



**HUNTINGTON**  
HYPER SPECTRAL

# HyLogged Mineralogy of Drill Hole 45134 YT01 Selina 1 Tasmania

Prepared for Yunnan Tin December 2016

**Final**

## Contact

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# Introduction & Location

Two drill holes, YT01 & YT02, known as Selina 1 & Selina, located in EL 20/2008 have been HyLogged to objectively characterise their contained host rock & alteration mineralogy. This page provides location for the two holes, and Selina 1 in particular, NNE of Queenstown, Western Tasmania.

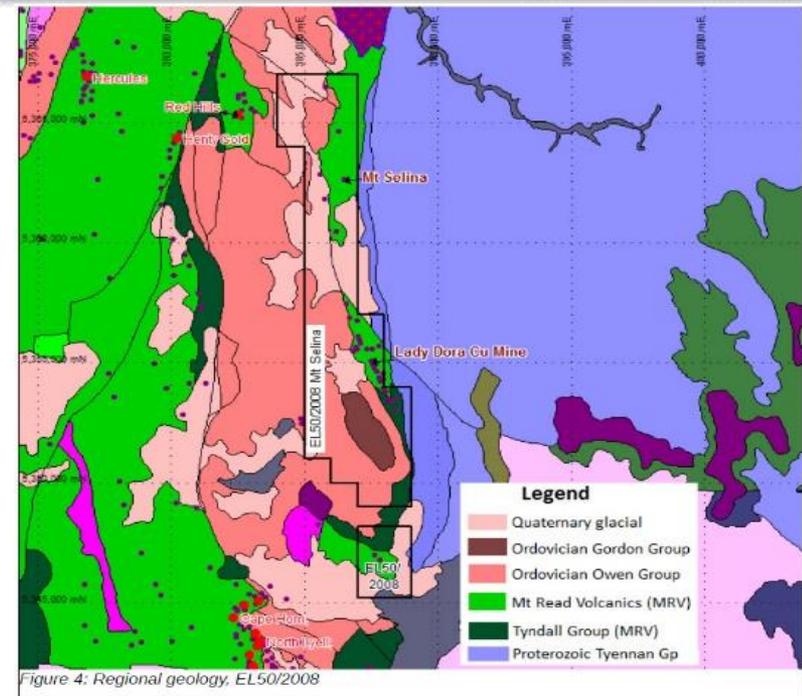
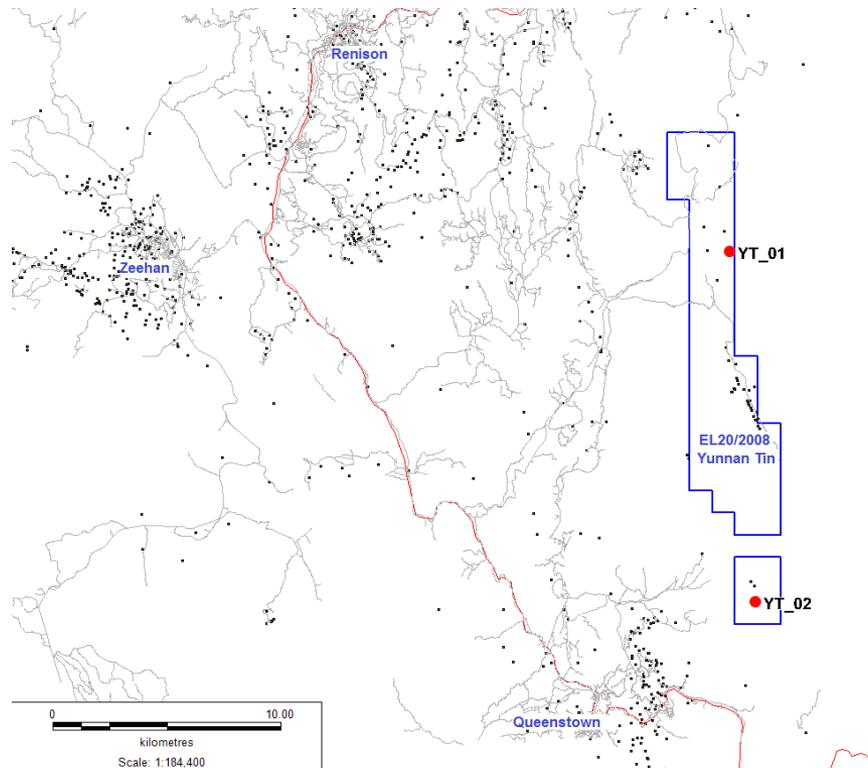
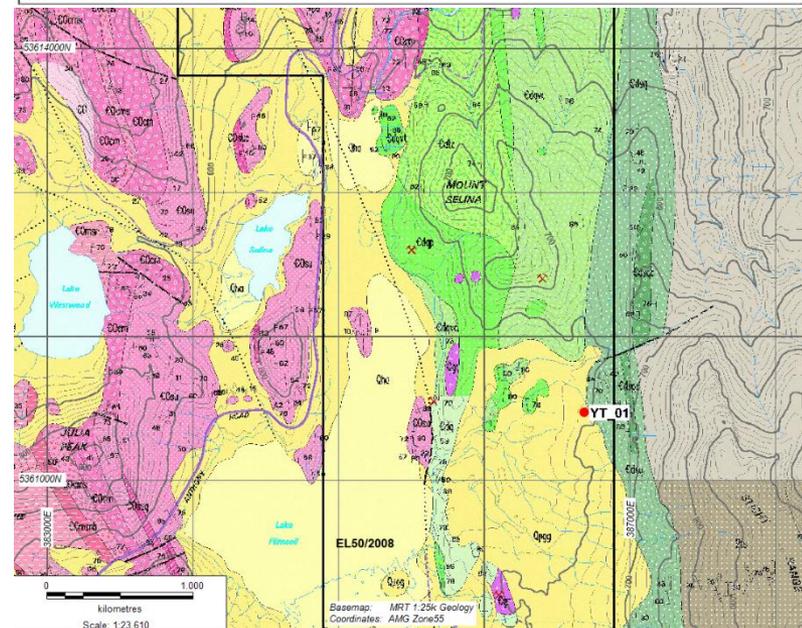


Figure 4: Regional geology, EL 50/2008



# Selina 1 Metadata

45133\_YT01\_Selina\_tsg

Metadata | Sizes | Description | TSA Summary

Hole name: 45133 YT01 Selina    Logger: HyLogger 3-6

Project: EL50/2008 Mt Selina - YT01 Lake Plimsoll Area - Western Tasmania

Owner/Cust: YTC Resources Yunnan Tin

Author: Jon Huntington (CSIRO)

Drilled: 2014-12-02 00:00    Scanned: 2015-12-22 10:29

Latitude: 5361643.000000    Long: 386797.000000    Datum: GDA94 Zone 55

Azimuth: 77.000000    Incl: -50.000000    RL: 586.000000

OK    Cancel

45133\_YT01\_Selina\_tsg

Metadata | Sizes | Description | TSA Summary

Samples: 47481 total; 33147 (69.81%) after masking; sample=8mm

Wavelength: 380 to 2500 by 4 nm, chans=531

Depth: 0.011 to 350.7 m, span=350.69 (339.6 after masking)

Scalars: System=48, core=12, user=68, total=128

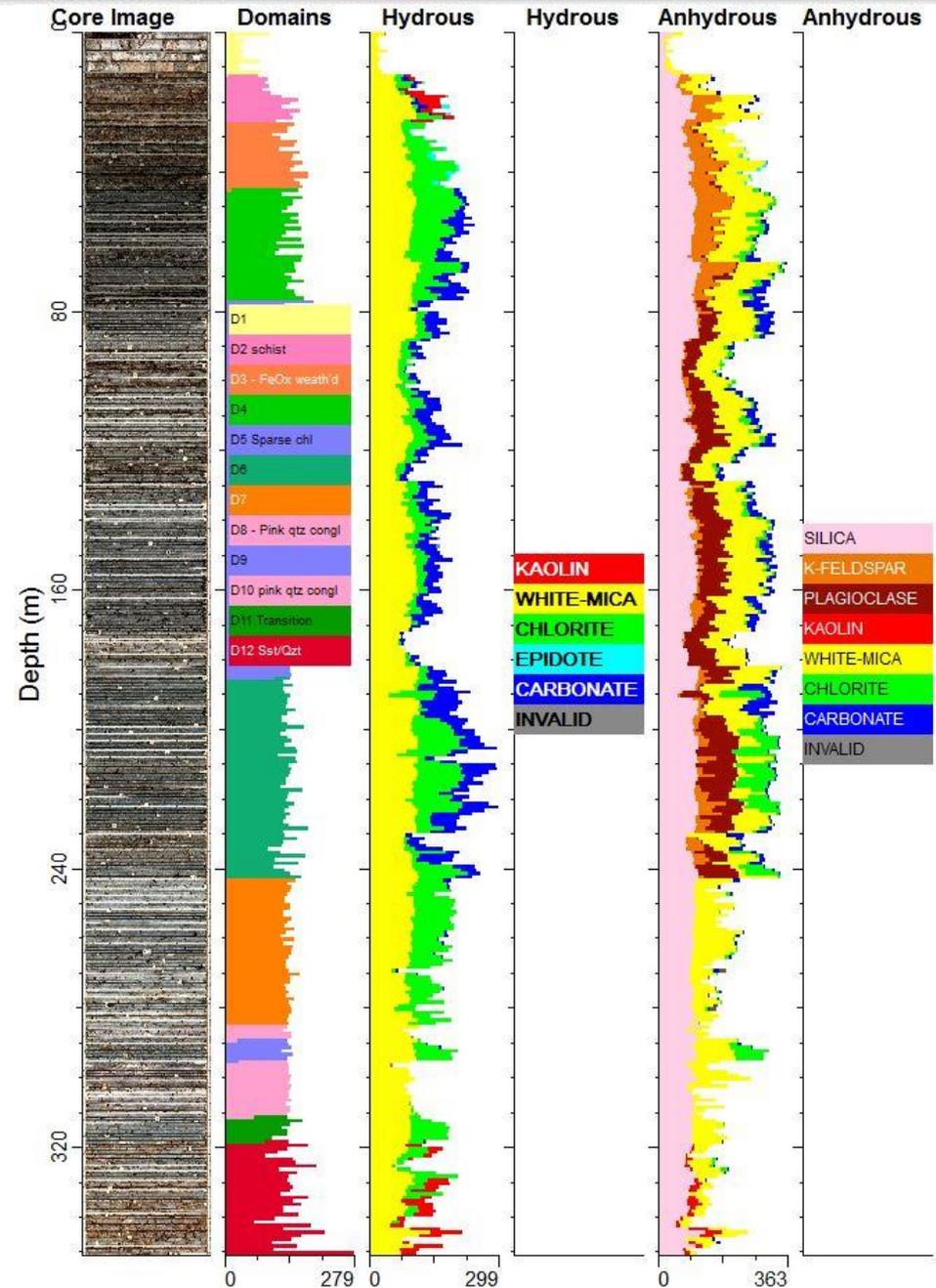
Linescan: Lines per sample=124, width=1380, JPEG quality=80

