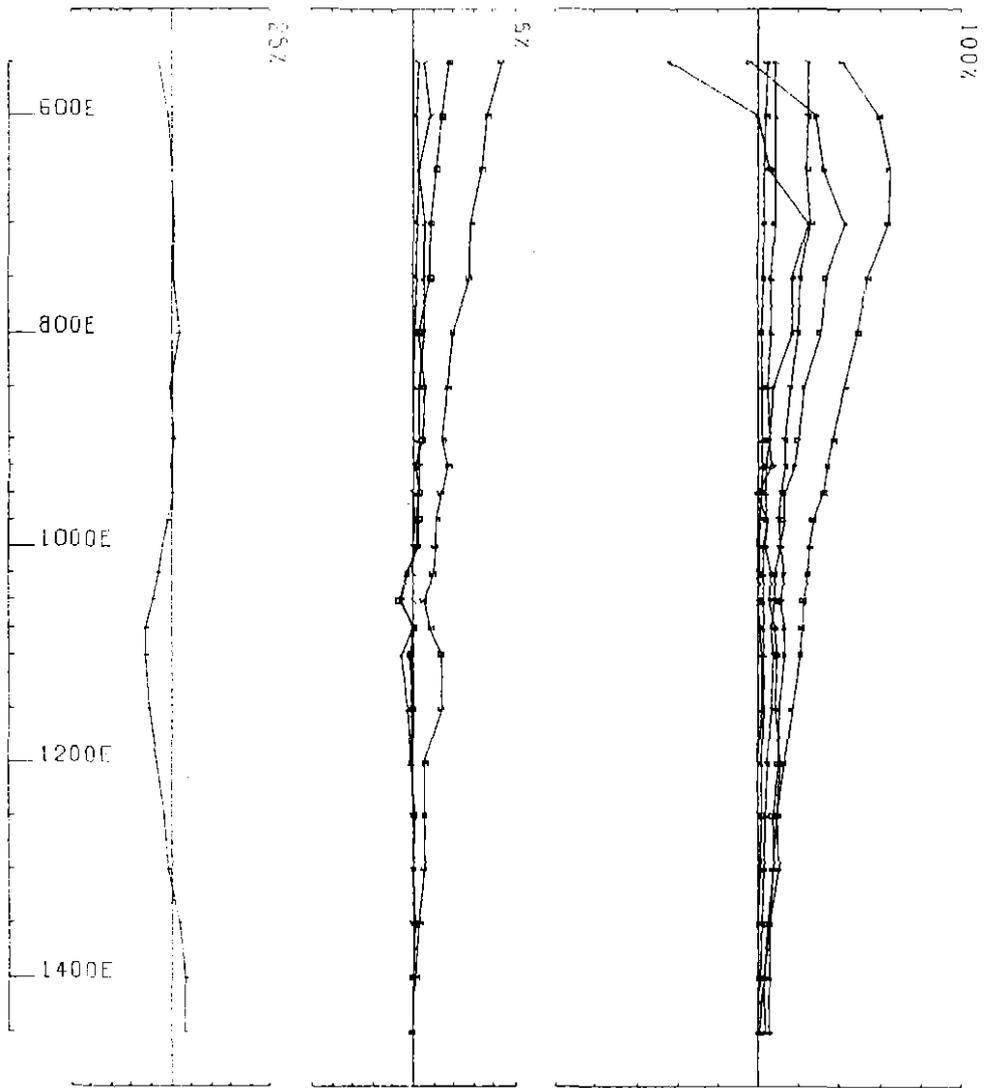
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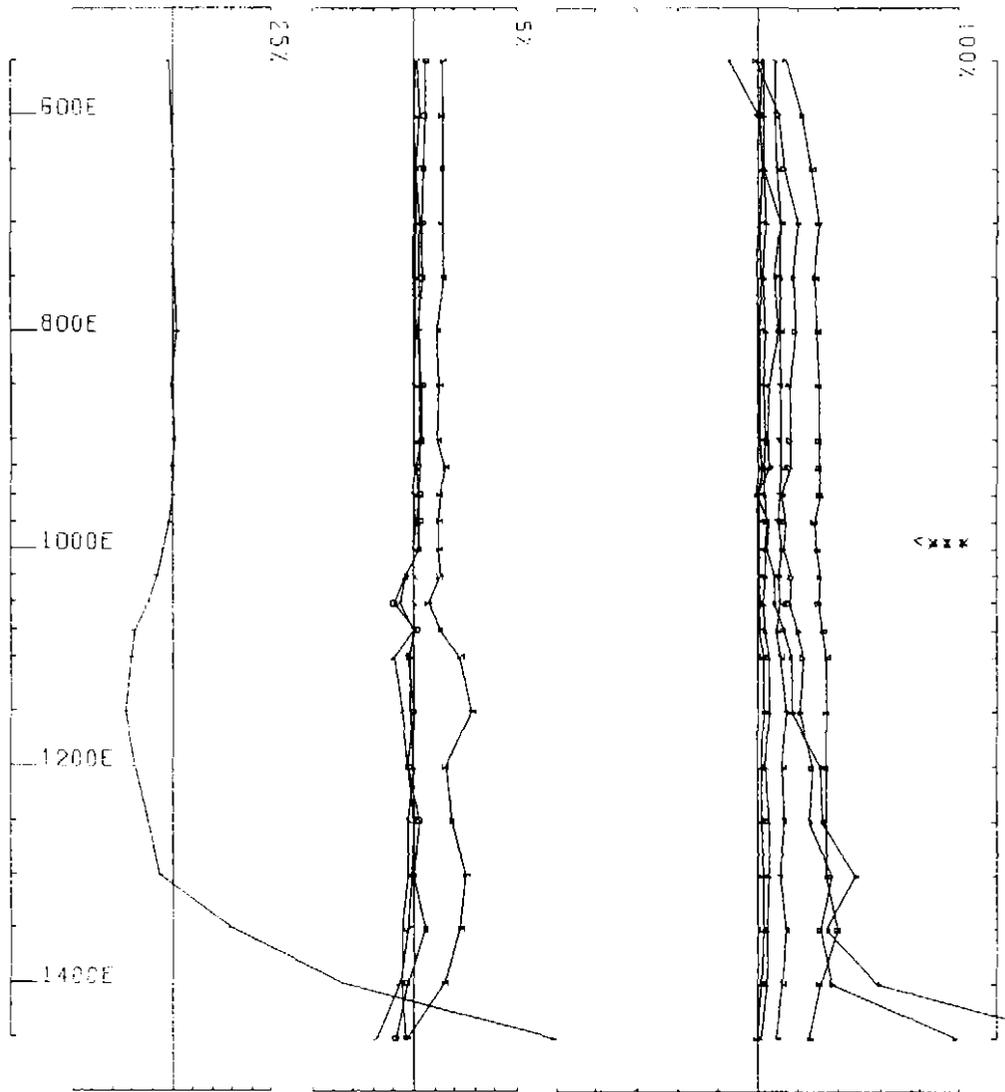
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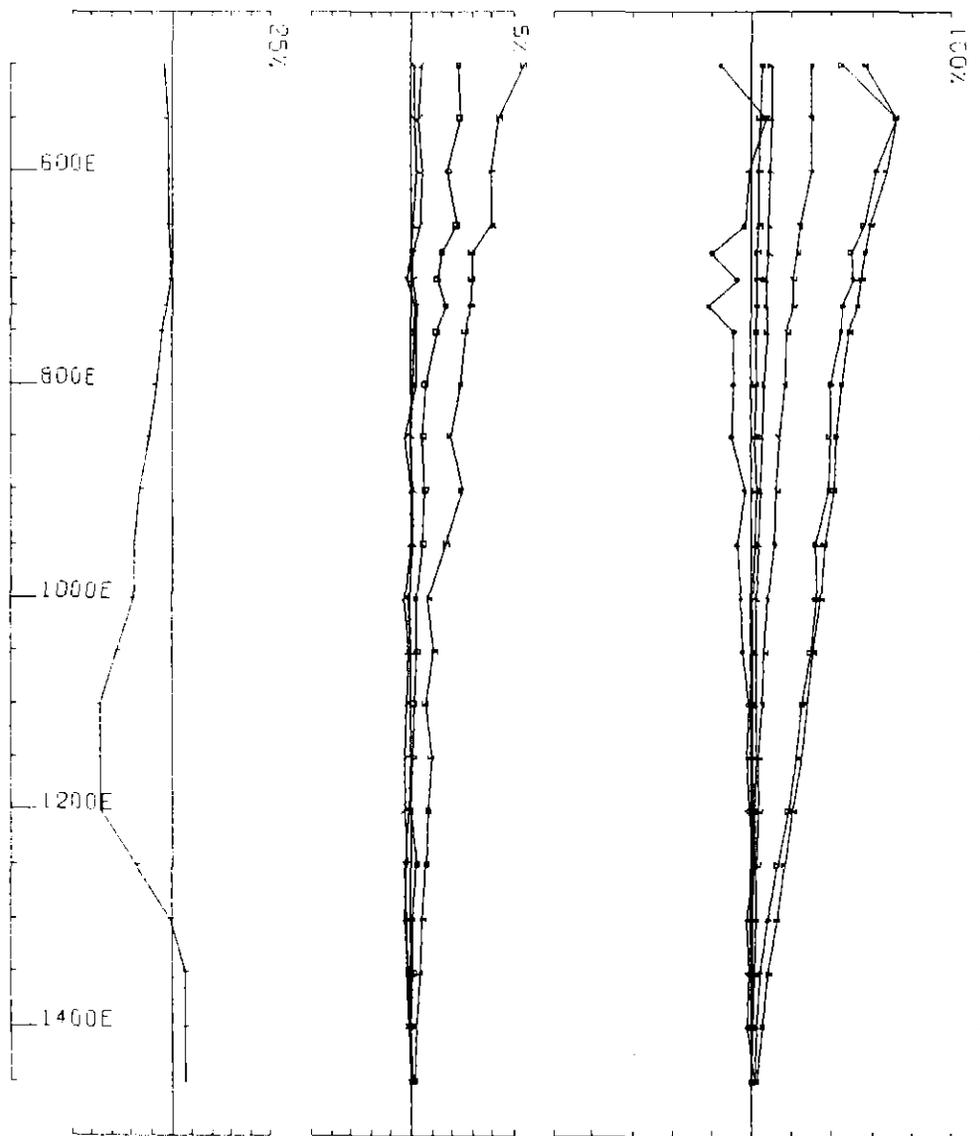
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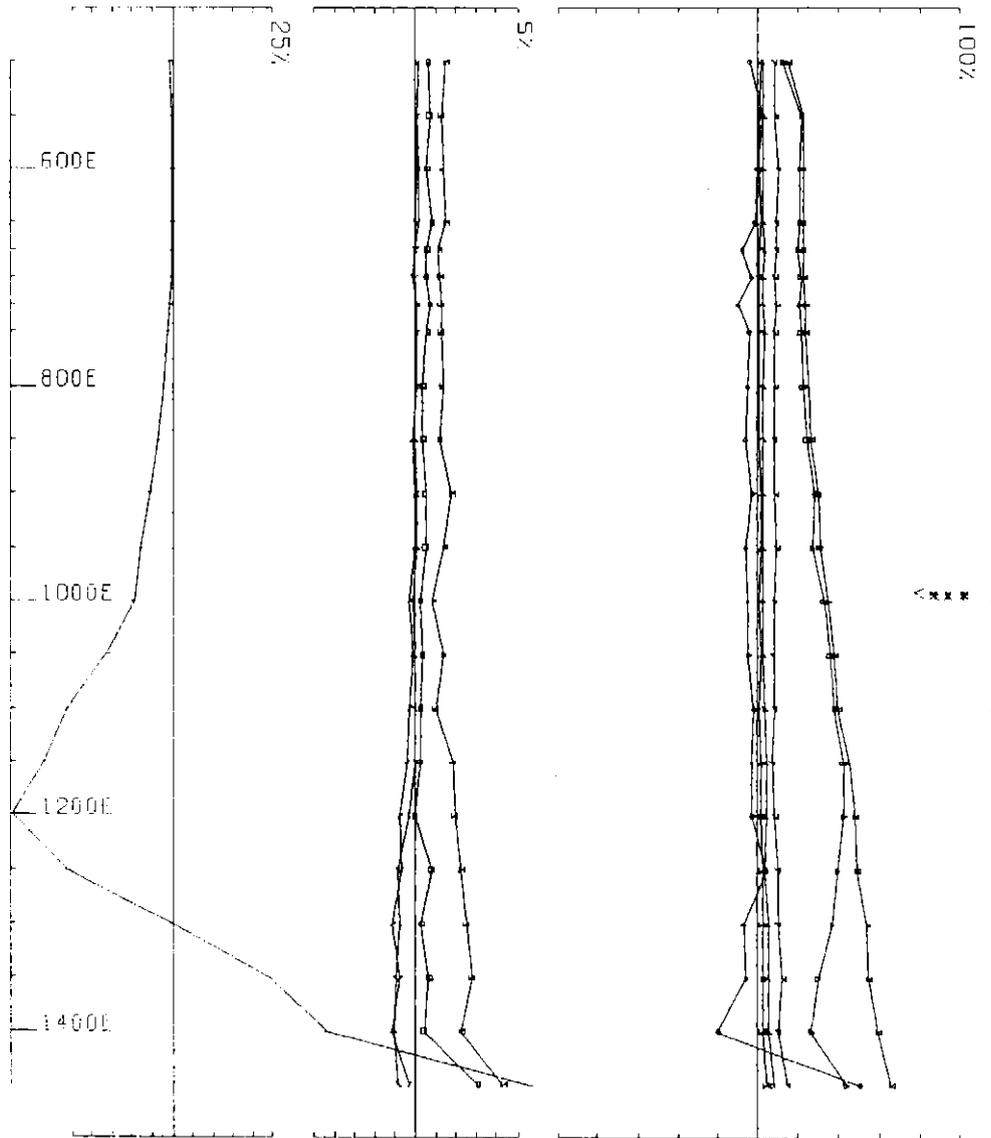
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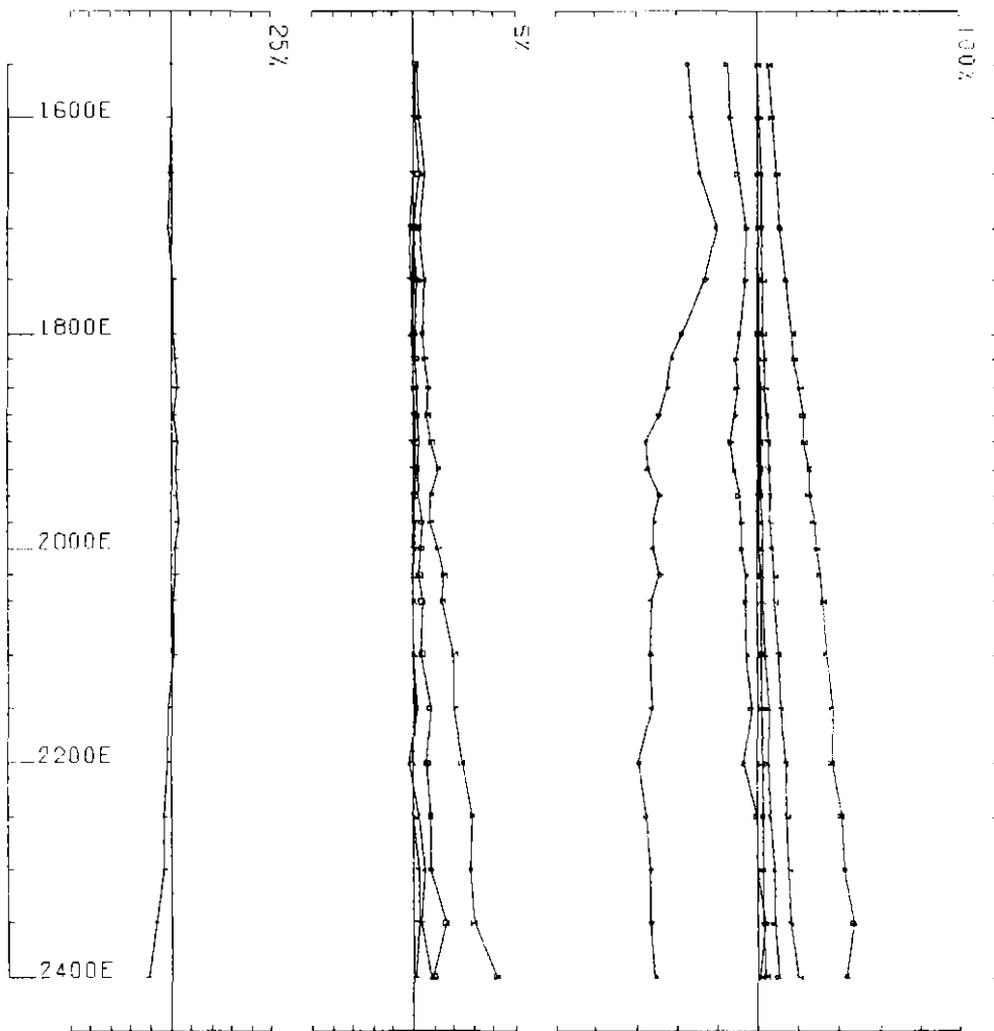