Profilometer: Measurements per sample=128

Disk size (MB): Sp1:197, Sp2:128, img:756, prof:23, pic:0, tot:1103.62

Size / m (MB): Sp1:0.56, Sp2:0.36, img:2.16, prof:0.07, pic:0.00, tot:3.147

OK    Cancel



# Provided Log

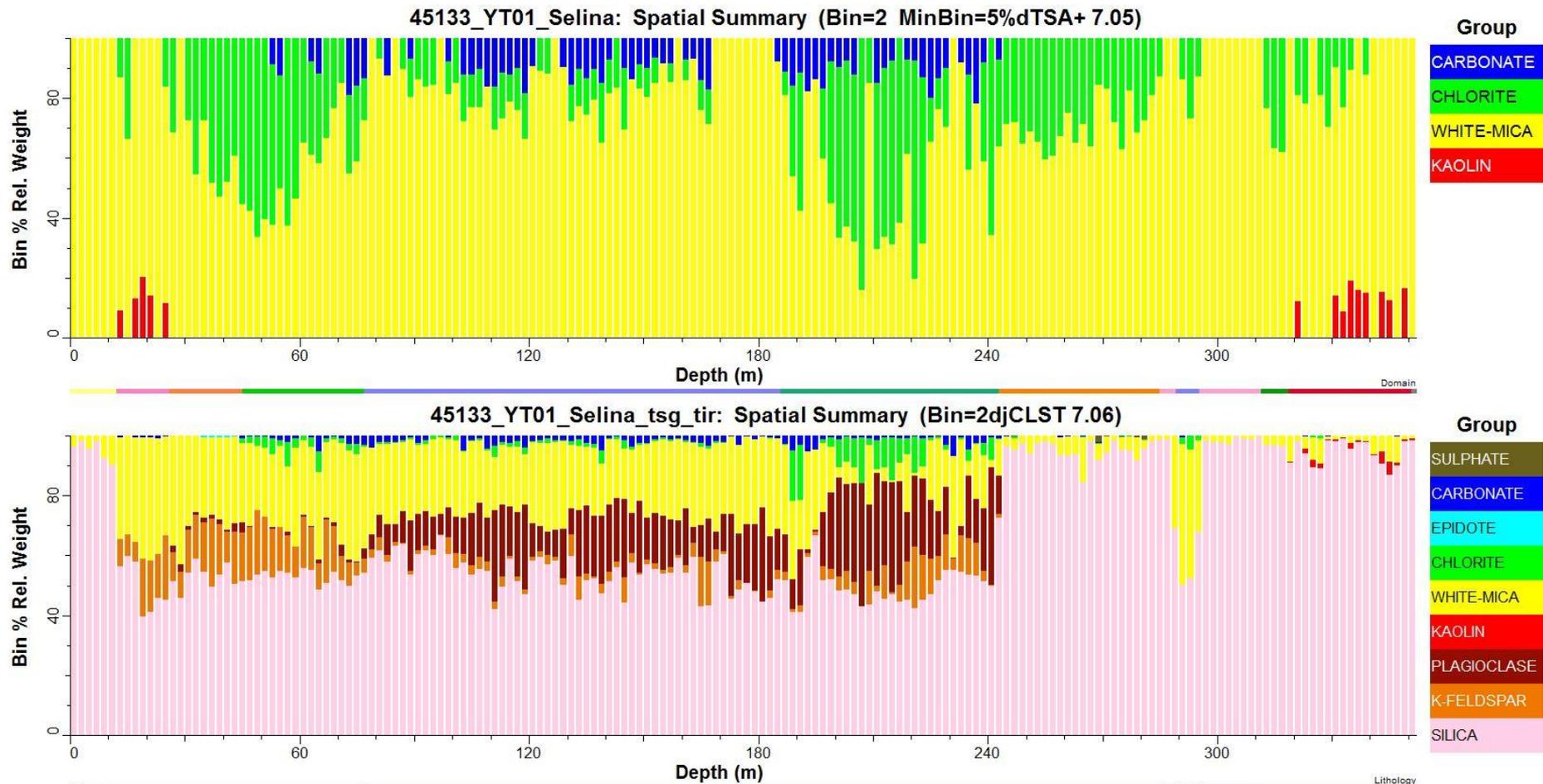
	Depth Fro	Depth To	Legacy Lit	Lithology	Lith Edited	Lithology Description
11426	0	1		(UNK) unknown	UNK unkn	Peaty soil with organic content. 0.5-1m core loss
11427	1	11.7		(CCO) colluvium	CCO coll	conglomerate and quartzite scree material
11428	11.7	77		(MSC) schist	MSC schist	Chloritic-sericitic-potassic alteration, yellowish green to dark green (+-reddish pink), schist. 11.7-45m weathered(oxidised). Disseminated magnetite(weak magnetic response). Vein:quartz-calcite+felspar(30,60 degree). Gradational contact.
11429	77	172		(VCC) volcaniclastic	VCC1	Chloritic(green)-hematitic(purplish red)-sericitic, matrix-supported(massive, angular-subround crystal and lithic fragment), polymict, chaotic, lithic rich(subangular-subround mudstone, quartzite and breccia clasts), volcaniclastic breccia. Vein:qtz-cct+cht+fpr, variety of orientations. Weak-strong magnetic response. Gradational contact. <b>Lynchford Member?</b>
11430	172	244		(VCC) volcaniclastic	VCC2	Mainly chloritic, crystal rich(quartz-felspar), volcaniclastic sandstone, with minor siltstone. Banded reddish-pink and green. Vein:quartz-calcite+sericite+pyrite (40 degree). Very weak magnetic response. <b>Middle Tyndall Group?</b>
11431	244	285		(VCC) volcaniclastic	VCC3	Sequences: graded?, dark-grey and green silicified volcaniclastic sandstone, conglomerate. Partially weathered. Very weak magnetic response. Vein:quartz+minor calcite+pyrite. Gradational contact
11432	285	289.2		(SCG) conglomerate	SCG congl	Purplish, hematite alteration, coarse sandstone to pebble conglomerate (breccia). Matrix supported(quartz crystal rich), subangular to subround clasts(quartzite). Sharp contact. Jukes conglomerate.
11433	289.2	295.2		(MSC) schist	MSC schist	Chloritic-sericitic, foliated, crystal rich(quartz), schist. Altered dacite? Sharp contact.
11434	295.2	312.3		(SCG) conglomerate	SCG congl	Purplish, hematite alteration, coarse sandstone to pebble conglomerate and breccia. Matrix supported(quartz crystal rich), subangular to subround clasts(quartzite). Gradational contact. <b>Jukes conglomerate.</b>
11435	312.3	350.7		(VCC) volcaniclastic	VCC4	<b>EOH.</b> Sequences: graded?, dark-grey and green silicified volcaniclastic sandstone, conglomerate. Partially weathered. Very weak magnetic response. Vein:quartz+minor calcite+pyrite.

# Selina 1 - Mineral Group Summary

Top - Relative abundance of hydrous mineral groups + carbonates / 2 m interval

Bottom - Relative abundance of anhydrous mineral groups + carbonates / 2 m interval

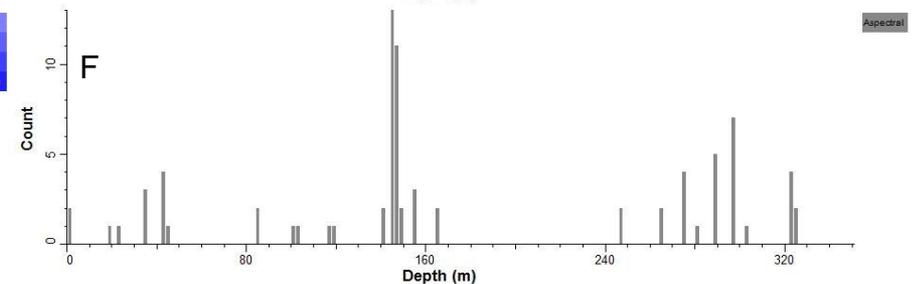
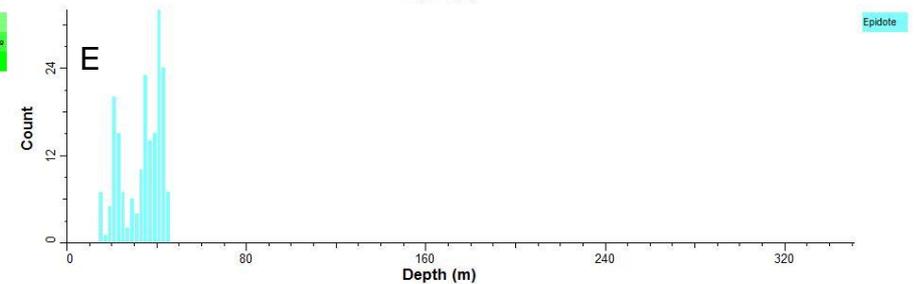
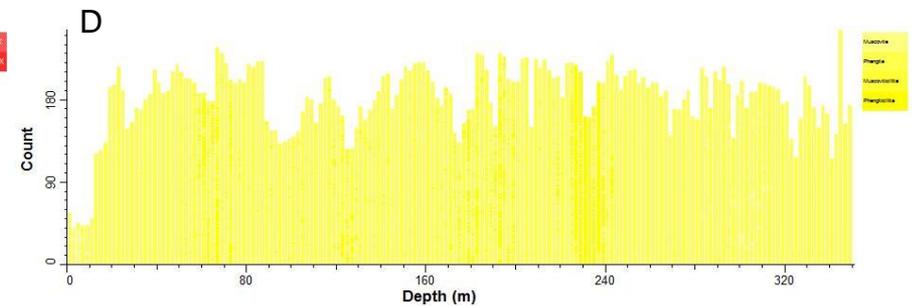
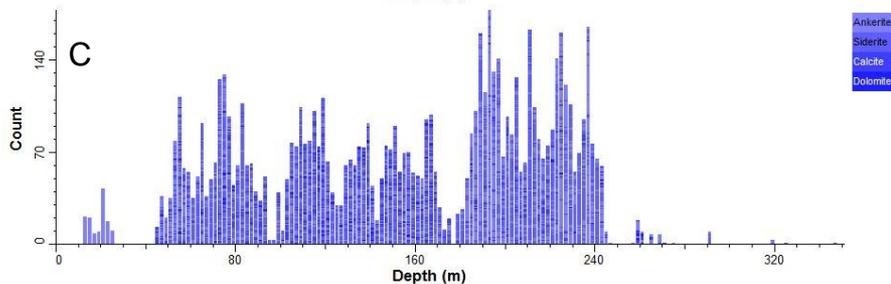
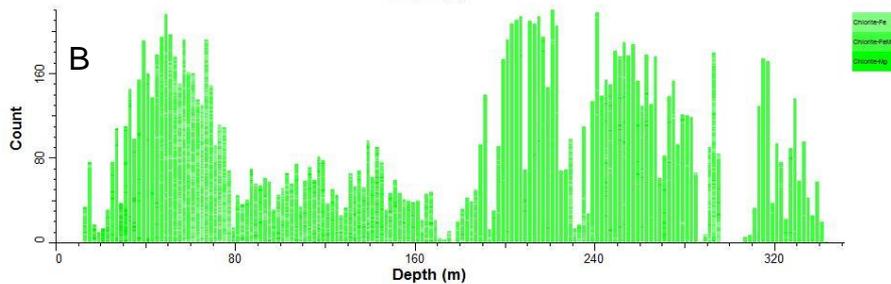
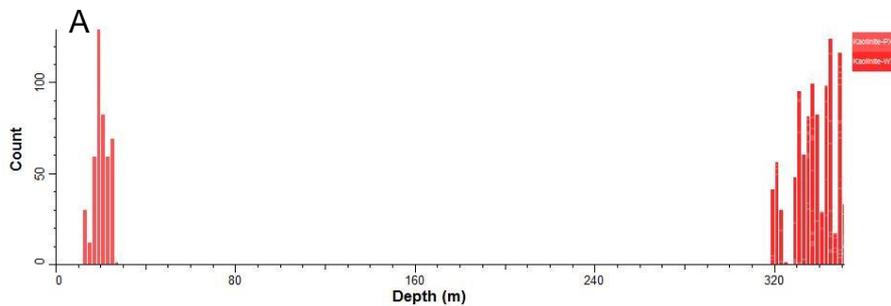
Upper ribbon shows spectro-mineralogical domains, the lower ribbon logged lithologies



# Relative abundance of main hydrous mineral groups + carbonates / 2m

A – Kaolinite – Spatially variable  
 B – Chlorite – Spatial variable  
 C – Carbonate – Spatially variable. Absent in lower domains

E – White mica – Relatively uniform  
 F – Epidote – Spatially constrained in D2 & D3  
 G – Aspectral – Spectrally un-responsive intervals.