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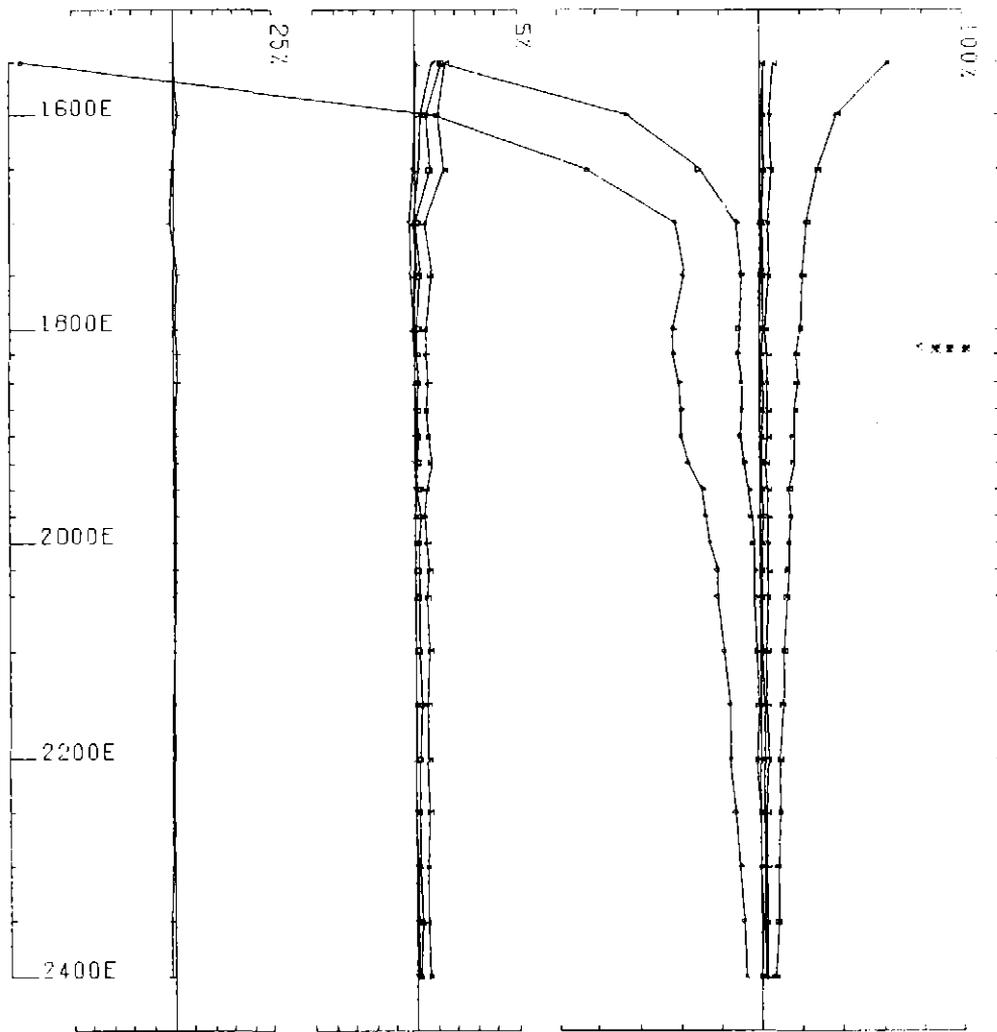
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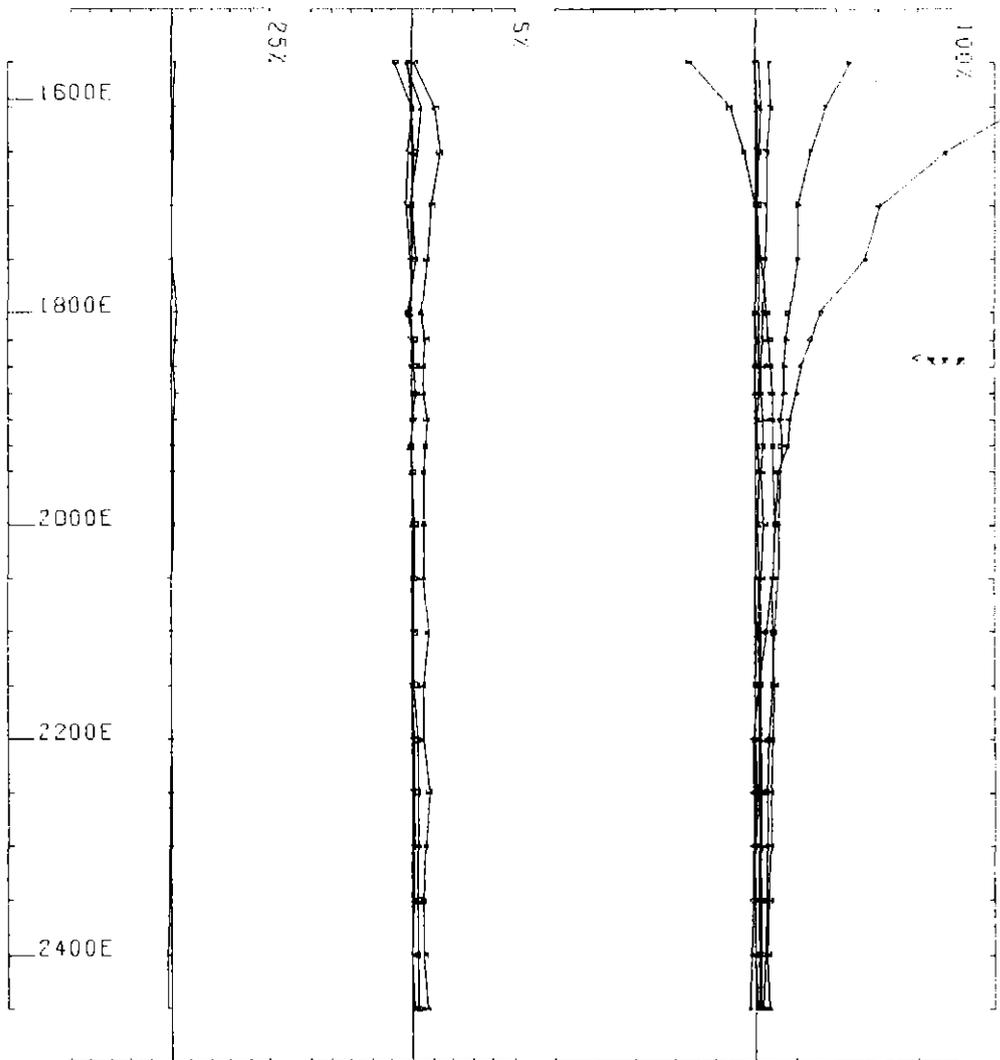
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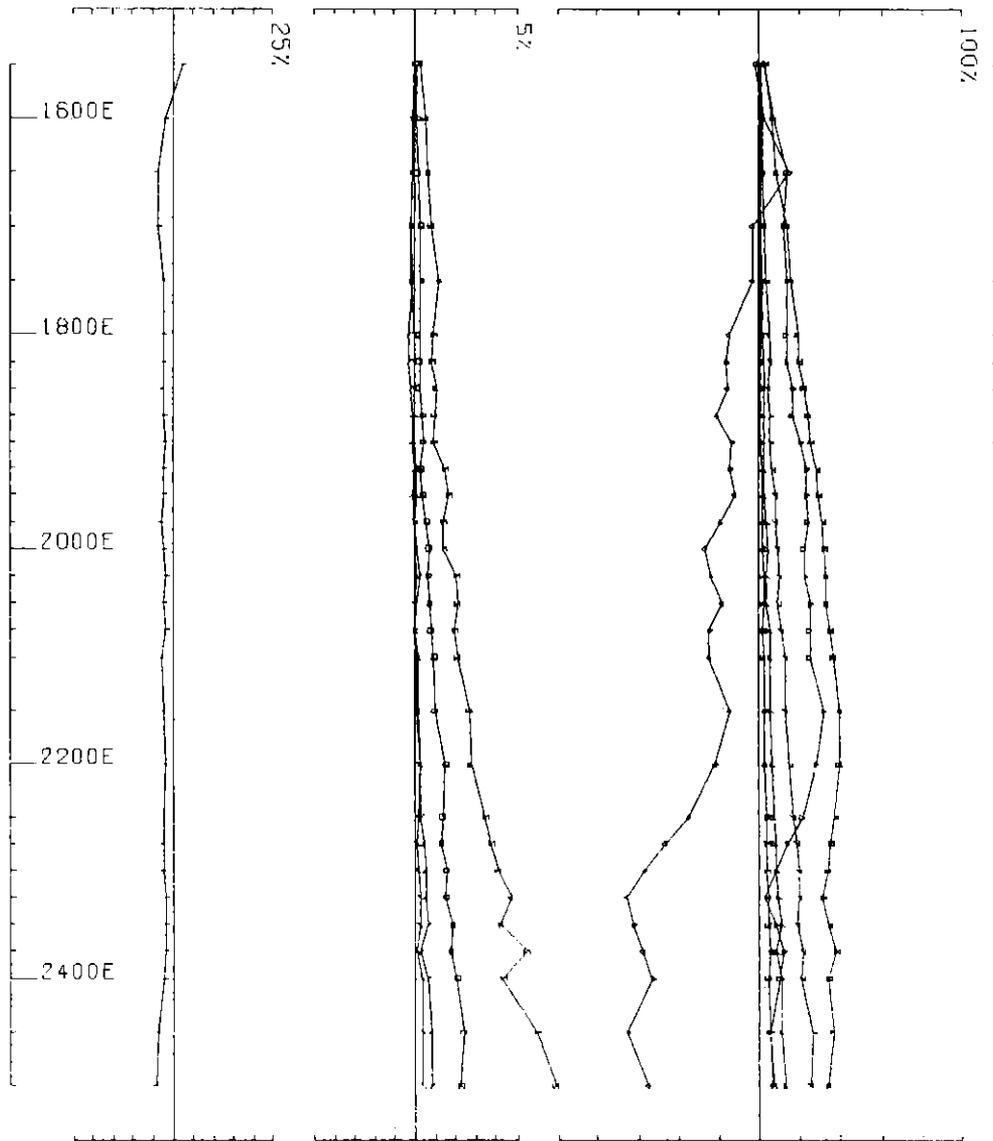
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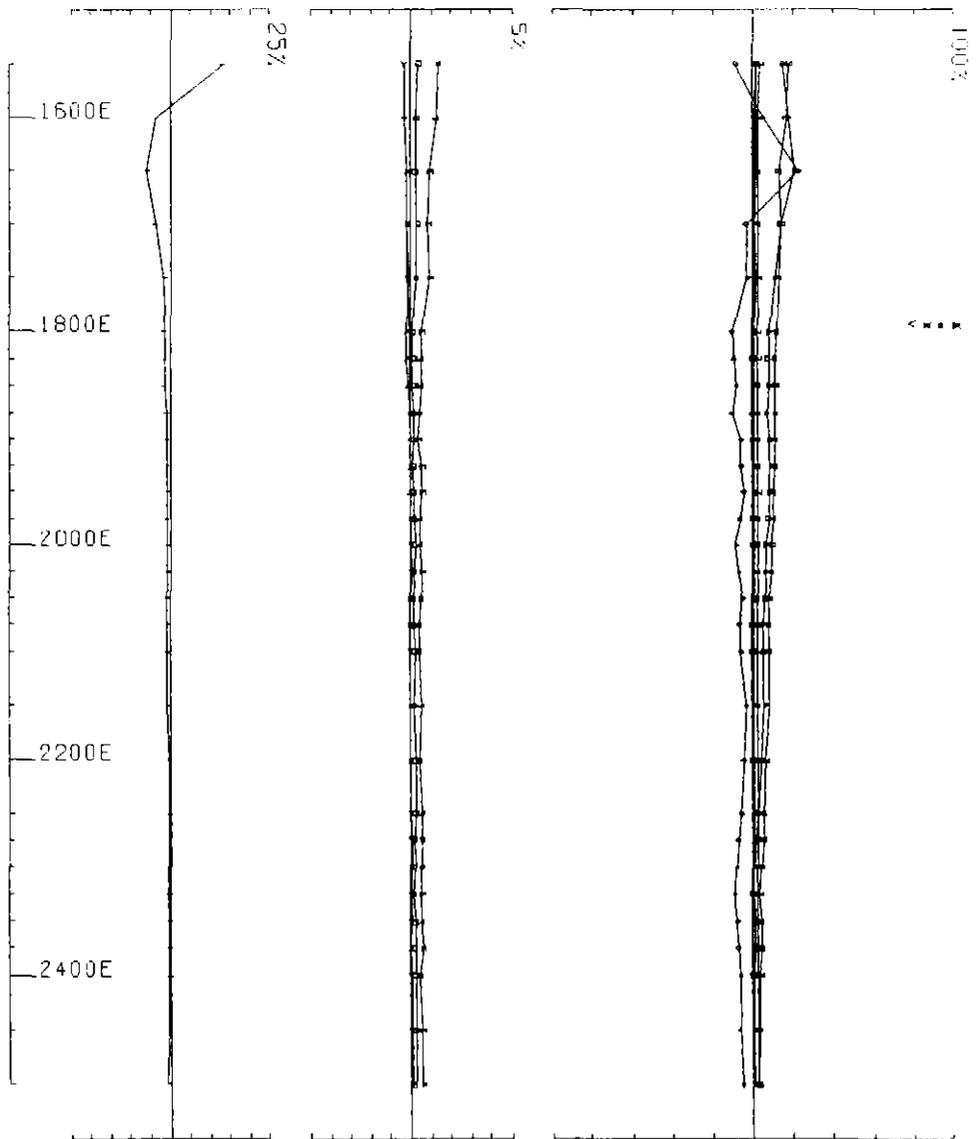
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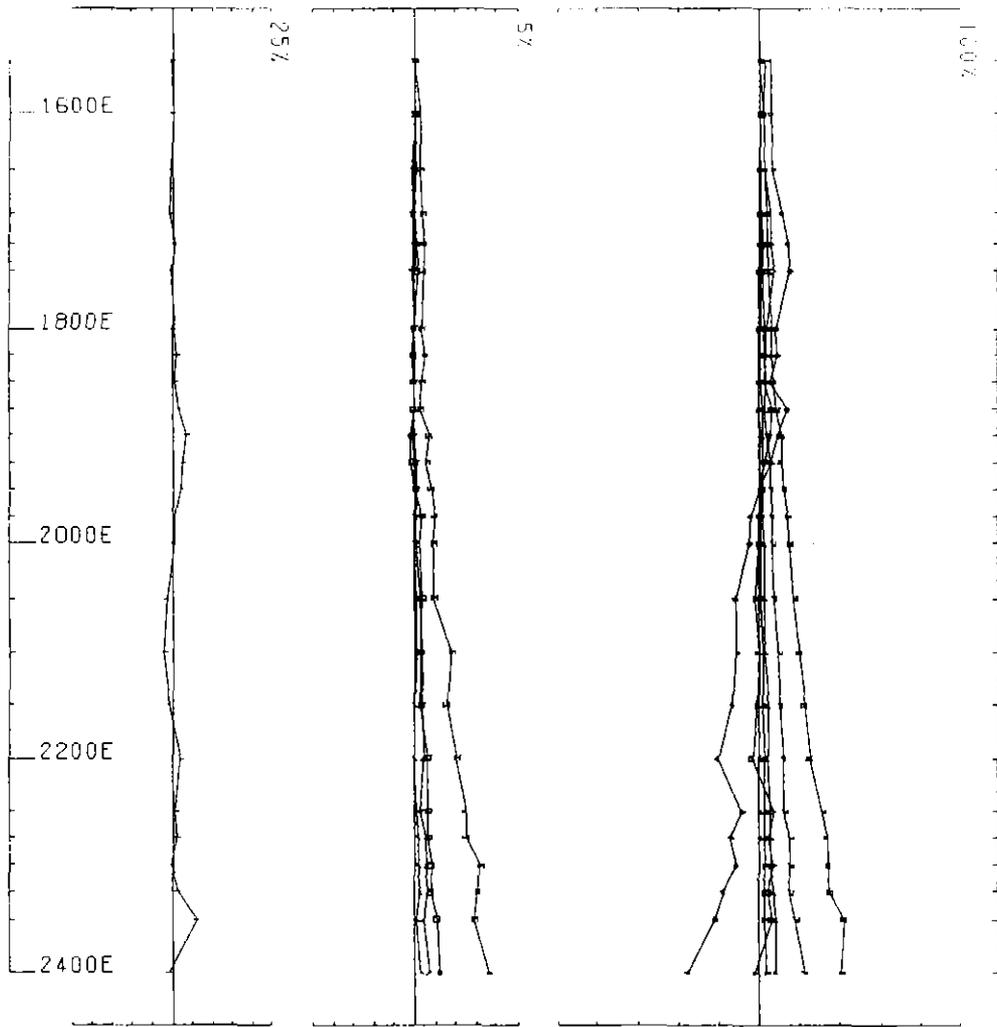