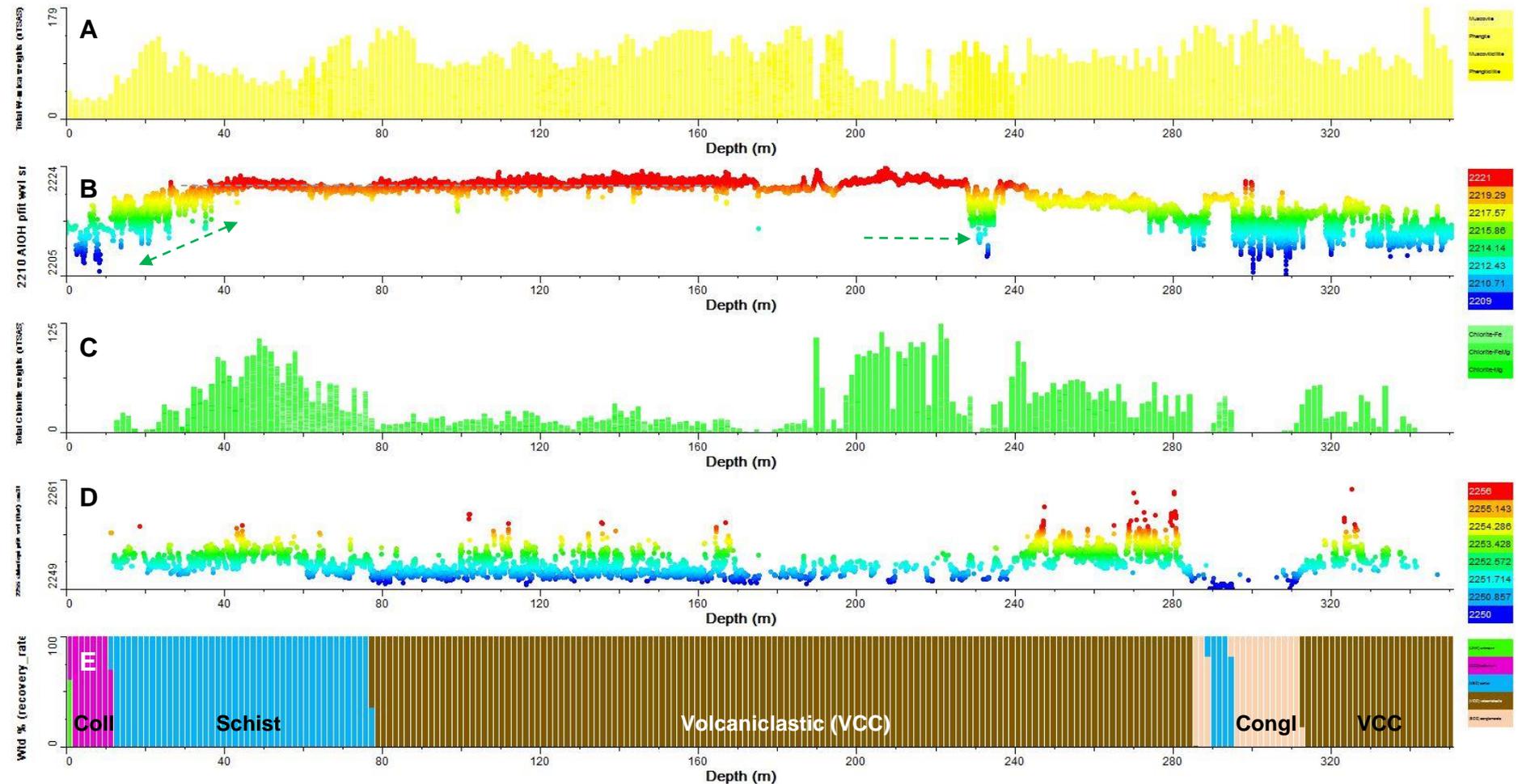
# White-mica & Chlorite Abundance & Composition

**A** – White mica abundance. **B** – White mica composition mapped with the wavelength of the 2200 AlOH feature. Above 40m probably shows the influence of weathering and minor kaolinite development (arrowed). From 40-220m mica is uniformly Al-poor (phengitic). Below 230m there are several changes in composition. **C** - Chlorite abundance is least well represented in D5 and D8 & D9. **D** - Chlorite composition shows slight variations in D3 & D4, D7 & D12. **E** – Spectro-mineralogical domains D1 to D12.



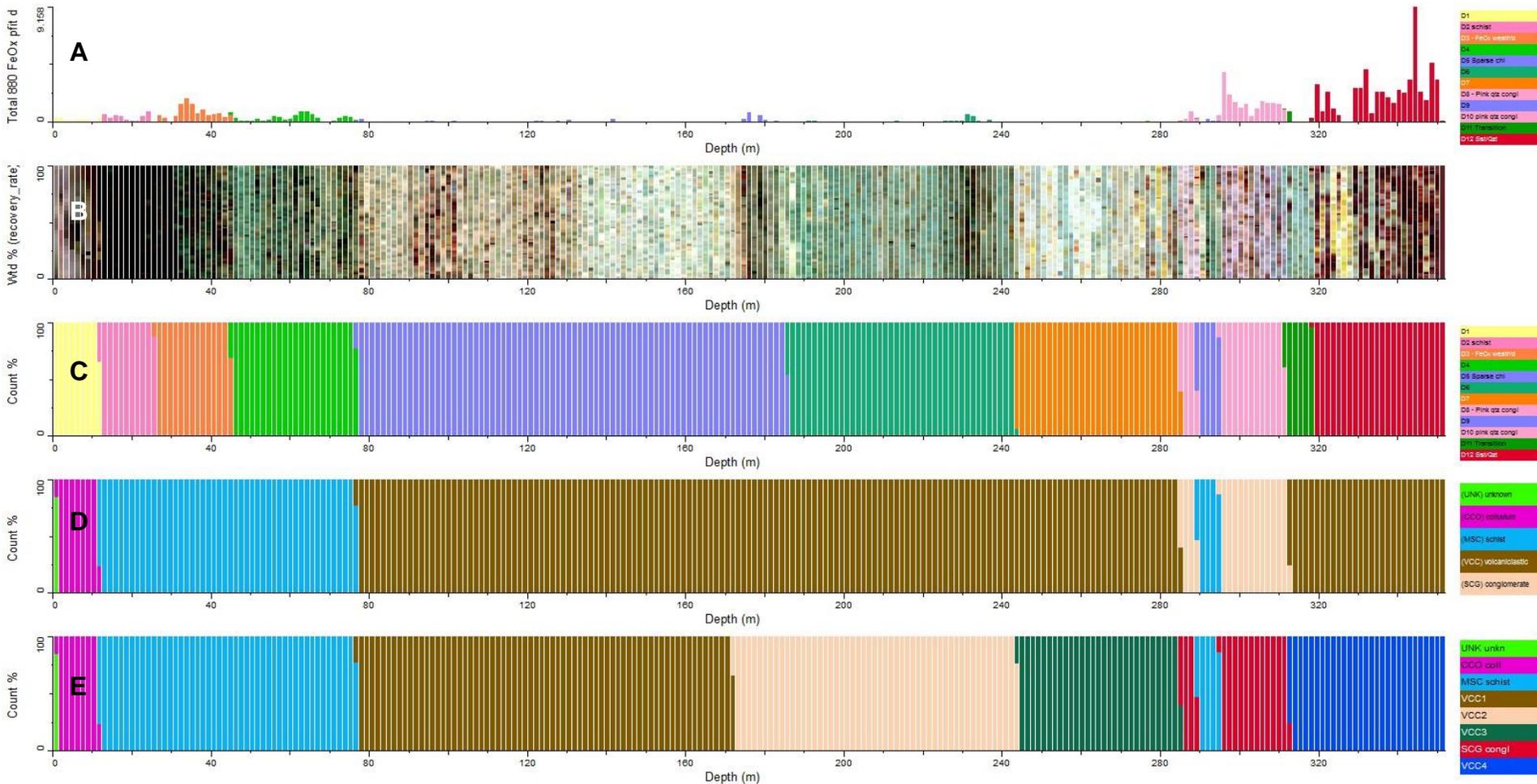
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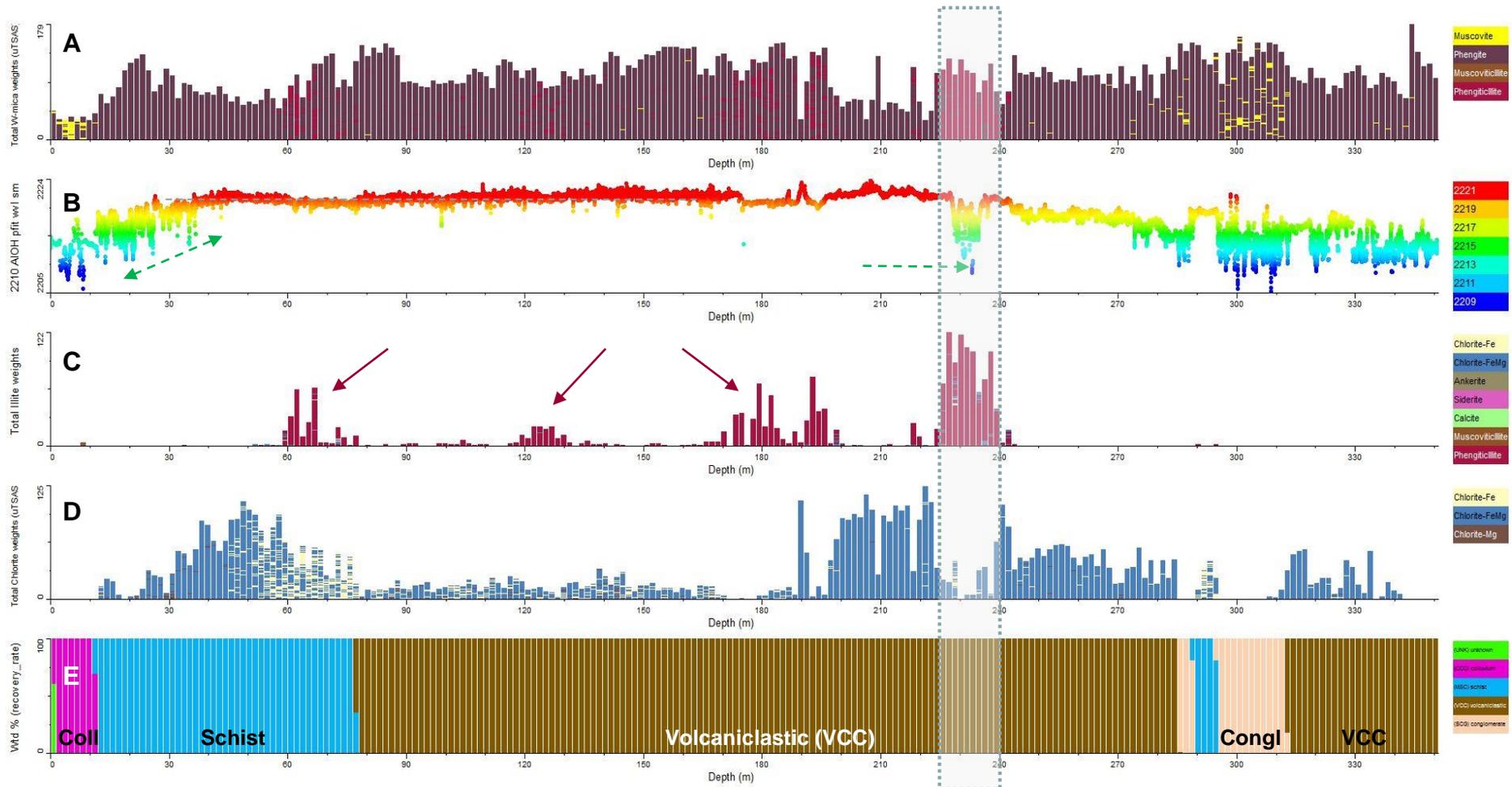
# Iron oxides, core colour, lithologies and domains