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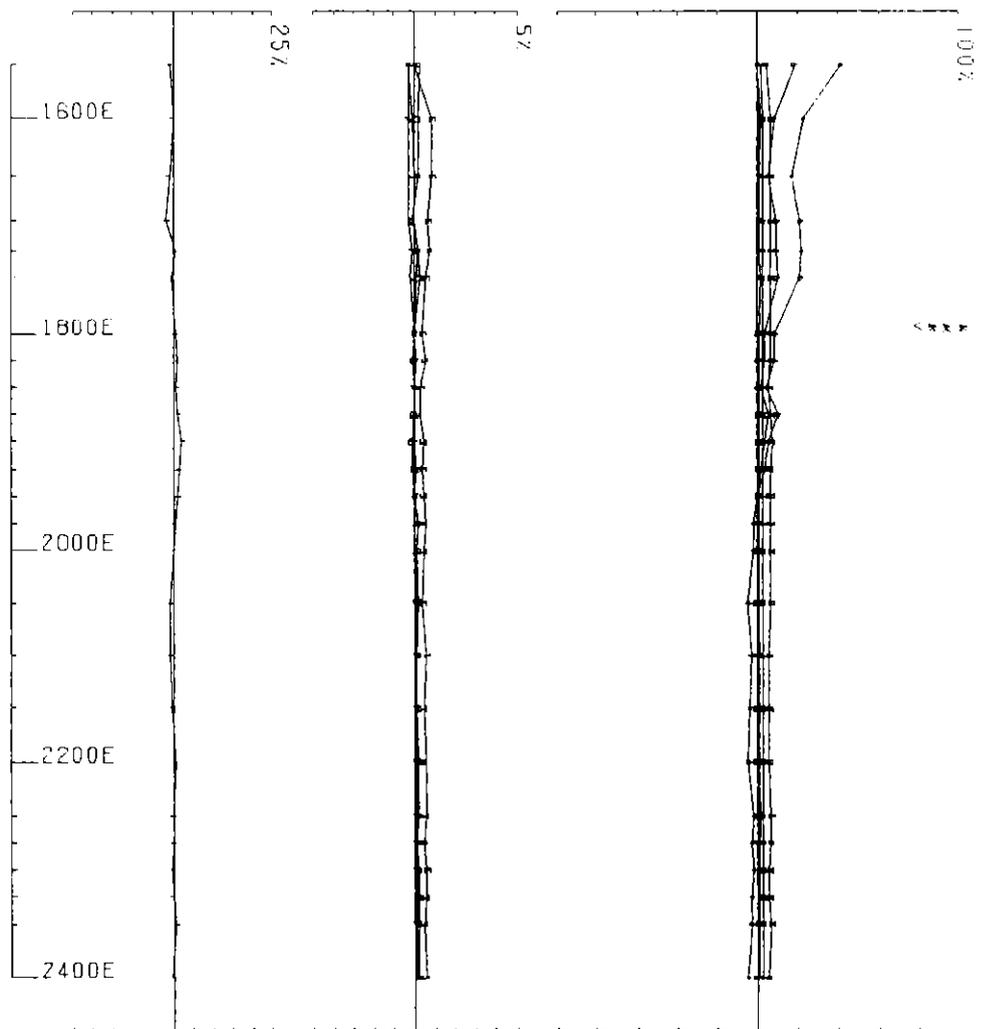
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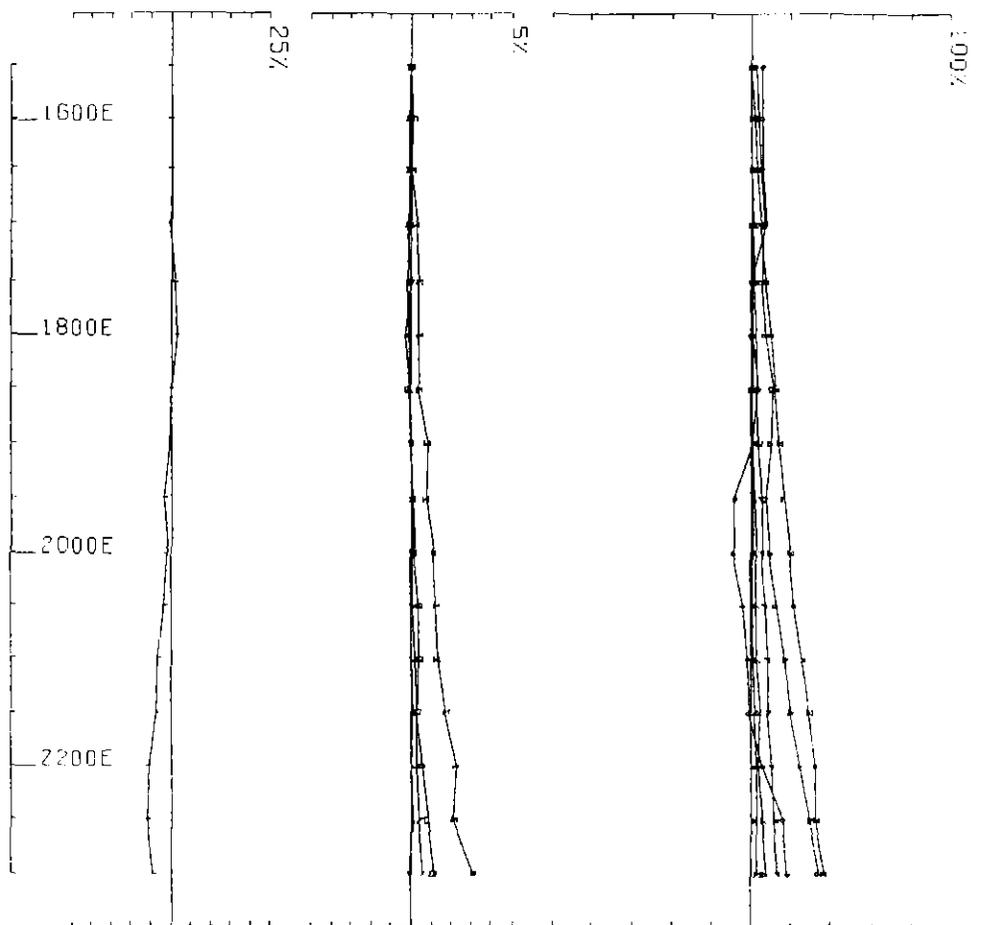
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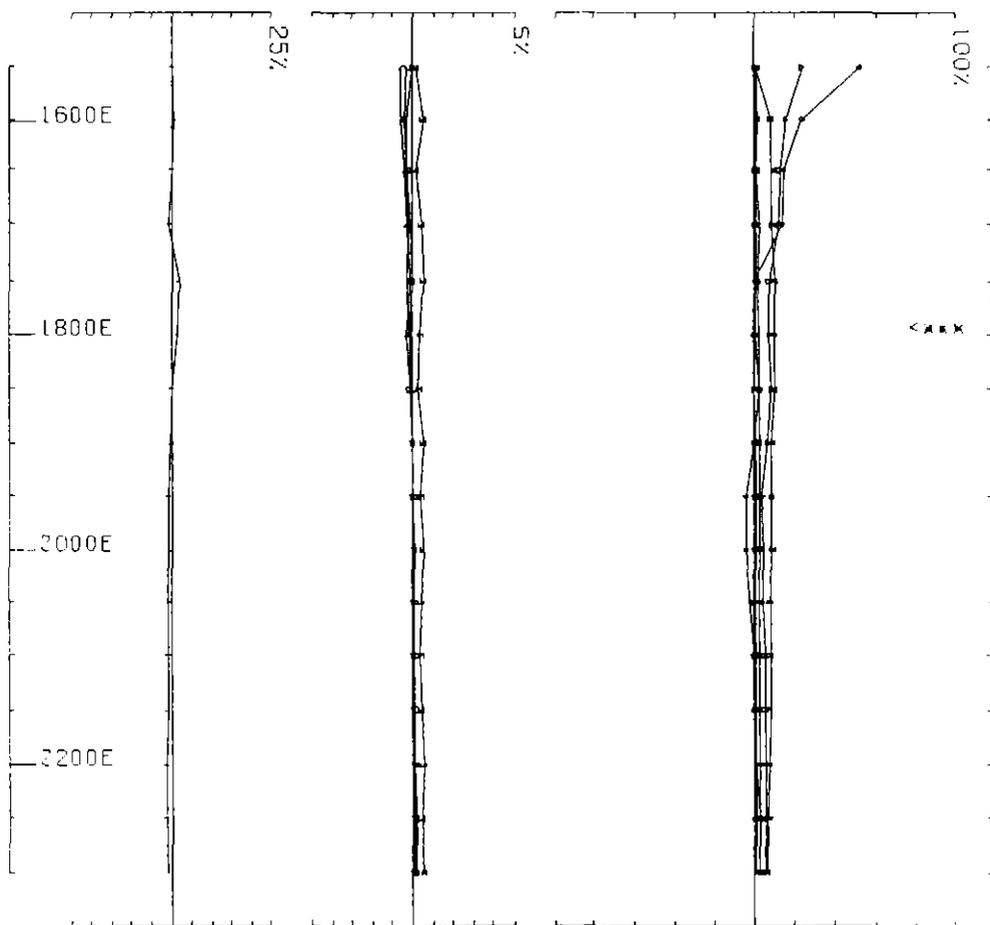
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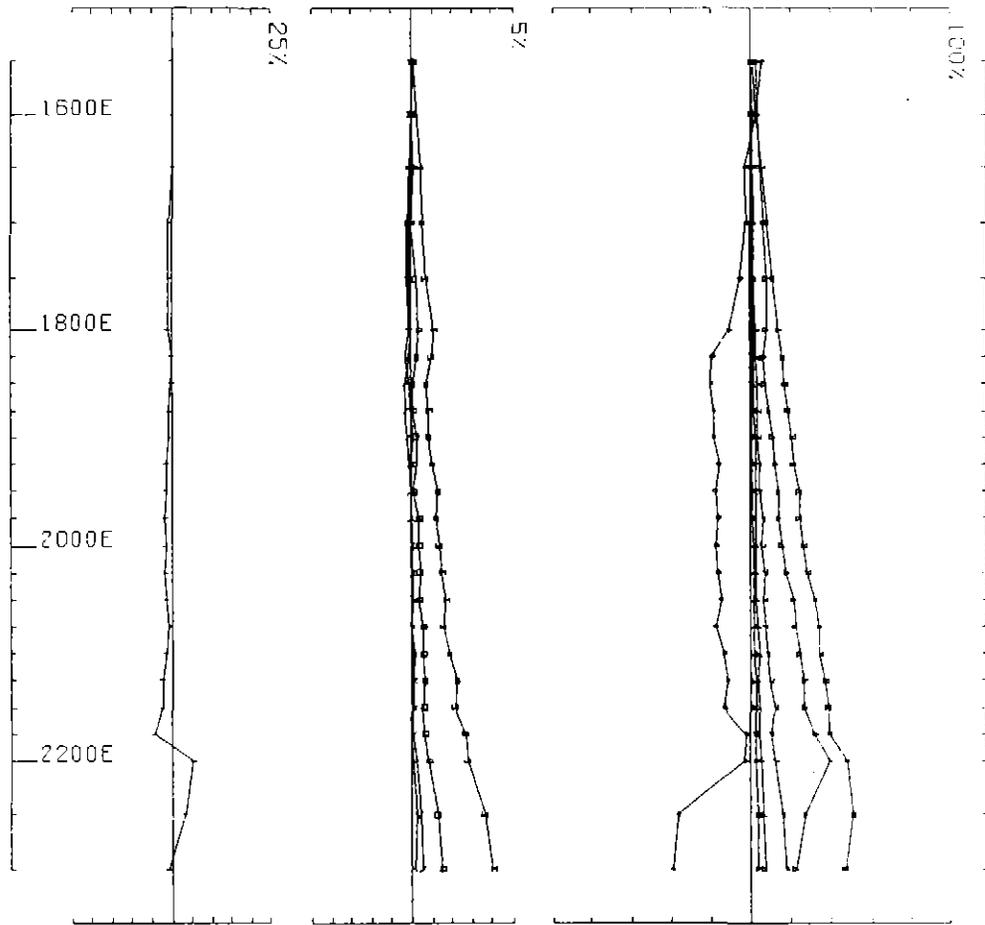
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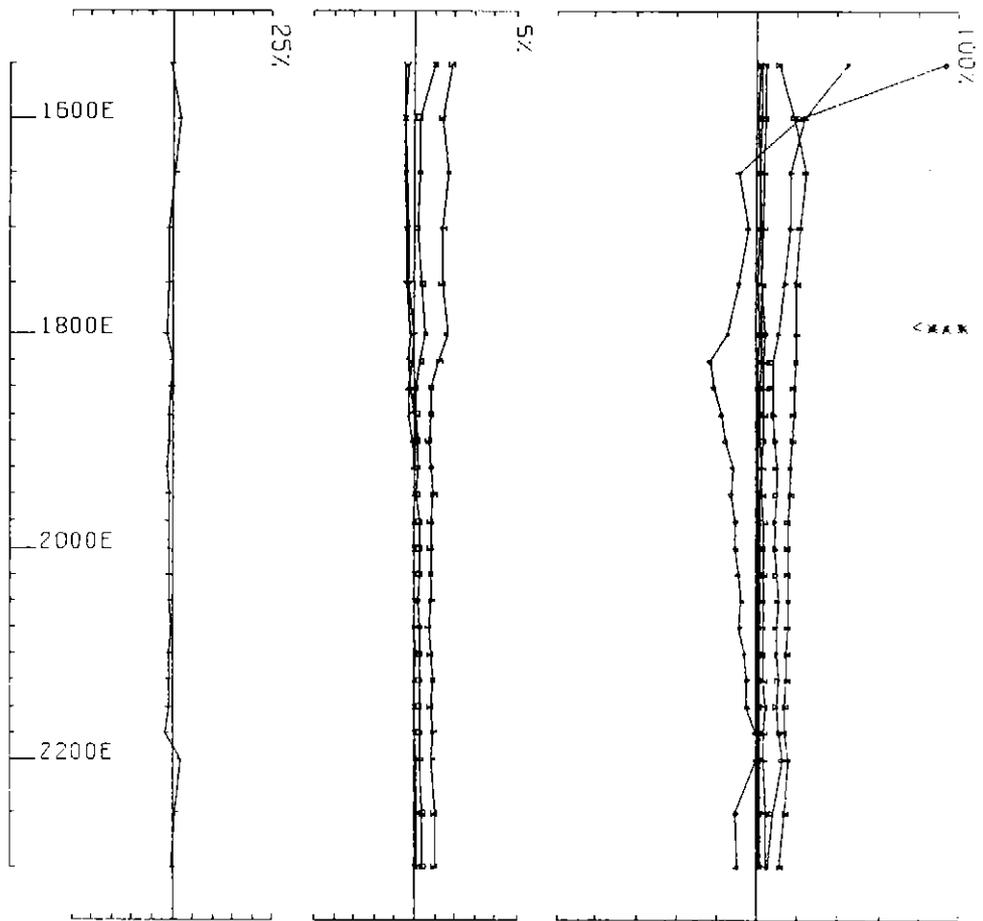
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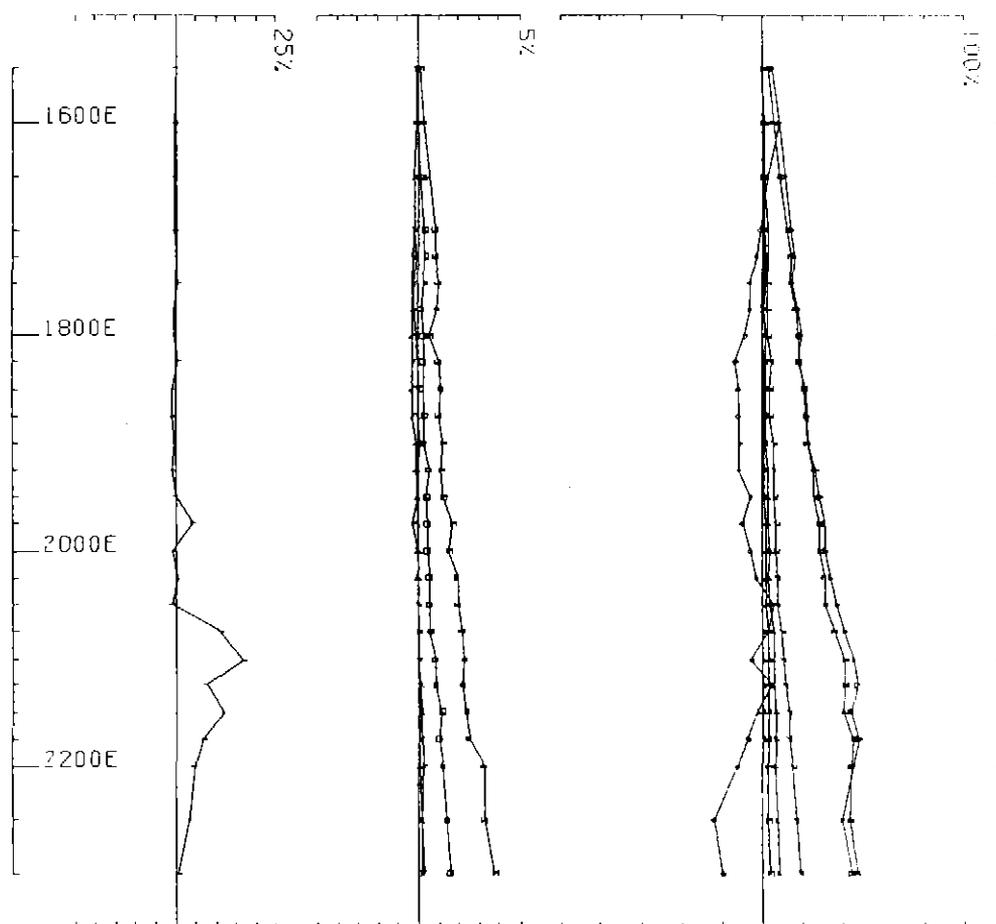
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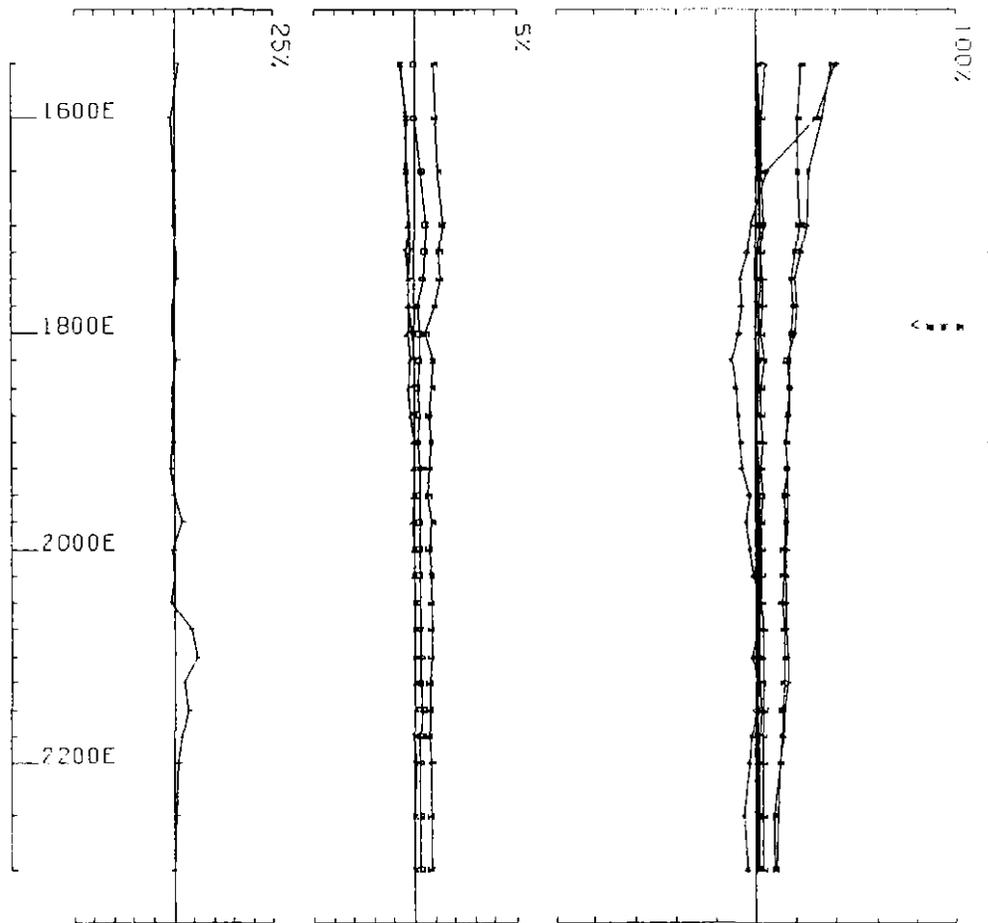
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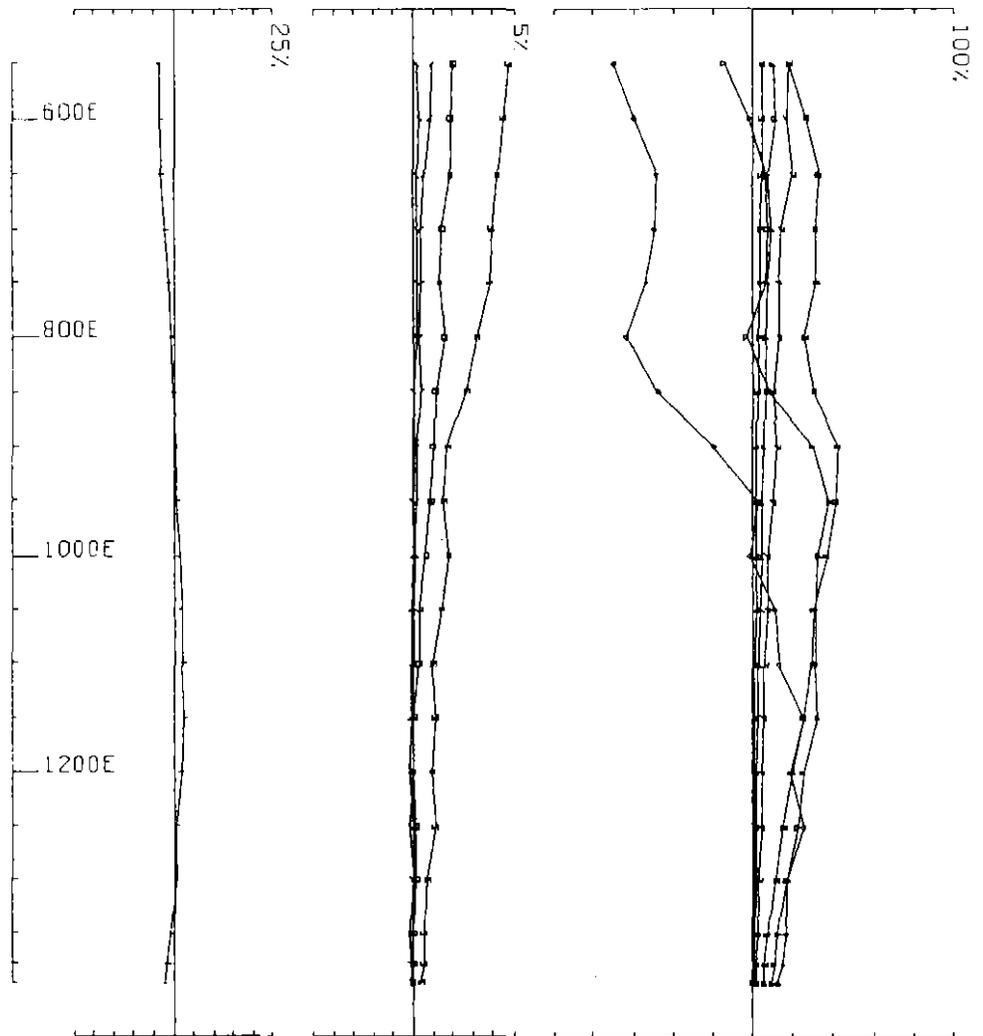
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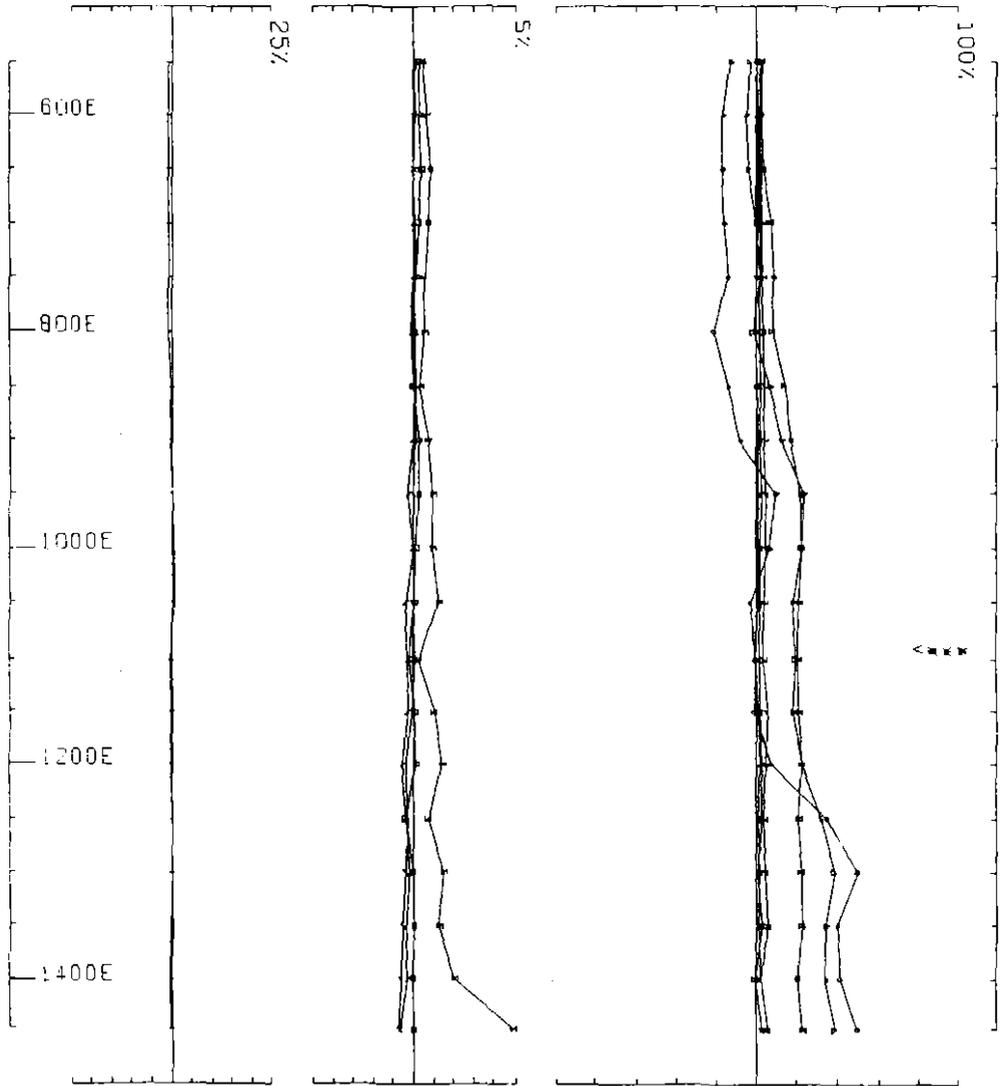
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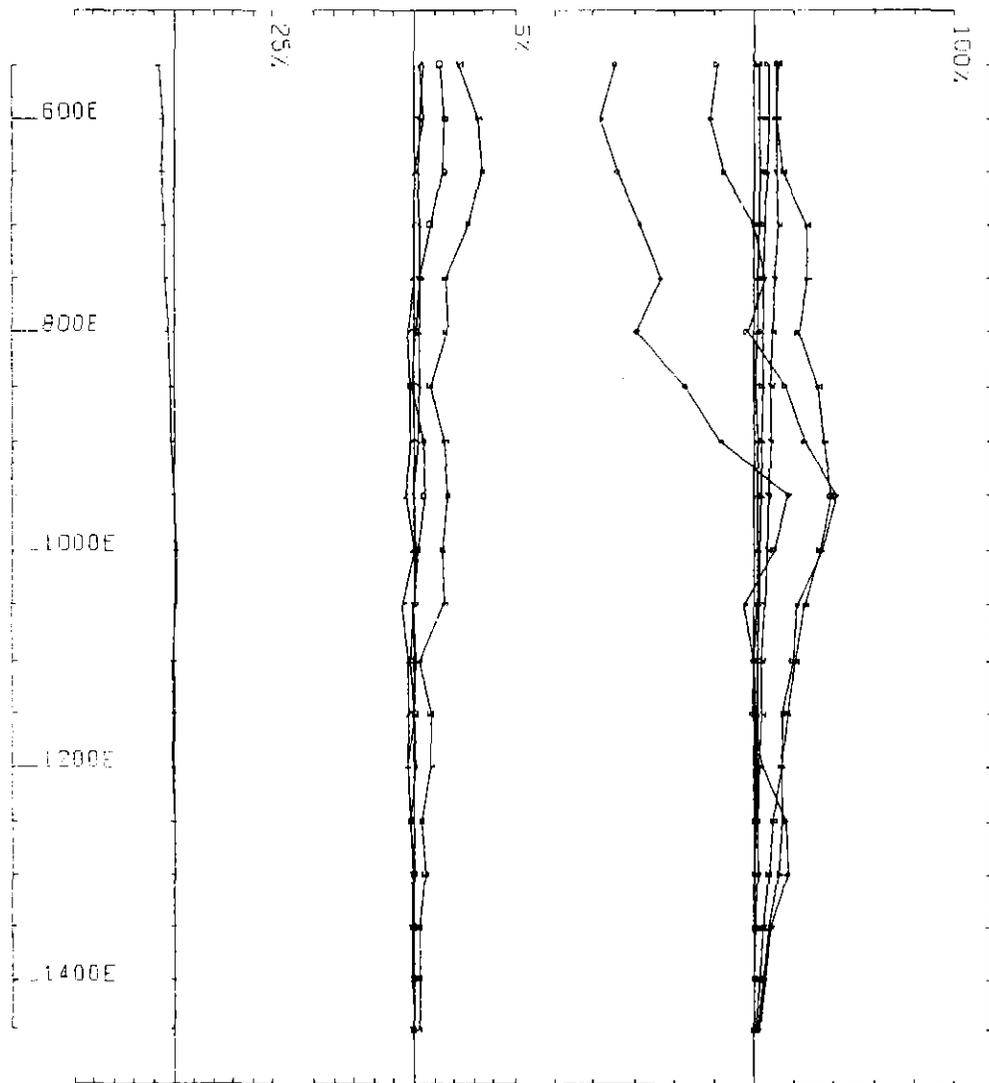