**A** – Iron oxide abundance coloured by domains. **B** – Enhanced core colour. **C** - HyLogged domains. **D** – Bulk logged lithologies. **E** – Detailed logged lithologies. The core colour helps question what might be happening mineralogically and focusses attention where subdivisions might be required: e.g. near 134m. Domains (plot C) match well the detailed lithological descriptions (E) (less so the coarse rock types, D), but can also be refined and sub-divided using the HyLogging data.



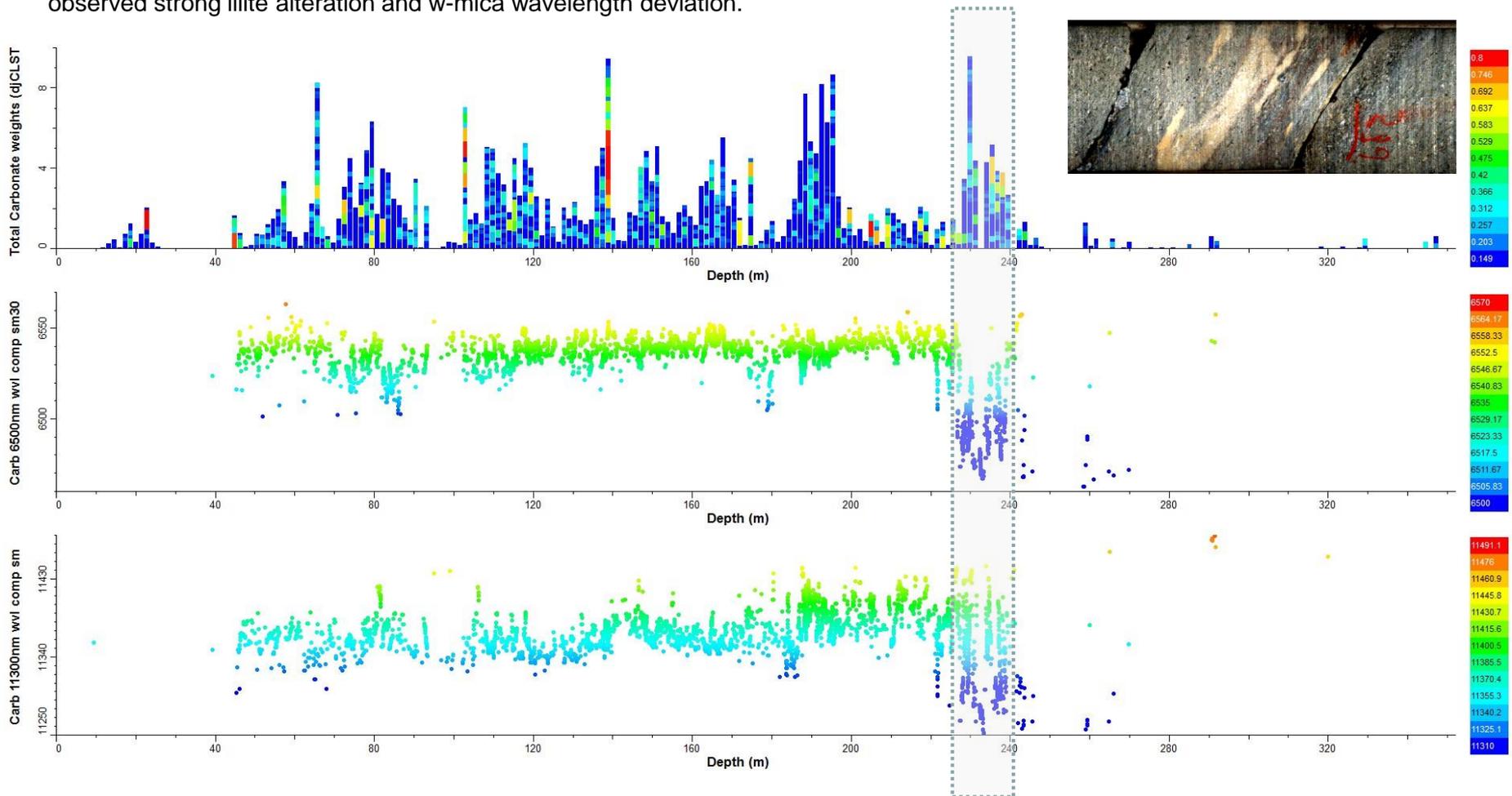
# W-Mica Composition - Muscovite / Illite

**A** – White mica abundance coloured by mineral species (old colours). **B** – White mica composition. Above 40m probably shows the influence of weathering & minor kaolinite development (arrowed). From 40-220m mica is uniformly Al-poor (phengitic). At 229m there is a striking change in AIOH composition wvl & 1900nm water bonding indicating an illitic alteration zone (highlighted box). **C** – Illite distribution (note secondary arrowed zones also). **D** - Chlorite composition shows inverse relationship to Illite. **E** – Logged bulk lithologies.



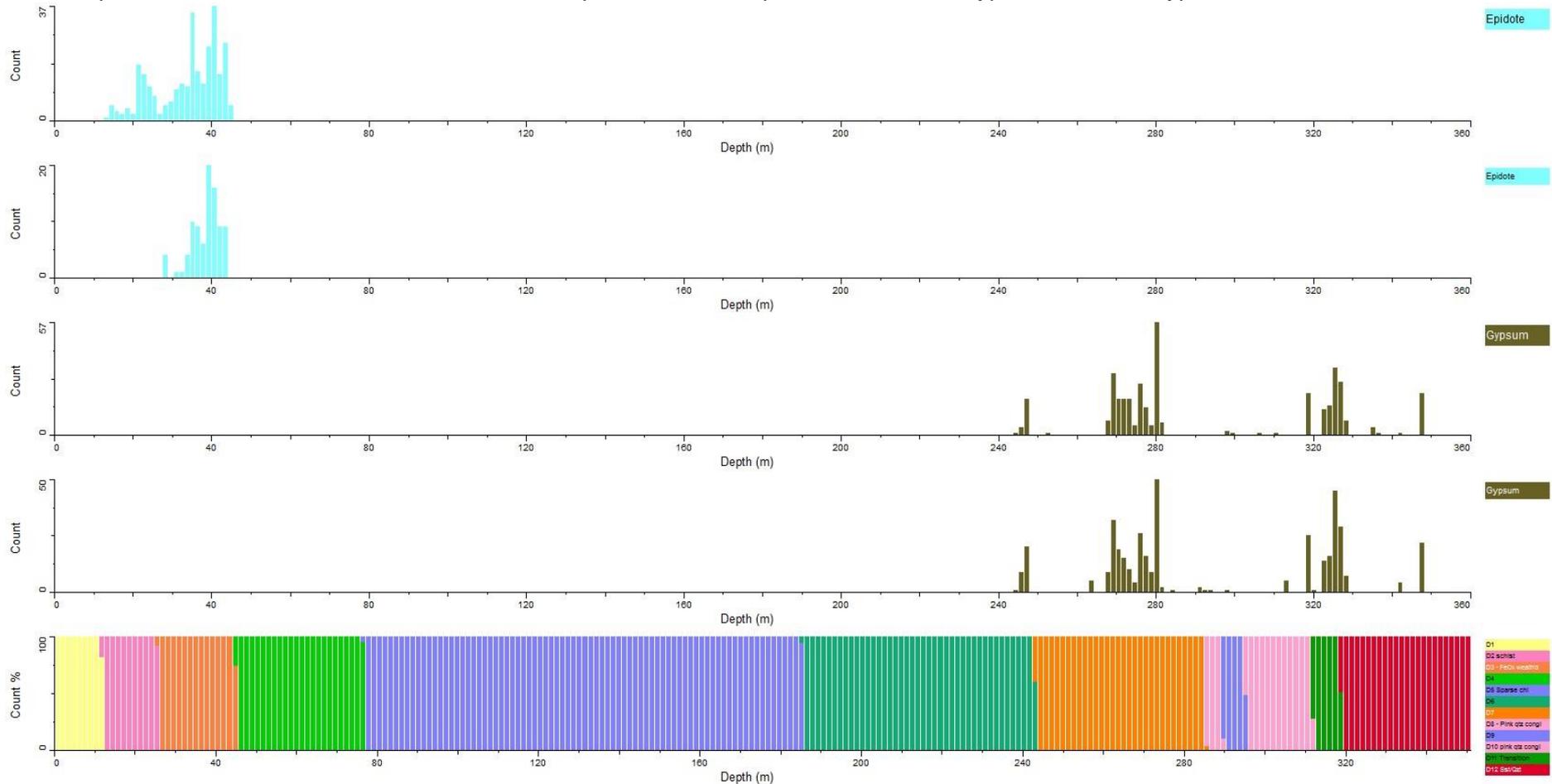
# Carbonate abundance & composition

**A** – Relative carbonate abundance per 1.4m interval. Carbonate is poorly developed in the lower domains below 243 metres.  
**B** – Carbonate composition from the 6500 nm peak wavelength. **C** – Carbonate composition from the 11300nm peak wavelength. The majority of samples in both wavelength plots are at the wavelength typical of calcite, at ~6540 and ~11350 nm respectively. The deviation in the zone 226 – 239 m (highlighted rectangle) is typical of more iron-rich composition typical of ankerite. This is further suggested by the brown colouring (see inset) of the carbonate veins in this zone. This zone is the same zone over which there is the previously observed strong illite alteration and w-mica wavelength deviation.