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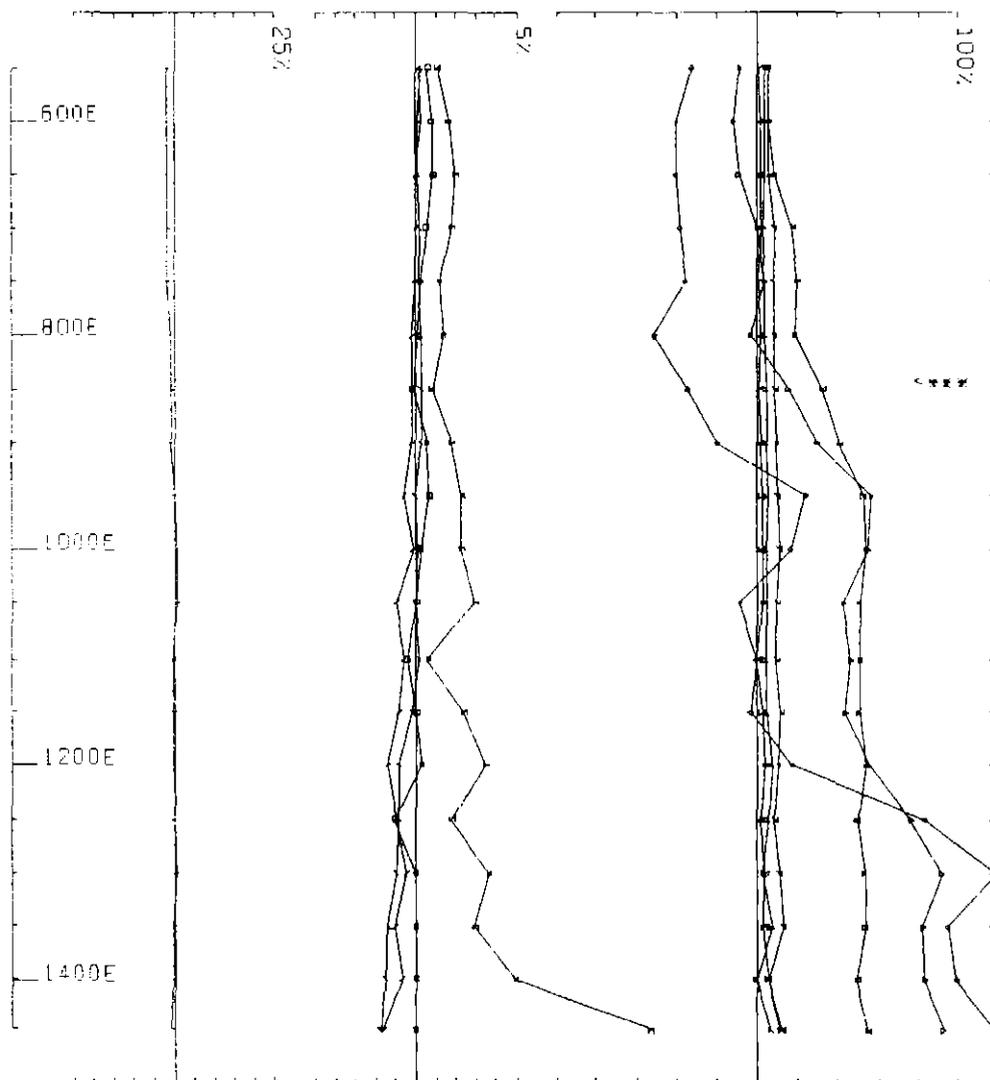