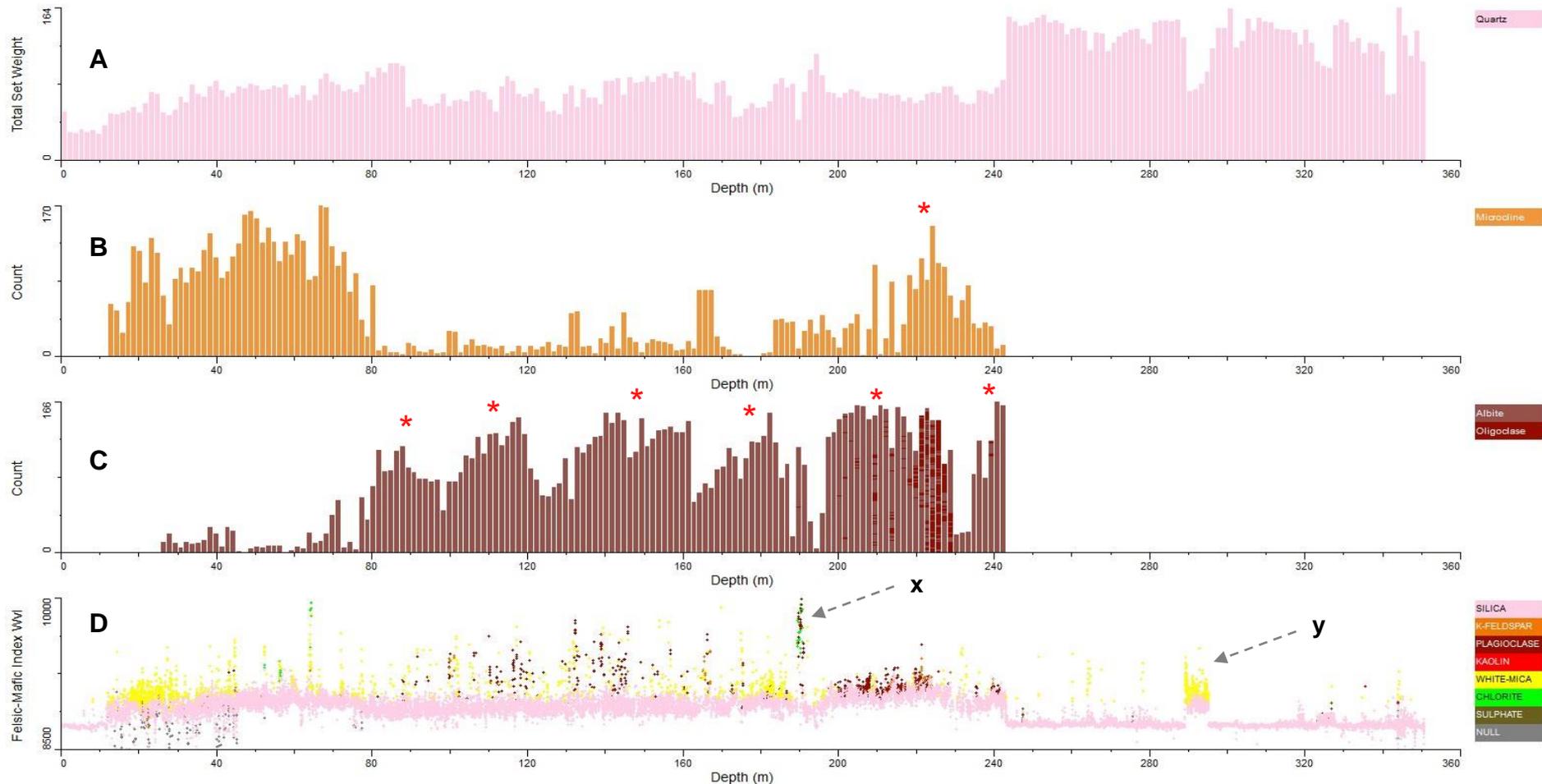
# Epidote and Gypsum abundance

Both epidote and gypsum are spatially constrained in their own specific zones, not randomly, and agree well in the SWIR and TIR interpretations. The epidote occurs in the upper schist domains 2 and 3. There is an equivalent epidote interval in the schist zone in drill hole Selina 2 several km away and thus may form a traceable marker horizon. The gypsum occurs mainly in domains 7 and 11 and appear to be due to stains on the core and maybe due to storage contamination, but should be checked if emanating from sulphides or carbonaceous bands. **A** – SWIR epidote. **B** – TIR Epidote. **C** – SWIR Gypsum. **D** - TIR Gypsum. **E** – Domains.



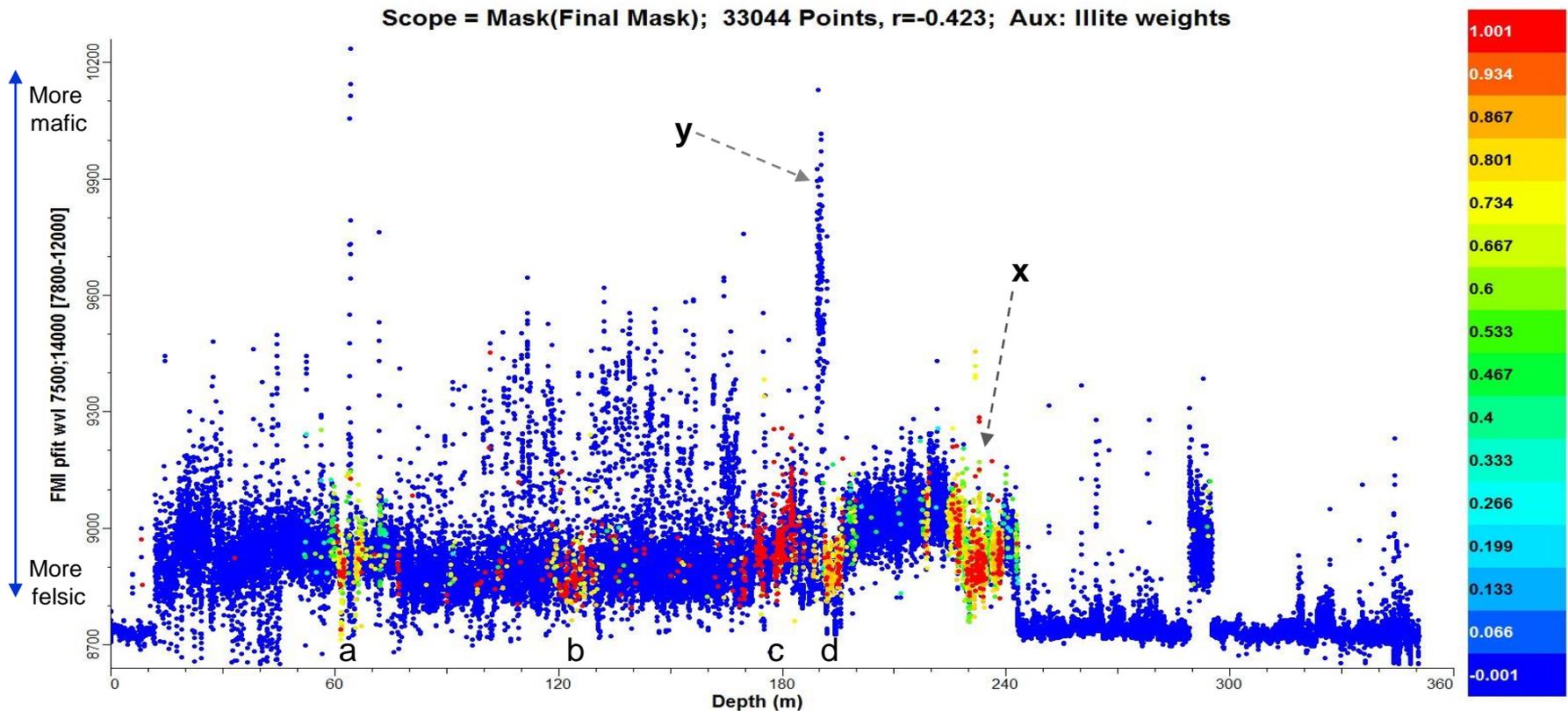
# Relative abundance of main anhydrous mineral groups

**A** – Quartz relative abundance per 1.4m interval. **B** – K-spar abundance. **C** – Plagioclase abundance. **D** – Felsic mafic index (FMI). These four plots clearly define the major domains comprising the schist down to ~ 80m and the central volcaniclastic down to 243m. The FMI emphasises the relative occurrence / mixing of purer chlorites (arrowed at **X**) and plagioclase / quartz / w-mica proportions (arrowed at **Y**). The distribution of plagioclase, K-spar and the FMI suggest possible subdivisions (\*) of the volcaniclastic.



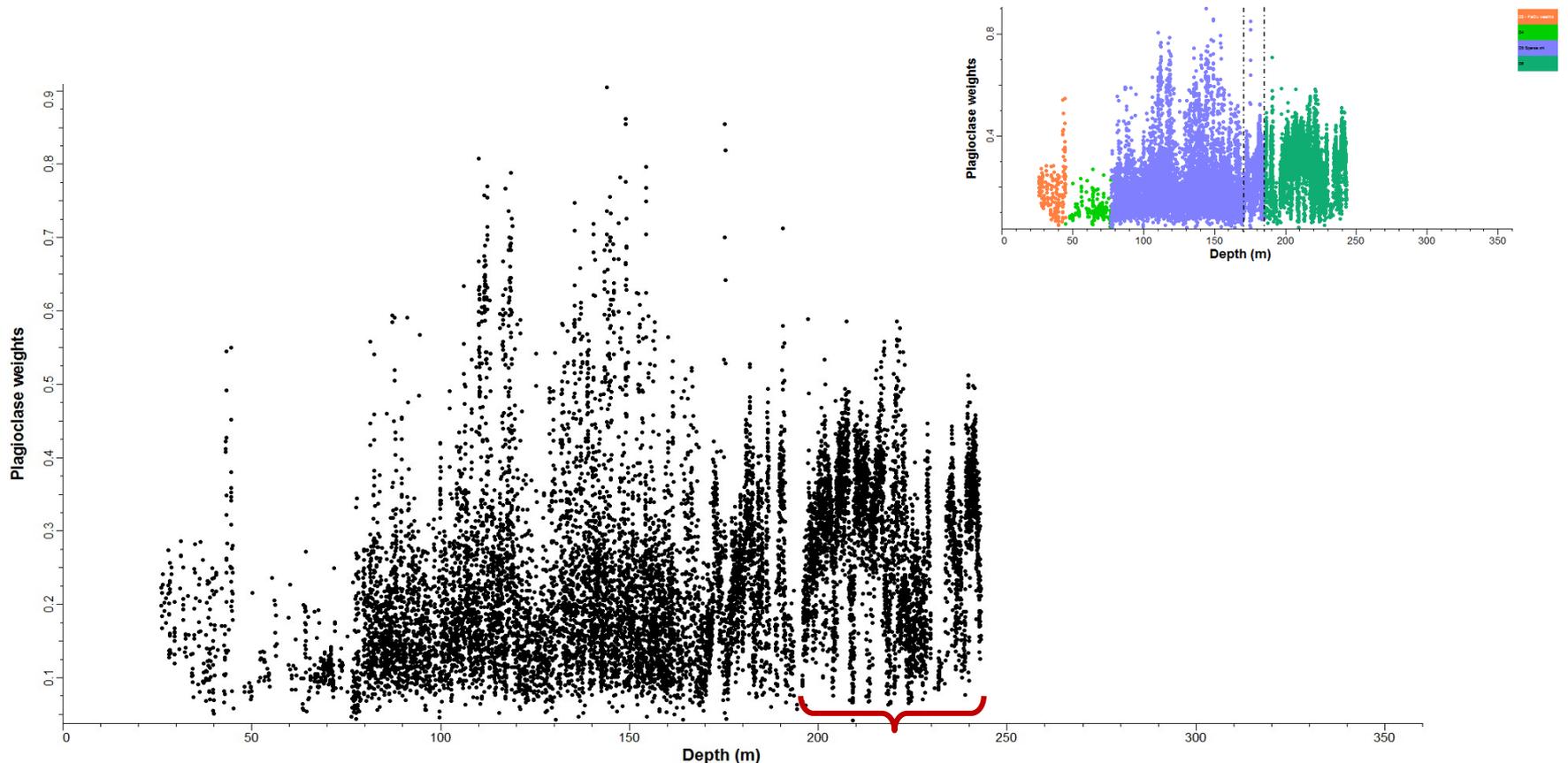
# Felsic-Mafic Index (FMI) and Illite distribution

This expansion of the felsic / mafic index is coloured by the SWIR illite abundance and shows, in particular, how the most illite-altered zone occurs near the base of the central volcanoclastic unit at ~230-240 metres (x), as well at four other depths (a,b,c,d). It also emphasises the chlorite concentrations within domain 4 (e.g. at y)



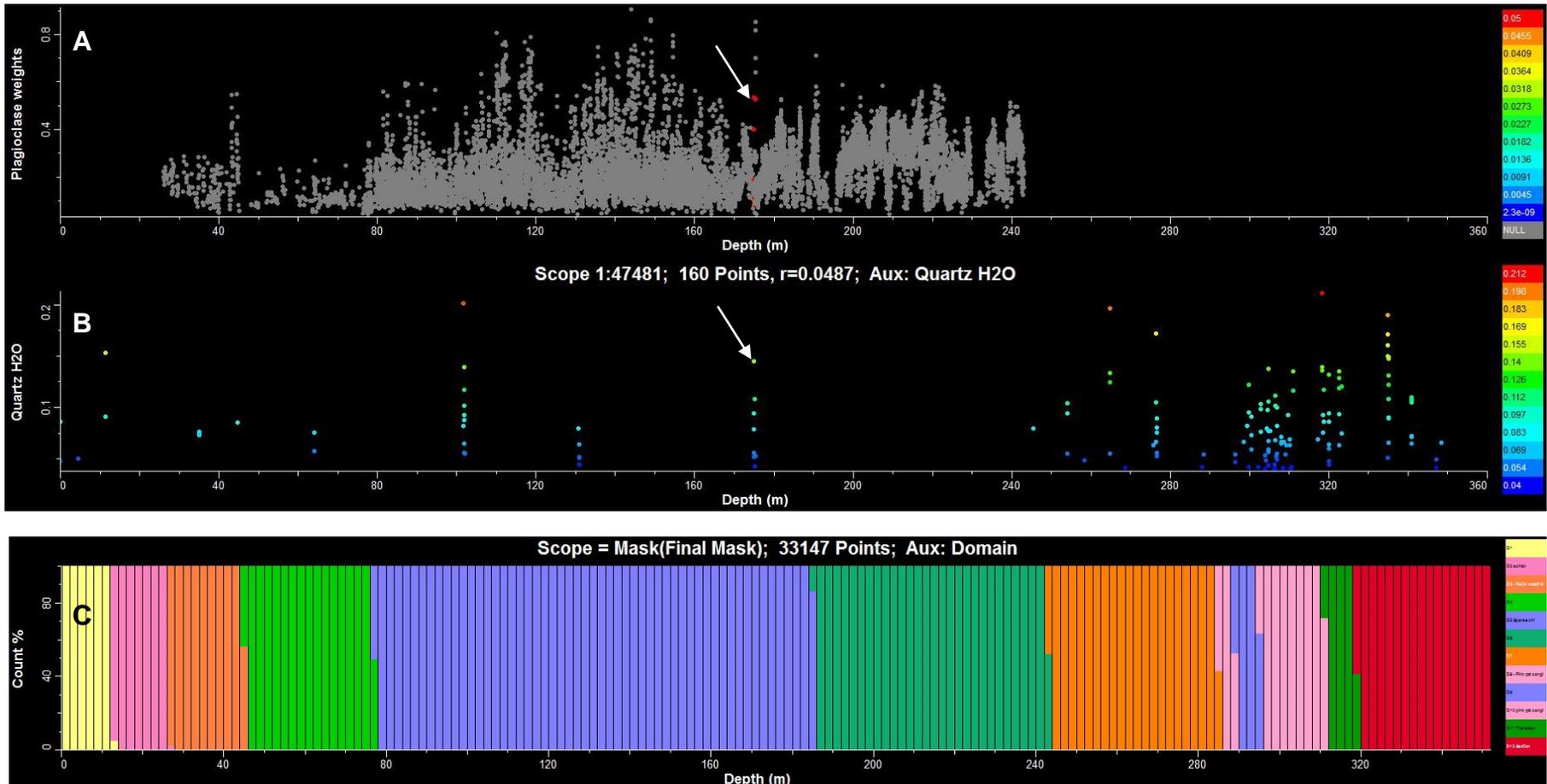
# Plagioclase zonation?

Plot of the modelled proportions of plagioclase. Plagioclase is largely confined to domains 5 & 6. The purpose of this plot is speculate as to whether it indicates possible cyclic compositional zonation or volcaniclastic pulses (particularly as bracketed in domain 6) that could be used in subdivision or correlation. It also emphasises different concentration patterns between domains 5 and 6 (inset), though where the (possibly gradational) boundary lies is open to further detailed analysis (175 or 194m).



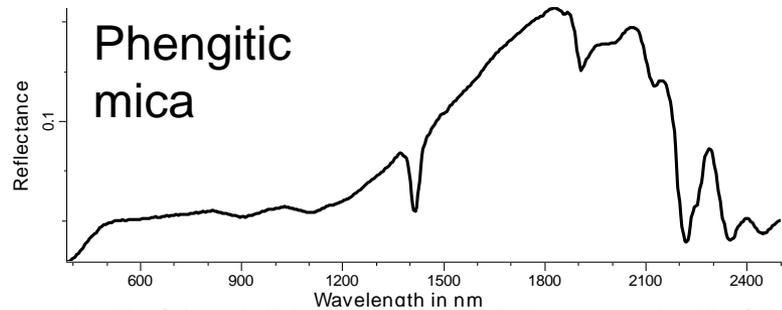
# Quartz veins and domain boundaries

This plot further explores the possible boundary between domains 5 and 6 (suggested in the previous plot) from the patterns in plagioclase relative abundance (plot A), coloured by qtz veins, and by looking at the distribution of quartz veins (plot B). If the quartz vein system at 175 metres (arrowed) is fault related one might argue that the boundary between domains 5 and 6 (plot C) could be placed near 171-175m rather than 191m as previously suggested. These are topics open to further more detailed investigation where considered important.

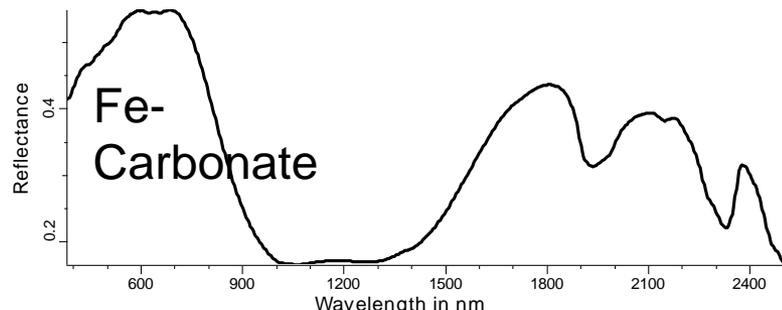


# Examples of Selina VNIR/SWIR Spectra

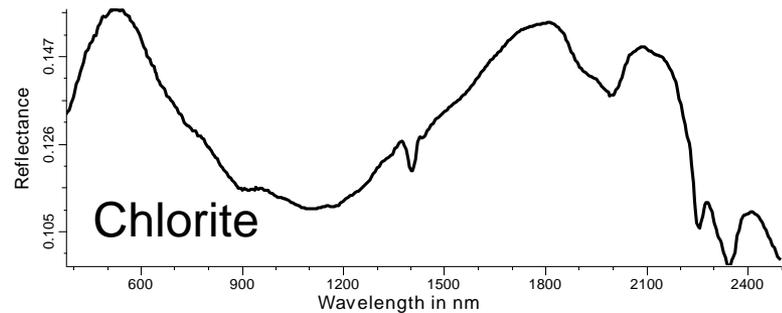
046102:45134\_YT02\_Selina\_0072\_483 T=0072 L=4 P=84 D=312.155240 X=668.000000 H=45134\_YT02\_Selina



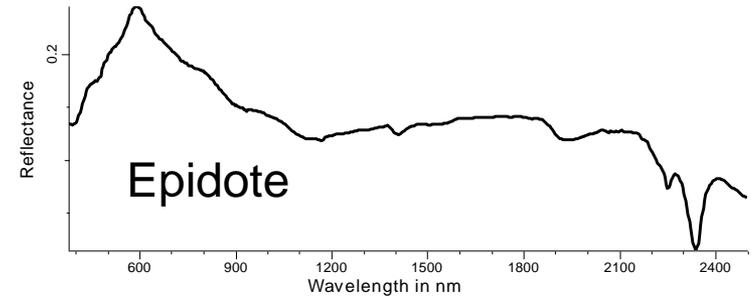
081321:45134\_YT02\_Selina\_0125\_457 T=0125 L=4 P=58 D=543.940741 X=460.000031 H=45134\_YT02\_Selina



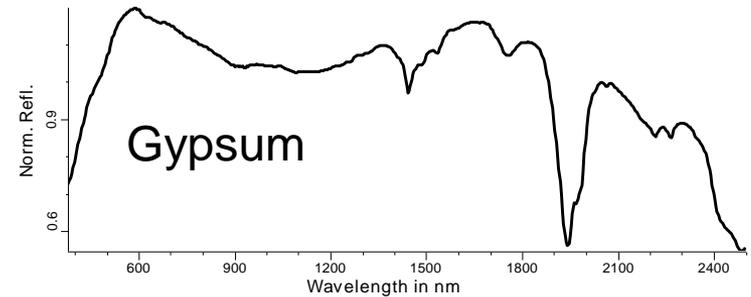
069086:45134\_YT02\_Selina\_0107\_192 T=0107 L=2 P=59 D=461.991023 X=468.000031 H=45134\_YT02\_Selina