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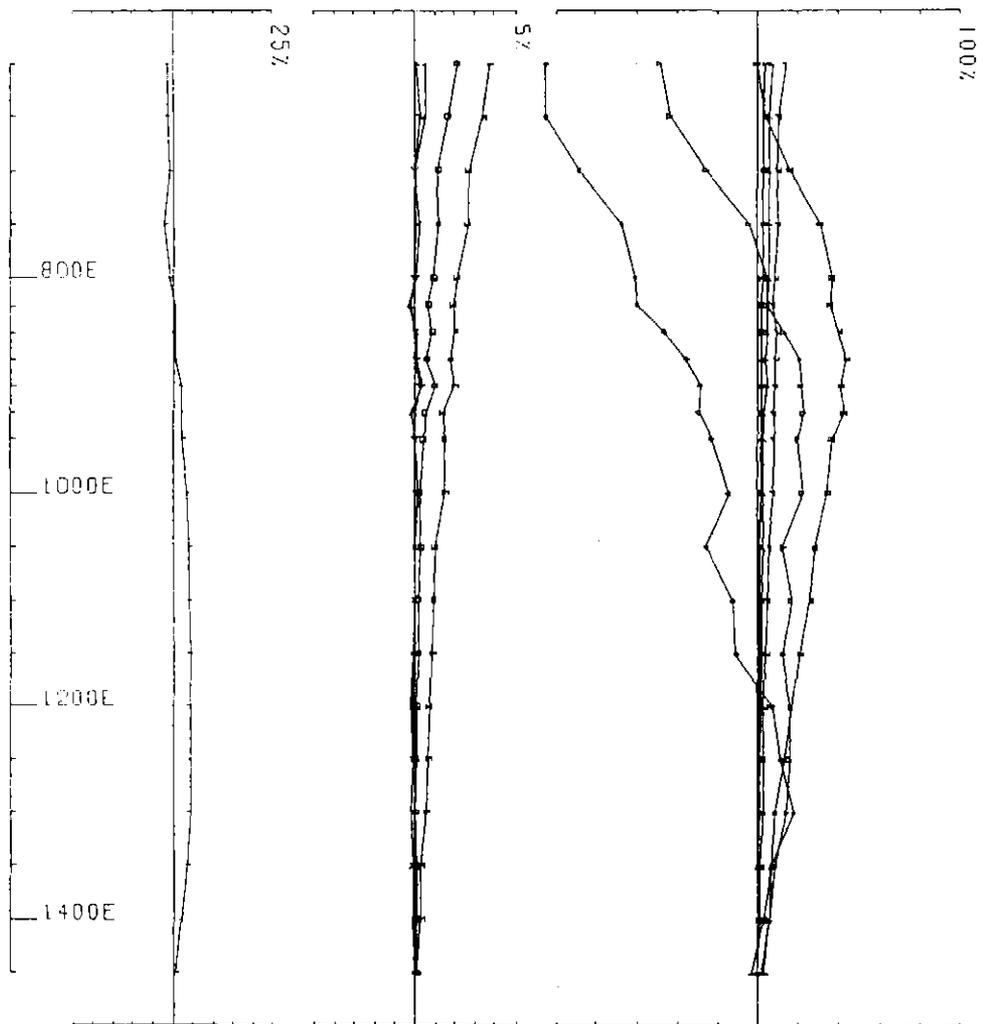
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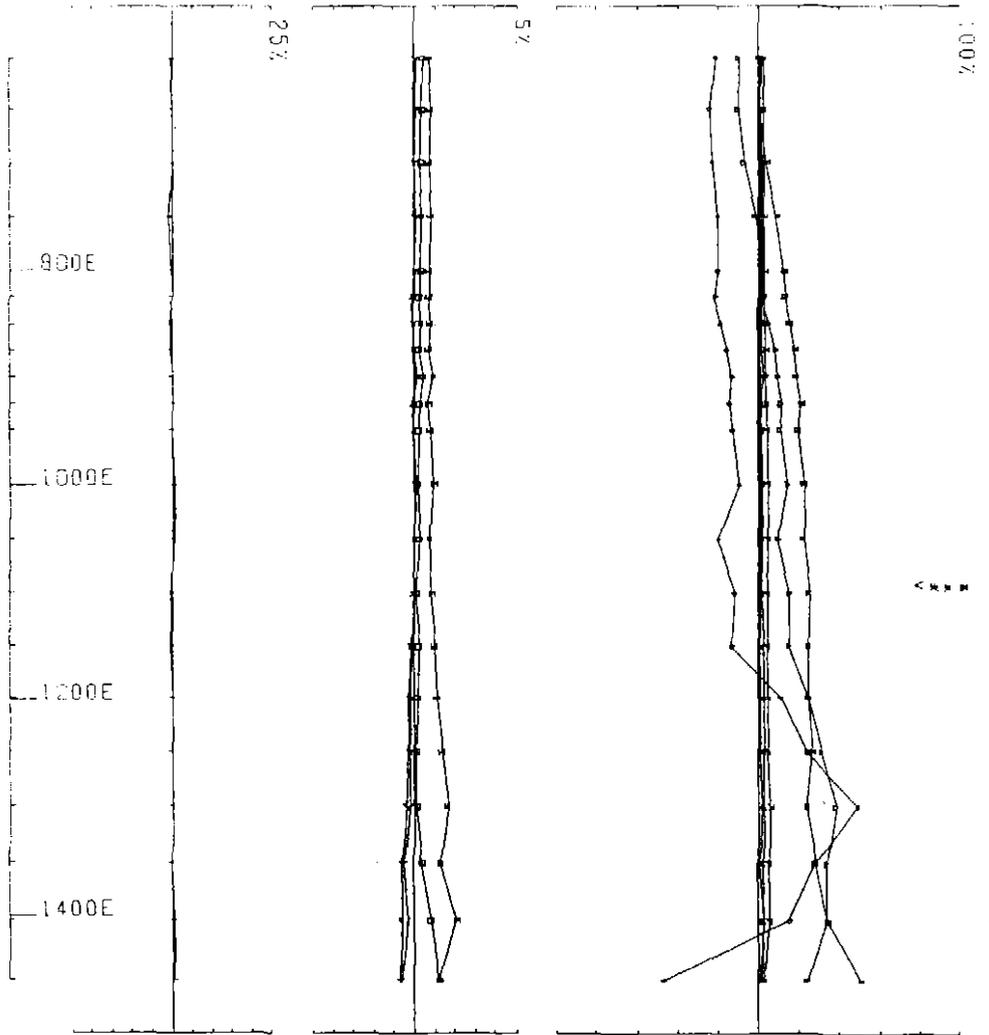
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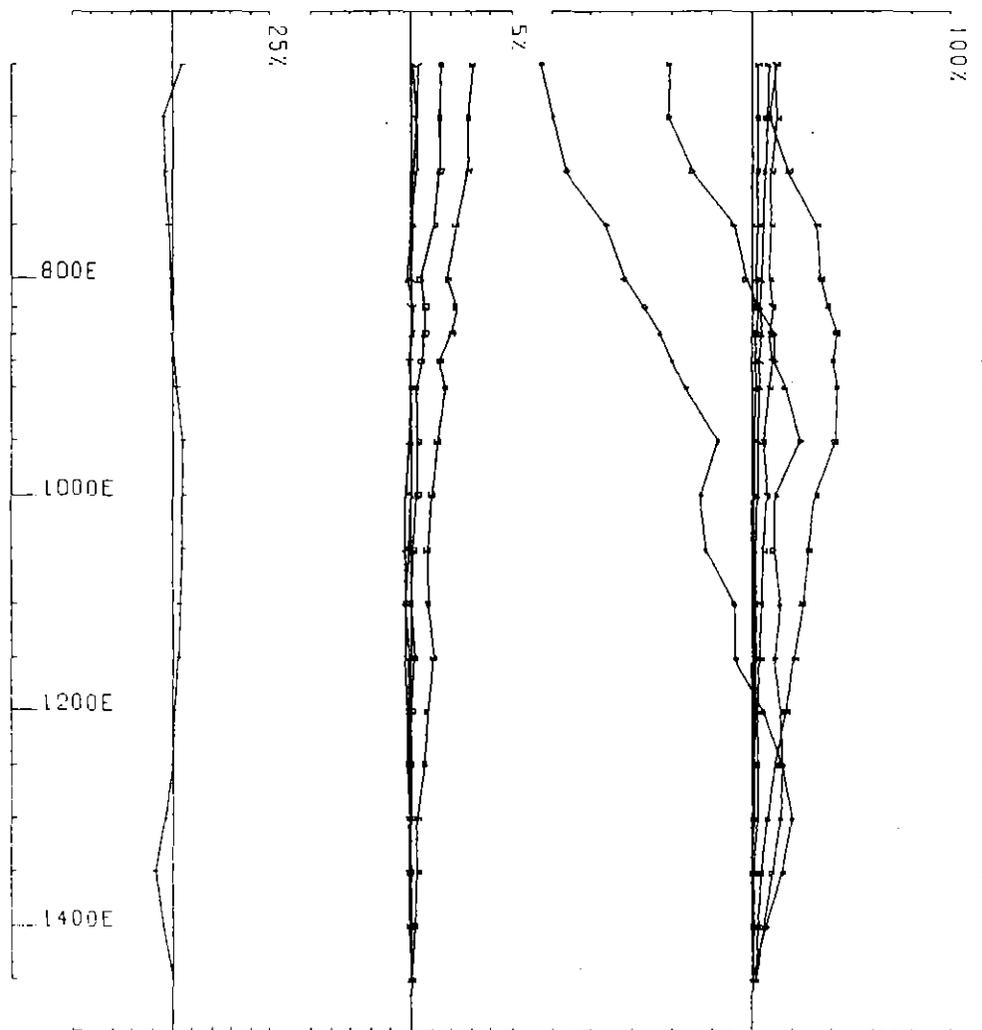
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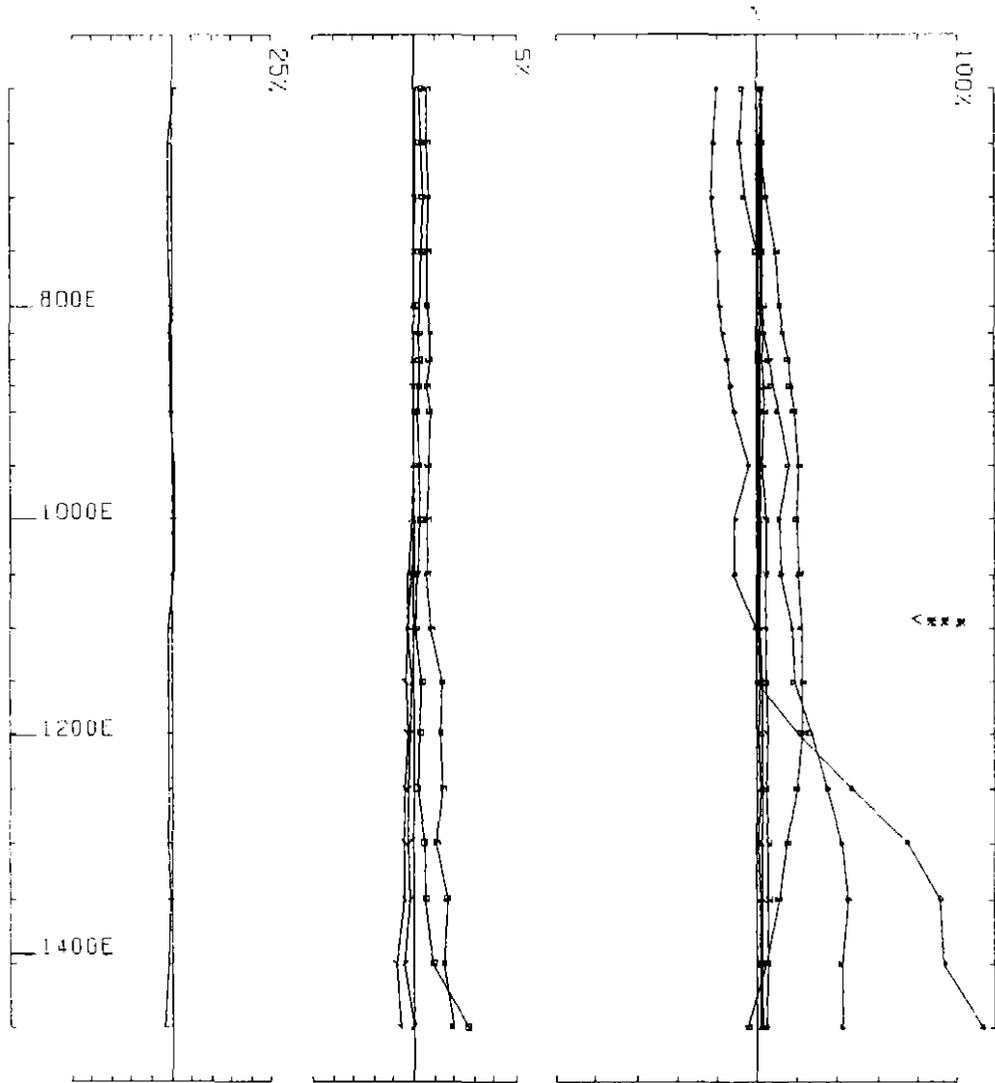
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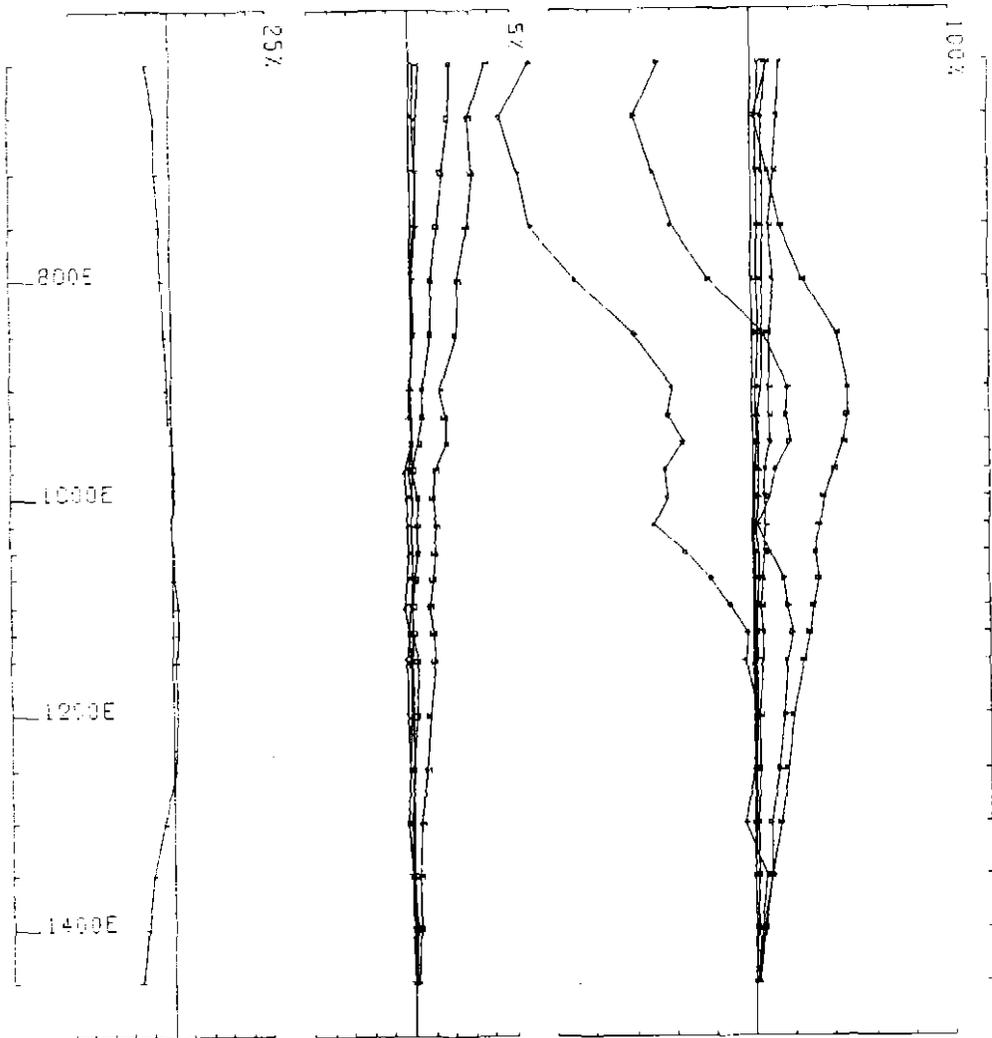
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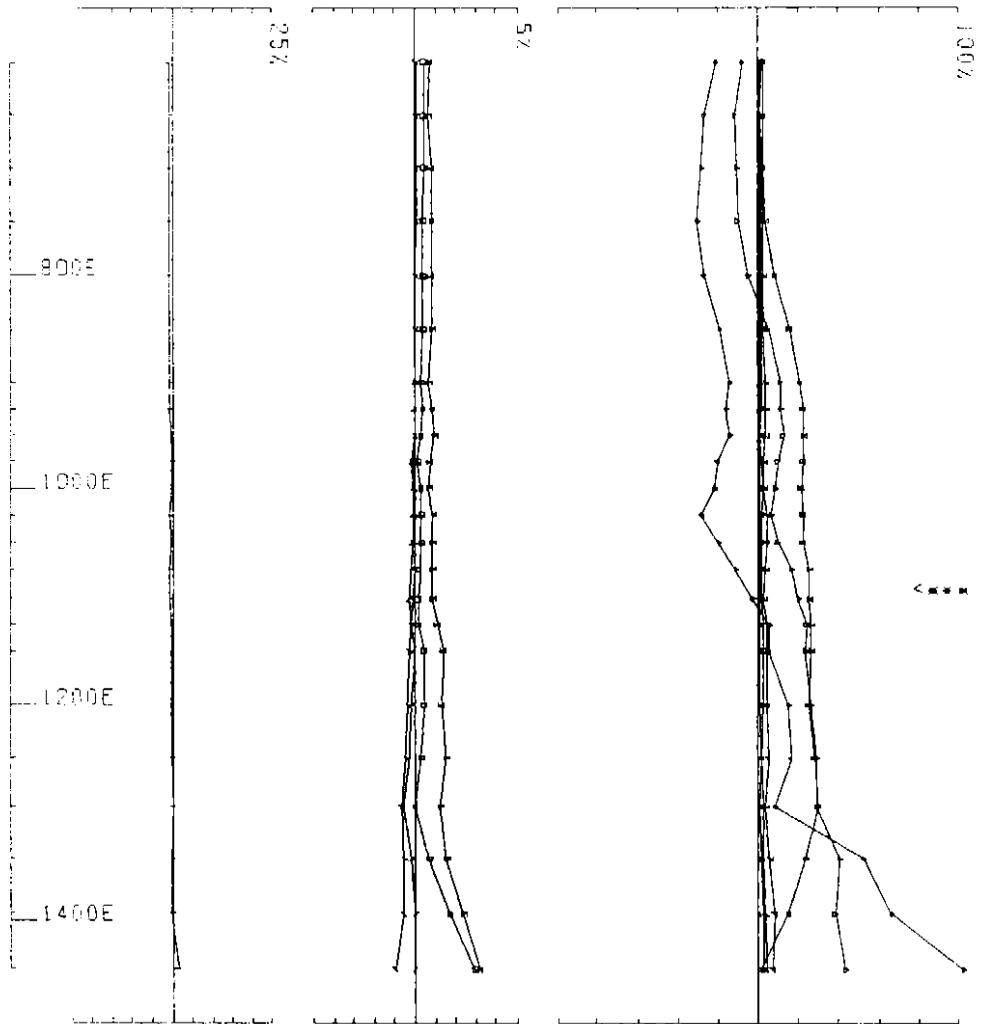
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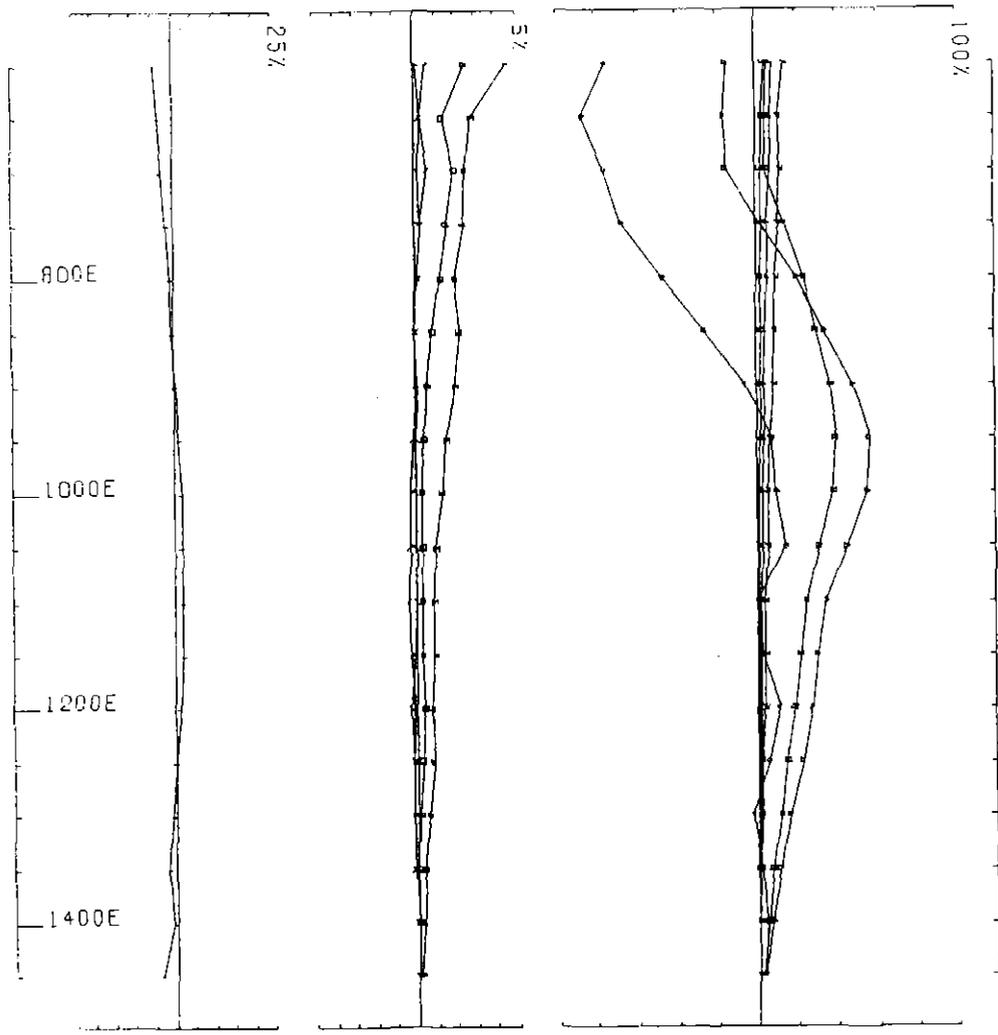
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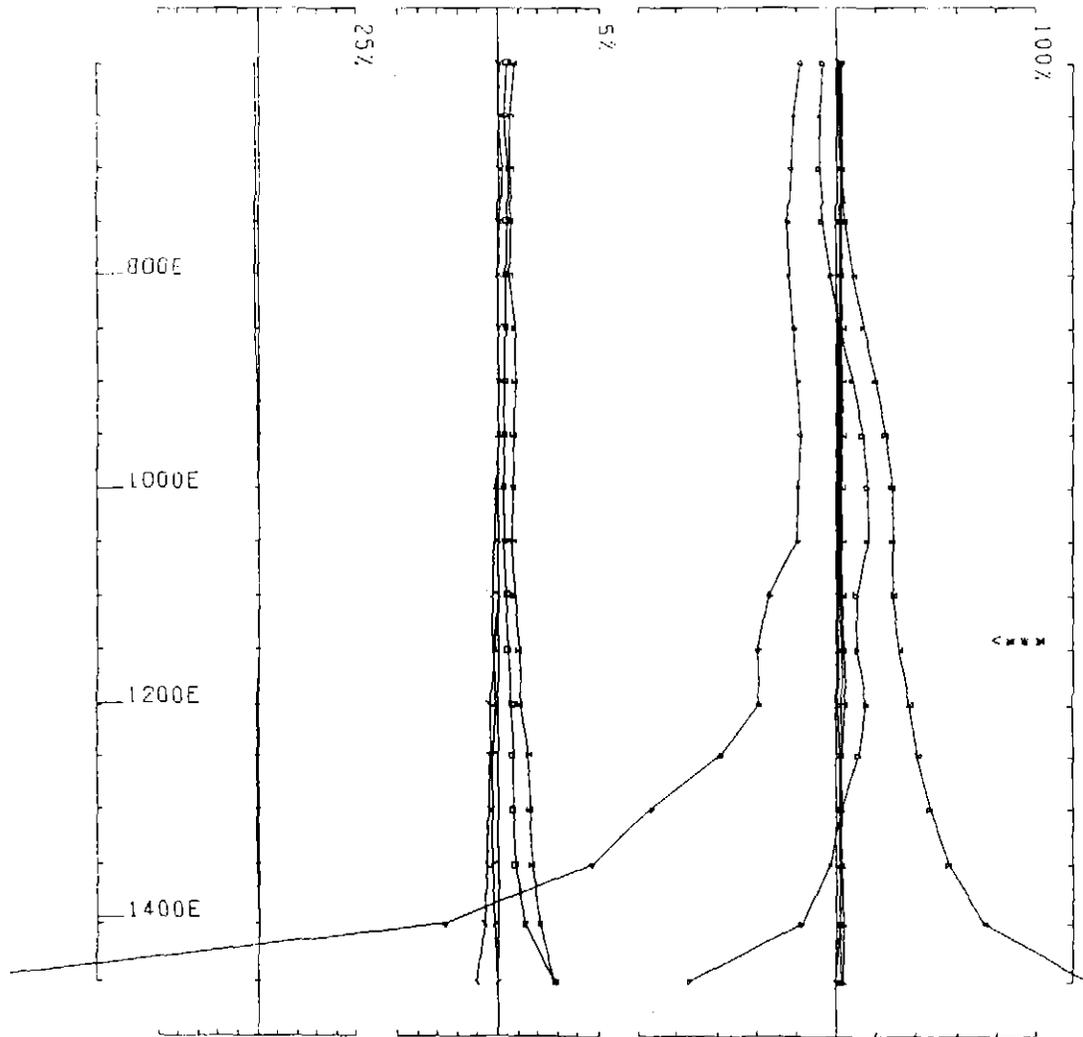
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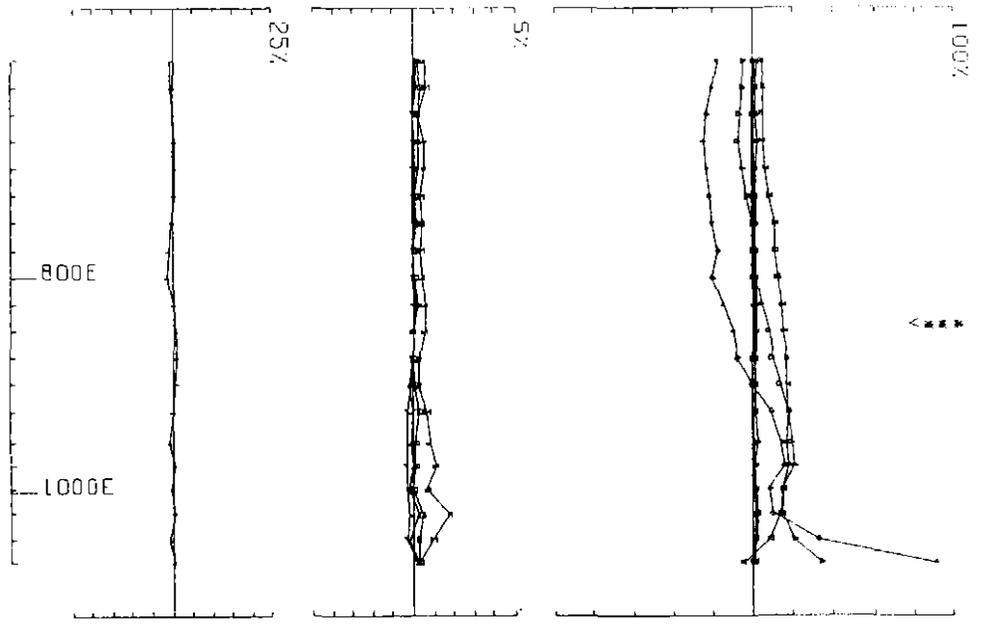
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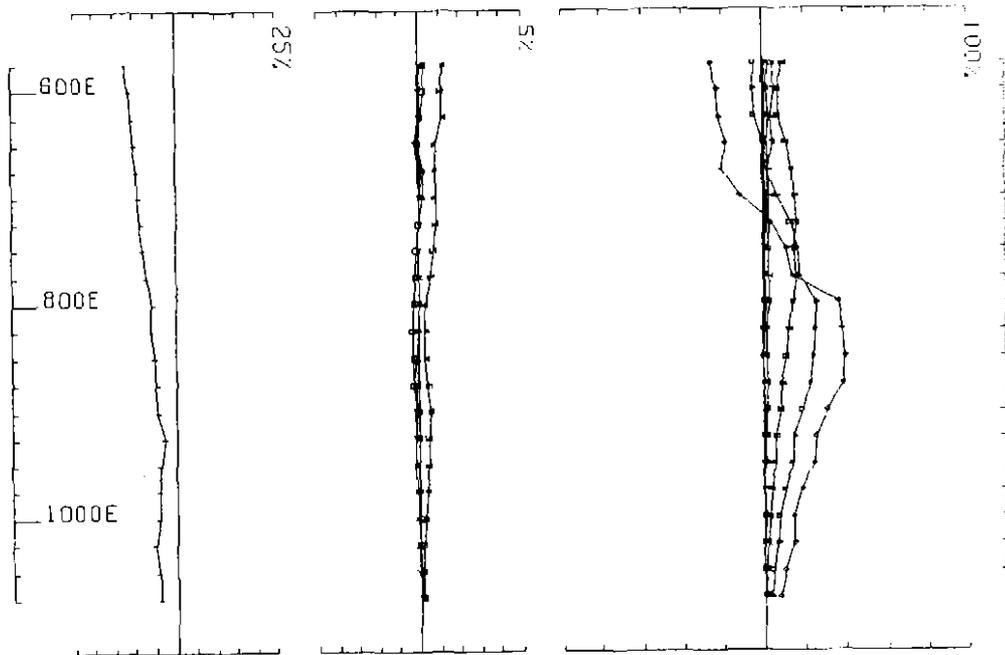