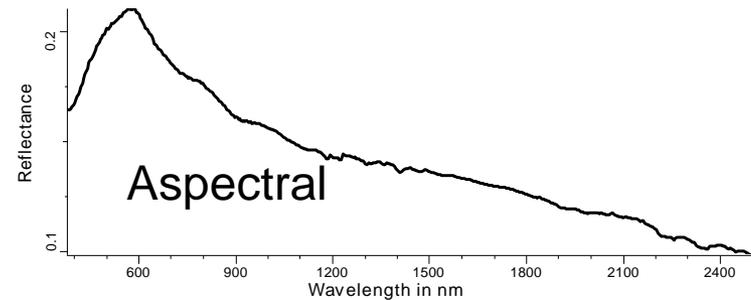
033567:45134\_YT02\_Selina\_0053\_583 T=0053 L=5 P=51 D=228.189137 X=404.151947 H=45134\_YT02\_Selina



044474:45134\_YT02\_Selina\_0070\_185 T=0070 L=2 P=52 D=301.977970 X=412.000031 H=45134\_YT02\_Selina

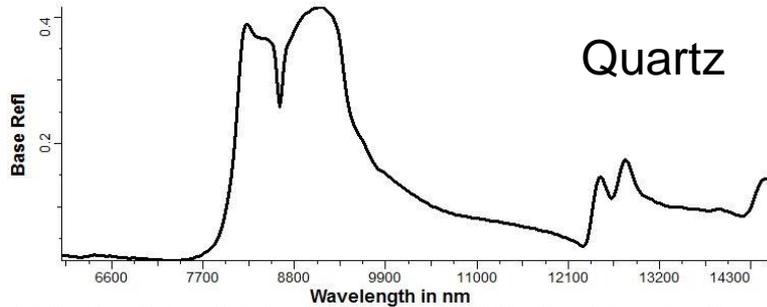


008754:45134\_YT02\_Selina\_0016\_375 T=0016 L=3 P=109 D=59.802771 X=868.151978 H=45134\_YT02\_Selina

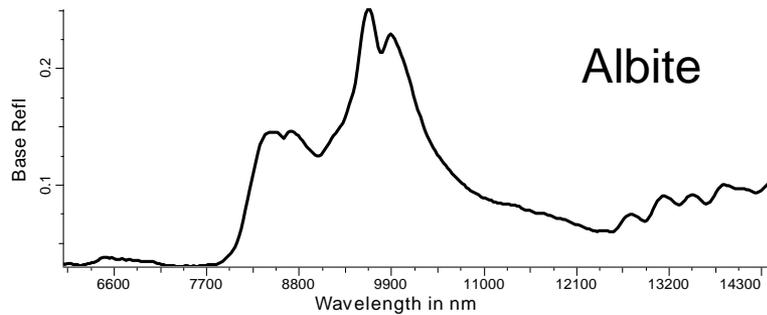


# Examples of Selina TIR Spectra

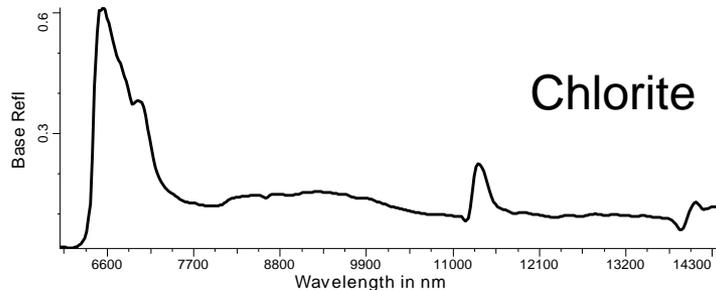
082826:45134\_YT02\_Selina\_0127\_632 T=0127 L=5 P=100 D=554.079467 X=796.151978 H=45134\_YT02\_Selina



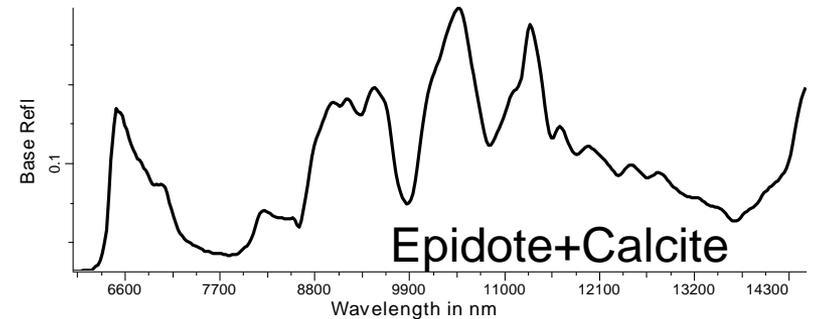
028430:45134\_YT02\_Selina\_0046\_101 T=0046 L=1 P=101 D=192.992586 X=804.151978 H=45134\_YT02\_Selina



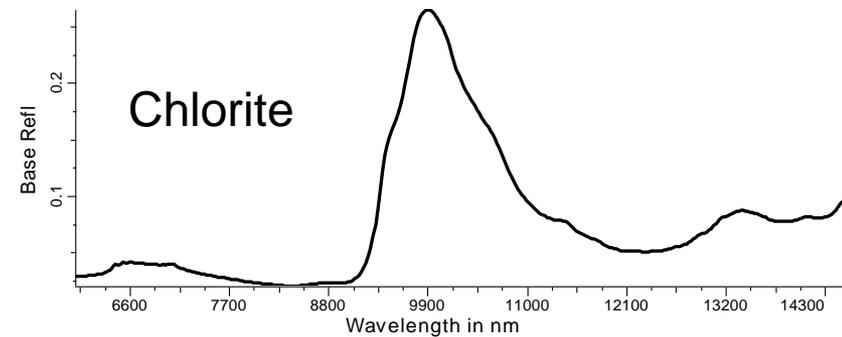
042449:45134\_YT02\_Selina\_0067\_155 T=0067 L=2 P=22 D=288.641579 X=172.000000 H=45134\_YT02\_Selina



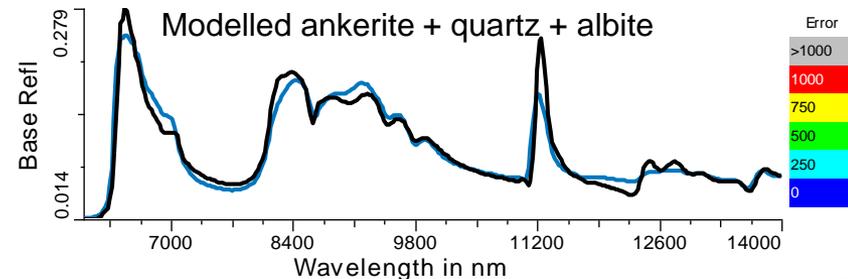
026247:45134\_YT02\_Selina\_0042\_578 T=0042 L=5 P=46 D=177.979781 X=364.151947 H=45134\_YT02\_Selina



043983:45134\_YT02\_Selina\_0069\_359 T=0069 L=3 P=93 D=298.886283 X=740.151978 H=45134\_YT02\_Selina



087275:45134\_YT02\_Selina\_0134\_426 T=0134 L=4 P=27 D=584.439527 X=212.000000 H=45134\_YT02\_Selina



57% Ankerite + 27% Quartz + 15% Albite ASP=1.434 ALB=0.101 SNR=281 SRSS=118 NIL=0.107 dT=1.208 TNorm=0.402

# Selina 1 - Domain Mineral Group Summary

Mineral group summaries for the hydrous minerals (top plot) and the anhydrous and hydrous minerals (bottom plot) per spectro-mineralogical domain. Note modelled abundances are all relative, not absolute. Locations refer to this specific TSG file and HyLogged dataset.

Domain Name	Red	Green	Blue	Description	From_Sample	To_Sample	From_Depth	To_Depth	KAOLIN	WHITE-MICA	CHLORITE	EPIDOTE	CARBONATE	SULPHATE	INVALID
D1	255	255	128	Quartz W-Mica	0	570	0.0	12.1	0	99	0	0	0	0	1
D2 schist	255	128	192	Quartz K-Feldspar Albite W-Mica Smectite-Al Oxide-Fe Kaolin Chlorite Epidote Carbonate-Fe-Mn-Zn	571	2201	12.1	26.0	14	72	9	2	4	0	0
D3 - FeOx weath'd	255	128	64	Quartz K-Feldspar Albite W-Mica Oxide-Fe Chlorite Epidote	2202	5026	26.0	45.1	0	60	36	4	0	0	0
D4	0	208	0	Quartz K-Feldspar minor Albite W-Mica Chlorite Carb veins	5027	9670	45.1	77.0	0	50	44	0	6	0	0
D5 Sparse chl	128	128	255	Quartz K-Feldspar increased Albite W-Mica sparse Chlorite	9671	24485	77.0	185.7	0	82	10	0	8	0	0
D6	16	173	115	Quartz K-Feldspar Albite Plagioclase-Na W-Mica Chlorite	24486	32340	185.7	243.0	0	51	40	0	9	0	0
D7	255	128	0	Quartz Gypsum W-Mica Chlorite Carbonate-Fe-Mn-Zn	32341	38138	243.0	285.0	0	69	28	0	2	1	0
D8 - Pink qtz congl	255	160	206	Quartz W-Mica Chlorite Carbonate-Fe-Mn-Zn	38139	38715	285.0	289.1	0	98	0	0	0	0	1
D9	128	128	255	Coarse grained Quartz Albite W-Mica Chlorite volcanoclastic. Minor Gypsum	38716	39541	289.1	295.2	0	78	22	0	0	0	0
D10 pink qtz congl	255	160	206	Quartz Hematite W-Mica Minor gypsum	39542	41803	295.2	311.4	0	99	1	0	0	0	0
D11 Transition	4	156	0	Green-grey transition frm qtz conglom to chl/musc rock. Quartz W-Mica minor Chlorite minor gypsum	41804	42783	311.4	318.8	0	69	31	0	0	0	0
D12 Sst/Qzt	224	0	40	Pink oxidised qtz musc kaol hm sst/qtzite? Quartz Kaolin W-Mica Chlorite Carbonate-Fe-Mn-Zn Fe-oxide. Only minor congl.	42784	47480	318.8	350.7	12	77	10	0	0	1	0