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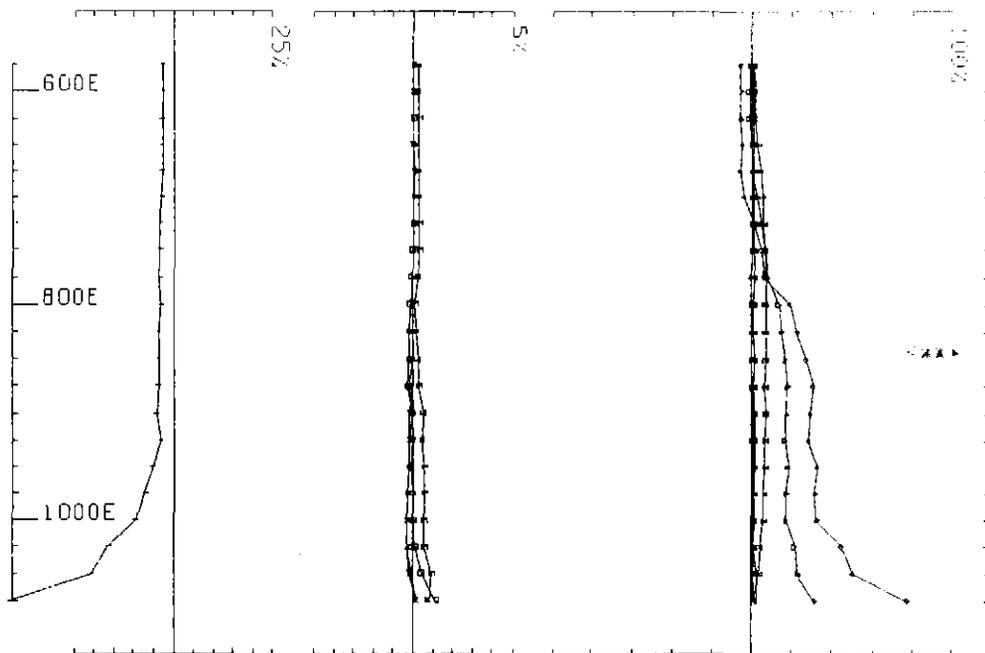
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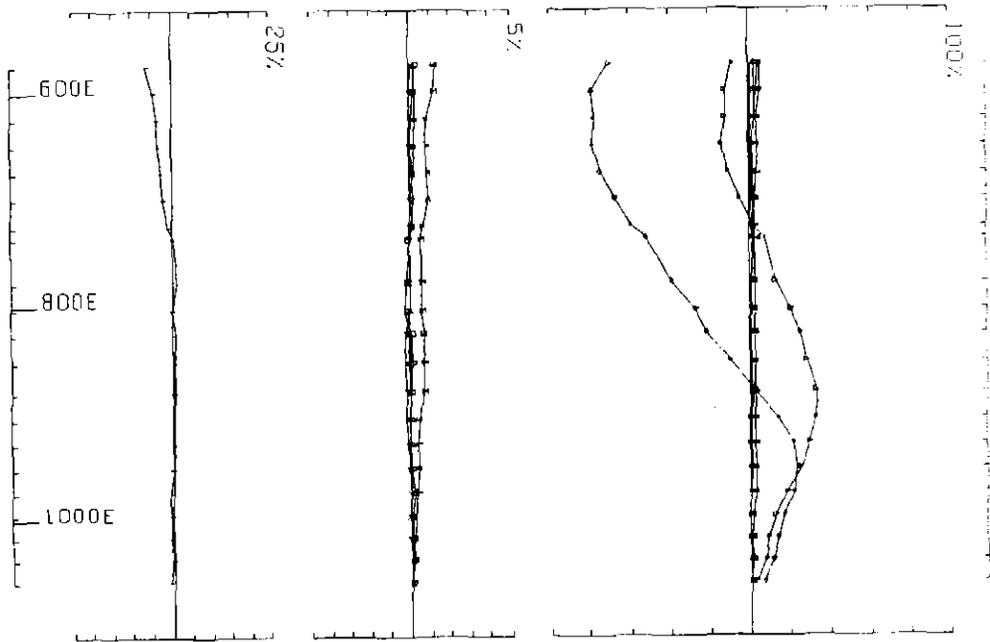
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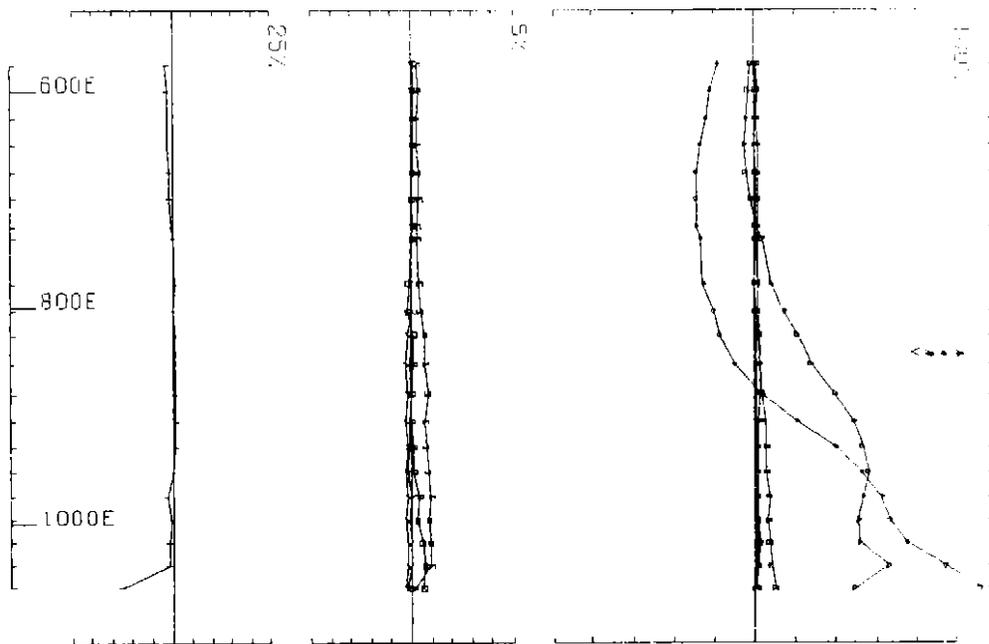
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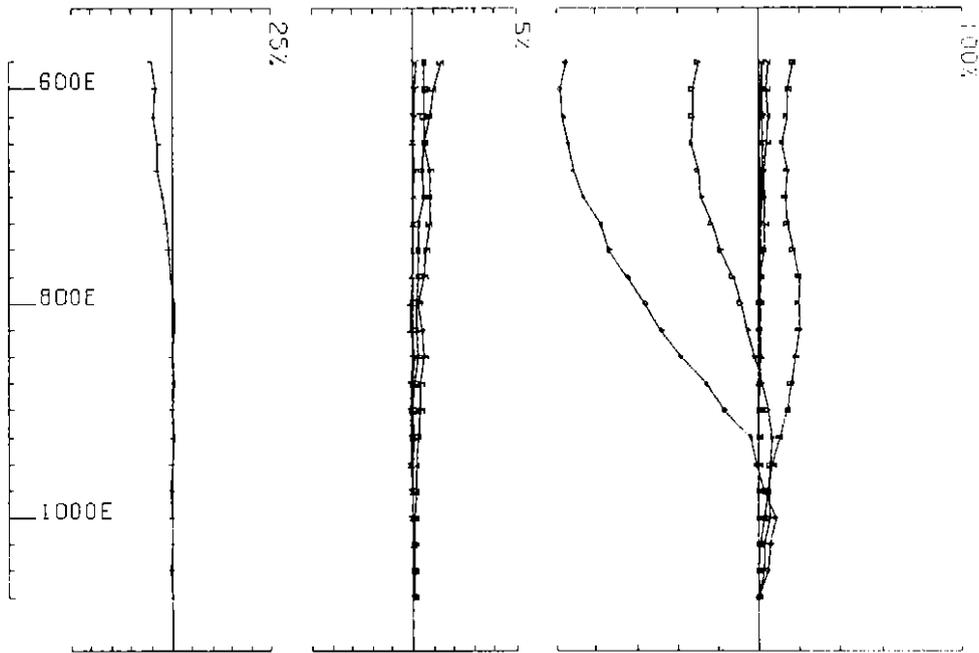
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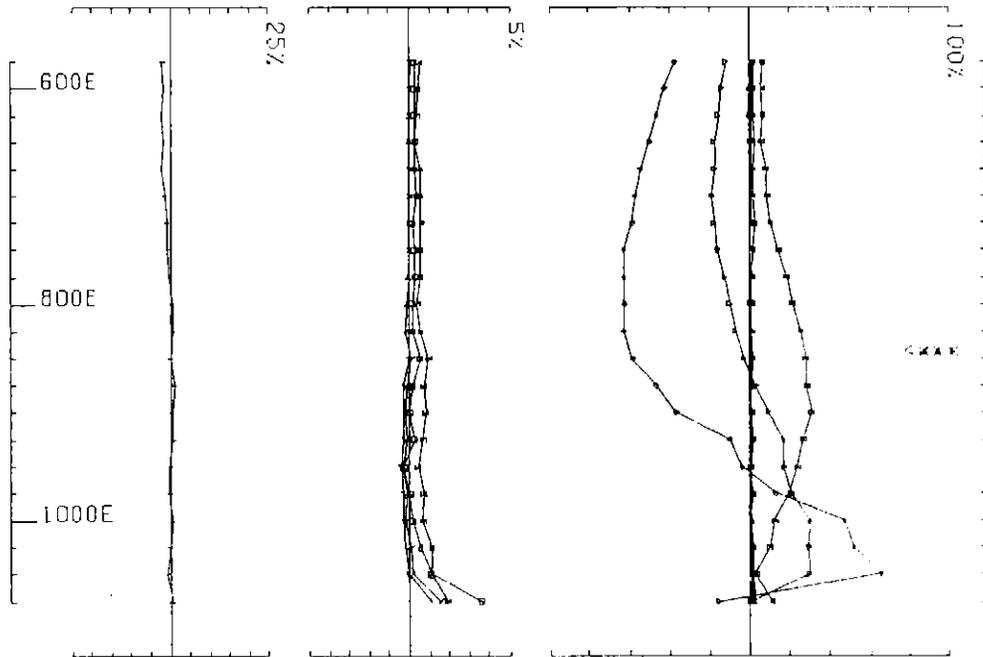
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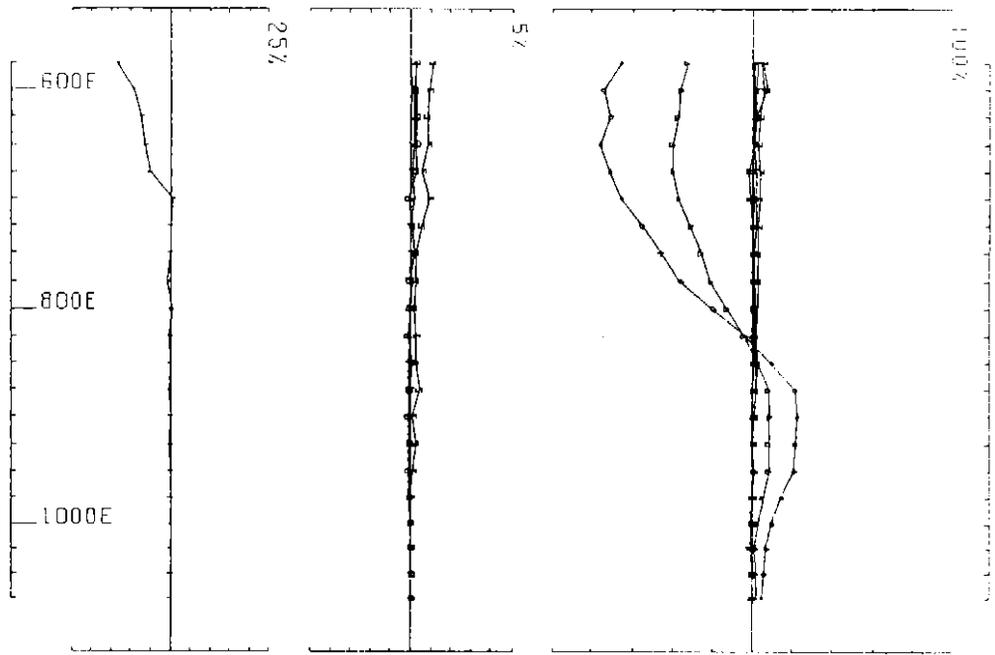
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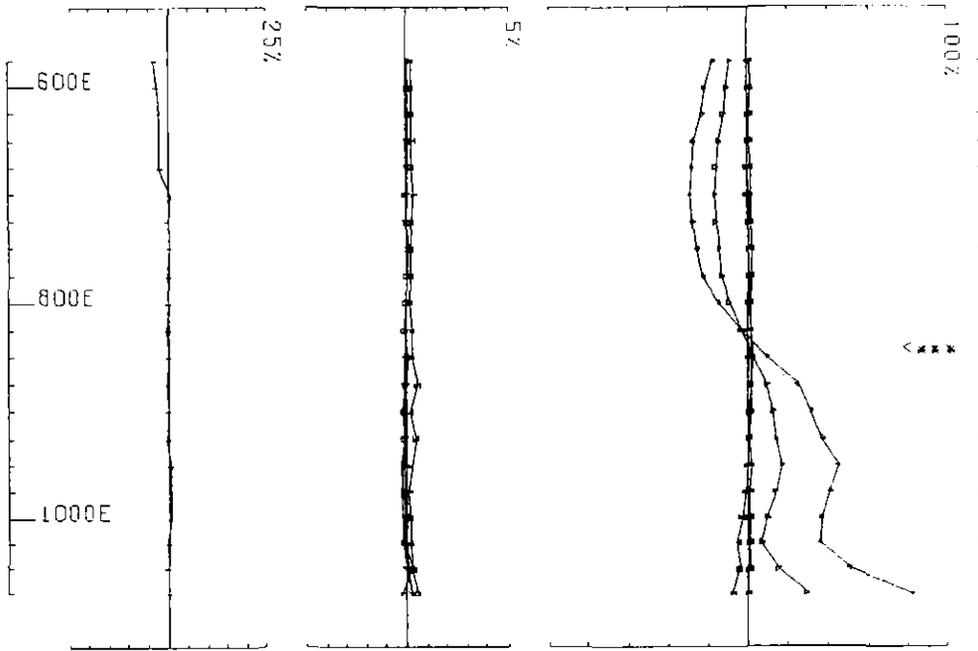
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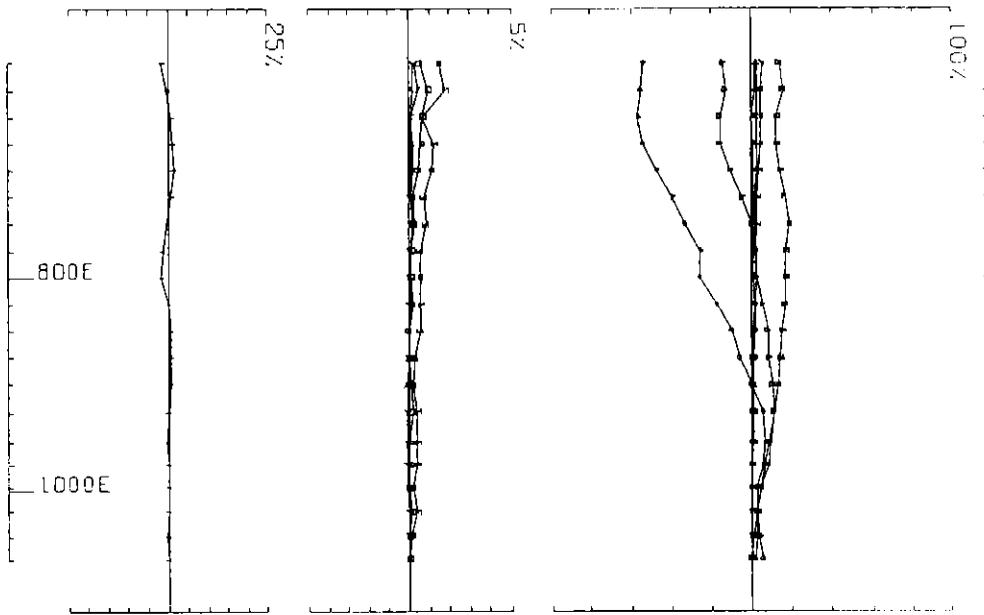
UTER SURVEY HI GARFIELD FOR BHP - UTAH DECEMBER 1990
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 LOOP NO 26 LINE 18600 N COMPONENT HZ SECONDARY FIELD CH1 POINT NORM



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 CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ 1421 26.02
 LOOP NO 26 LINE 18400 N COMPONENT H2 SECONDARY FIELD CHI CORR: NORM.



UTEM SURVEY AT GARFIELD FOR BHP - UTAH DECEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ 1HZ 26.23
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ITEM SURVEY AT GARFIELD FOR BHP - UTAH DECEMBER 1990
CONDUCTED BY LAMONTAGNE GEOPHYSICS LTD JOB 9090 BASE FREQ (HZ) 26-28
LOOP NO 26 LINE 18200 N COMPONENT HZ SECONDARY FIELD CHI CONTIN. NORM.

APPENDIX 6

WS-2 DRILLHOLE ASSAY RESULTS

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ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.

Phone (09) 458 7999

52 Murray Road, Westport, W.A. 6106

Telex AA92560

ANALYTICAL REPORT No.

14.4.08.07027

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

BHP Minerals
P.O. Box 503
Queenstown
Tasmania 7467

1990

ORDER No. 005618 PROJECT B57

DATE RECEIVED 18/04/90 RESULTS REQUIRED ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
2	08/05/90	1	24

STATE OF SAMPLES	PRE-TREATMENT							ANALYSIS			
	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
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<DC,401/424	DC								Au,AuChk/309		
<DC,401/424	DC								Ba,As/401		

Mr. Peter Gregory
BHP - UTAH Minerals Limited
P O Box 619
Hawthorn
Victoria 3122

REMARKS

RESULTS TO RESULTS TO

STATE OF SAMPLES	ANALYSIS — PREPARATION	ANALYSIS — METHOD
hole core WC	perchloric acid A1	atomic absorption AAS
split core SC	hydrochloric acid A2	x-ray fluorescence XRF
cutting CU	nitric acid A3	spectrophotometry SPEC
rock Ro	aqua regia A4	colorimetry COL
oil SO	nitric-perchloric A5	chromatography CHR
slip PU	HF mixture A6	titration TTN
water WA	HF under pressure A7	other chemicals means CHEM
fissure TI	fusion A8	miscellaneous MISC
stream sediment SS		fluorescence FLUOR
heavy mineral HM		inductively coupled plasma ICP

AUTHORISED OFFICER *Stewart*

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ANALYTICAL DATA

SAMPLE PREFIX

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PAGE

		14.4.08.07027				08/05/90	005618		1 OF 2	
TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	Ba	As	
1	DC401	70	25	100	0.5	<0.008	<0.008	2520	23	
2	DC402	85	25	110	0.5	<0.008	-	2290	25	
3	DC403	80	25	185	0.5	<0.008	-	2160	22	
4	DC404	85	25	130	<0.5	<0.008	-	1810	28	
5	DC405	80	20	135	0.5	<0.008	-	1530	20	
6	DC406	60	70	140	0.5	<0.008	-	1290	22	
7	DC407	60	60	145	0.5	<0.008	-	1210	33	
8	DC408	70	95	220	0.5	<0.008	-	1260	10	
9	DC409	90	30	95	0.5	<0.008	-	837	14	
10	DC410	65	45	115	<0.5	<0.008	-	1040	6	
11	DC411	60	75	170	0.5	<0.008	-	916	22	
12	DC412	60	60	190	0.5	<0.008	-	887	19	
13	DC413	105	25	110	<0.5	0.010	-	873	19	
14	DC414	55	20	120	<0.5	<0.008	-	1460	11	
15	DC415	40	20	100	<0.5	<0.008	-	1450	11	
16	DC416	80	100	240	0.5	<0.008	<0.008	1660	10	
17	DC417	55	130	410	<0.5	<0.008	-	1450	11	
18	DC418	75	25	100	<0.5	<0.008	<0.008	714	8	
19	DC419	55	30	60	<0.5	<0.008	-	607	21	
20	DC420	55	55	75	<0.5	<0.008	-	733	24	
21	DC421	30	20	65	<0.5	<0.008	-	367	222	
22	DC422	60	5	80	<0.5	<0.008	<0.008	2860	8	
23	DC423	60	<5	85	<0.5	0.010	-	1900	6	
24	DC424	60	5	80	<0.5	<0.008	-	1660	9	
25										

Results in ppm unless otherwise specified

T = element present; but concentration too low to measure

X = element concentration is below detection limit

-- = element not determined

AUTHORISED
OFFICER

gentkins

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14.4.08.07027

08/05/90

00561B

2 OF 2

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	AuChk	Ba	As
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22	DETECTION	5	5	5	0.5	0.008	0.008	10	2
23	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
24	METHOD	101	101	101	101	309	309	401	401
25									

Results in ppm unless otherwise specified
 T = element present, but concentration too low to measure
 X = element concentration is below detection limit
 -- = element not determined

AUTHORISED OFFICER *Gentkins*