Domain Name	Red	Green	Blue	Description	From Sample	To Sample	From Depth	To Depth	SILICA	K-FELDSPAR	PLAGIOCLASE	KAOLIN	WHITE-MICA	SMECTITE	CHLORITE	EPIDOTE	CARBONATE	SULPHATE	OXIDE	INVALID
D1	255	255	128	Quartz W-Mica	0	570	0	12	93.4	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D2 schist	255	128	192	Quartz K-Feldspar Albite W-Mica Smectite-Al Oxide-Fe Kaolin Chlorite Epidote Carbonate-Fe-Mn-Zn	571	2201	12	26	50.2	4.4	0.0	0.0	43.6	0.1	0.0	0.0	1.0	0.0	0.2	0.4
D3 - FeOx weath'd	255	128	64	Quartz K-Feldspar Albite W-Mica Oxide-Fe Chlorite Epidote	2202	5026	26	45	54.4	10.6	0.8	0.0	33.0	0.0	0.0	0.3	0.0	0.0	0.3	0.5
D4	0	208	0	Quartz K-Feldspar minor Albite W-Mica Chlorite Carb veins	5027	9670	45	77	53.2	13.9	0.9	0.0	27.5	0.0	3.3	0.0	1.2	0.0	0.0	0.0
D5 Sparse chl	128	128	255	Quartz K-Feldspar increased Albite W-Mica sparse Chlorite	9671	24485	77	186	56.8	2.2	20.0	0.0	18.5	0.0	0.7	0.0	1.9	0.0	0.0	0.0
D6	16	173	115	Quartz K-Feldspar Albite Plagioclase-Na W-Mica Chlorite	24486	32340	186	243	49.9	6.5	21.3	0.0	14.1	0.0	6.4	0.0	1.9	0.0	0.0	0.0
D7	255	128	0	Quartz Gypsum W-Mica Chlorite Carbonate-Fe-Mn-Zn	32341	38138	243	285	94.3	0.0	0.0	0.0	4.7	0.0	0.0	0.0	0.1	0.9	0.0	0.0
D8 - Pink qtz congl	255	160	206	Quartz W-Mica Chlorite Carbonate-Fe-Mn-Zn	38139	38715	285	289	98.9	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D9	128	128	255	Coarse grained Quartz Albite W-Mica Chlorite volcanoclastic. Minor Gypsum	38716	39541	289	295	49.2	0.0	0.0	0.0	47.2	0.0	3.4	0.0	0.1	0.1	0.0	0.0
D10 pink qtz congl	255	160	206	Quartz Hematite W-Mica Minor gypsum	39542	41803	295	311	98.5	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D11 Transition	4	156	0	Green-grey transition frm qtz conglom to chl/musc rock. Quartz W-Mica minor Chlorite minor gypsum	41804	42783	311	319	95.7	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
D12 Sst/Qzt	224	0	40	Pink oxidised qtz musc kaol hm sst/qtzite? Quartz Kaolin W-Mica Chlorite Carbonate-Fe-Mn-Zn Fe-oxide. Only minor congl.	42784	47480	319	351	93.3	0.0	0.0	1.2	4.2	0.0	0.0	0.0	0.1	1.1	0.2	0.0

# Domain Metadata – D1-D4

Summaries of each domain's depth extents and mineral group content are given below and can be found in TSG's domain editor. The drill hole ribbon is shown on the left of each screen.

**Domain Editor**

Current sample=1, depth=0.011  
Domain 1 of 12

Prev (none) Next D2 - Strongly we,

Start  Linked 1 (0.011) Curr Goto

End  Linked 571 (12.086) Curr Goto

Colour R 255 G 255 B 128

Name D1 - Colluvium

Quartz W-Mica rubble

Quartz **W-Mica**

SWIR 4 active E D I T CLS TSA Clear

VNIR 0 active E D I T CLS TSA Clear

TIR 10 active E D I T CLS TSA Clear

Aux S n/a CLS Clear

Aux T n/a CLS Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo CLS Export Undo Close

**Domain Editor**

Current sample=1018, depth=17.185  
Domain 2 of 12

Prev D1 - Colluvium, Next D3 - FeOx

Start  Linked 572 (12.102) Curr Goto

End  Linked 2202 (26.027) Curr Goto

Colour R 255 G 128 B 192

Name D2 - Strongly weathered schist

Oxidised strongly foliated orange-brown schist w. Quartz K-Feldspar Albite W-Mica Smectite-Al Oxide-Fe Kaolin Chlorite Epidote Carbonate-Fe-

Quartz K-Feldspar Kaolin **W-Mica** Smectite-Al Chlorite Epidote **Carbonate-Fe-Mn Oxide-Fe**

SWIR 13 active E D I T CLS TSA Clear

VNIR 2 active E D I T CLS TSA Clear

TIR 14 active E D I T CLS TSA Clear

Aux S n/a CLS Clear

Aux T n/a CLS Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo CLS Export Undo Close

**Domain Editor**

Current sample=2203, depth=26.04  
Domain 3 of 12

Prev D2 - Strongly we, Next D4 - Fresh schis,

Start  Linked 2203 (26.04) Curr Goto

End  Linked 5027 (45.109) Curr Goto

Colour R 255 G 128 B 64

Name D3 - FeOx weath'd schist

Green-grey foliated schist. FeOxide on fractures & broken core. Quartz K-Feldspar Albite W-Mica Oxide-Fe Chlorite Epidote

Quartz K-Feldspar Albite **W-Mica** Chlorite **Epidote Oxide-Fe**

SWIR 9 active E D I T CLS TSA Clear

VNIR 2 active E D I T CLS TSA Clear

TIR 14 active E D I T CLS TSA Clear

Aux S n/a CLS Clear

Aux T n/a CLS Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo CLS Export Undo Close

**Domain Editor**

Current sample=5028, depth=45.119  
Domain 4 of 12

Prev D3 - FeOx Next D5 - Volcaniclas,

Start  Linked 5028 (45.119) Curr Goto

End  Linked 9671 (77) Curr Goto

Colour R 0 G 208 B 0

Name D4 - Fresh schist

Green/grey/brown foliated schist w. qtz/k-spar veins. Quartz K-Feldspar minor Albite W-Mica Chlorite Carb veins.

Quartz K-Feldspar Albite **W-Mica** Chlorite **Carbonate-Fe-Mn Carbonate-Ca-Mg**

SWIR 12 active E D I T CLS TSA Clear

VNIR 0 active E D I T CLS TSA Clear

TIR 16 active E D I T CLS TSA Clear

Aux S n/a CLS Clear

Aux T n/a CLS Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo CLS Export Undo Close

# Domain Metadata – D5-D8

Summaries of each domain's depth extents and mineral group content are given below and can be found in TSG's domain editor. The drill hole ribbon is shown on the left of each screen.

**Domain Editor** (Domain 5 of 12)

Current sample=9672, depth=77.009

Prev D4 - Fresh schis, Next D6 - Volcaniclas,

Start  Linked 9672 (77.009) Curr Goto

End  Linked 24486 (185.72) Curr Goto

Colour R 128 G 128 B 255

Name D5 - Volcaniclastic A

More massive variably coarse volc w. agglom pebbles. Quartz K-Feldspar increased Albite W-Mica sparse Chlorite

Quartz K-Feldspar Albite **W-Mica Chlorite**  
Carbonate-Fe-Mn Carbonate-Ca-Mg

SWIR 17 active E D I T CLS TSA Clear

VNIR 0 active E D I T CLS TSA Clear

TIR 23 active E D I T CLS TSA Clear

Aux S n/a CLS Clear

Aux T n/a CLS Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo CLS Export Undo Close

**Domain Editor** (Domain 6 of 12)

Current sample=24487, depth=185.73

Prev D5 - Volcaniclas, Next D7 - Silicified ,

Start  Linked 24487 (185.73) Curr Goto

End  Linked 32341 (243.03) Curr Goto

Colour R 16 G 173 B 115

Name D6 - Volcaniclastic B

More chlorite. Quartz K-Feldspar Albite Plagioclase-Na W-Mica Chlorite Illite + brown Fe-rich carbonate alteration nr base.

Quartz K-Feldspar Albite Plagioclase-Na **W-Mica Chlorite Carbonate-Fe-Mn Carbonate-Ca-Mg**

SWIR 14 active E D I T CLS TSA Clear

VNIR 0 active E D I T CLS TSA Clear

TIR 24 active E D I T CLS TSA Clear

Aux S n/a CLS Clear

Aux T n/a CLS Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo CLS Export Undo Close

**Domain Editor** (Domain 7 of 12)

Current sample=32342, depth=243.03

Prev D6 - Volcaniclas, Next D8 - Pink qtz co,

Start  Linked 32342 (243.03) Curr Goto

End  Linked 38139 (284.98) Curr Goto

Colour R 255 G 128 B 0

Name D7 - Silicified sst?

Light grn/gry coloured silicified sst. No feldspar. Equiv VCC3. Quartz Gypsum W-Mica Chlorite Carbonate-Fe-Mn-Zn

Quartz **W-Mica Chlorite Carbonate-Fe-Mn Carbonate-Ca-Mg Gypsum**

SWIR 16 active E D I T CLS TSA Clear

VNIR 0 active E D I T CLS TSA Clear

TIR 17 active E D I T CLS TSA Clear

Aux S n/a CLS Clear

Aux T n/a CLS Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo CLS Export Undo Close

**Domain Editor** (Domain 8 of 12)

Current sample=38140, depth=284.99

Prev D7 - Silicified , Next D9 - Schist,

Start  Linked 38140 (284.99) Curr Goto

End  Linked 38716 (289.12) Curr Goto

Colour R 255 G 160 B 206

Name D8 - Pink qtz cong

Quartz W-Mica Chlorite Carbonate-Fe-Mn-Zn

Quartz **W-Mica Chlorite Carbonate-Fe-Mn Carbonate-Ca-Mg**

SWIR 15 active E D I T CLS TSA Clear

VNIR 0 active E D I T CLS TSA Clear

TIR 16 active E D I T CLS TSA Clear

Aux S n/a CLS Clear

Aux T n/a CLS Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo CLS Export Undo Close

# Domain Metadata – D9-D12

Summaries of each domain's depth extents and mineral group content are given below and can be found in TSG's domain editor. The drill hole ribbon is shown on the left of each screen.

**Domain Editor**

Current sample=38717, depth=289.12  
Domain 9 of 12

Prev D8 - Pink qtz co, Next D10 - pink qtz c,

Start  Linked 38717 (289.12) Curr Goto

End  Linked 39542 (295.22) Curr Goto

Colour R 128 G 128 B 255

Name D9 - Schist

Coarse grained un-foliated schist. Quartz Albite W-Mica Chlorite volcanoclastic. Minor Gypsum

Quartz W-Mica Chlorite Carbonate-Fe-Mn  
Carbonate-Ca-Mg Gypsum

SWIR 18 active E D I T C L S T S A Clear

VNIR 0 active C L S T S A Clear

TIR 17 active C L S T S A Clear

Aux S n/a C L S Clear

Aux T n/a C L S Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo C L S Export Undo Close

**Domain Editor**

Current sample=39543, depth=295.23  
Domain 10 of 12

Prev D9 - Schist, Next D11 - Mafic tran,

Start  Linked 39543 (295.23) Curr Goto

End  Linked 41804 (311.42) Curr Goto

Colour R 255 G 160 B 206

Name D10 - pink qtz congl

Quartz Hematite W-Mica Minor gypsum

Quartz W-Mica Chlorite Carbonate-Ca-Mg  
Gypsum

SWIR 13 active E D I T C L S T S A Clear

VNIR 0 active C L S T S A Clear

TIR 15 active C L S T S A Clear

Aux S n/a C L S Clear

Aux T n/a C L S Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo C L S Export Undo Close

**Domain Editor**

Current sample=41805, depth=311.42  
Domain 11 of 12

Prev D10 - pink qtz c, Next D12 - Sst/Qzt ,

Start  Linked 41805 (311.42) Curr Goto

End  Linked 42784 (318.82) Curr Goto

Colour R 4 G 156 B 0

Name D11 - Mafic transition

Green-grey transition frm qtz conglom to chl/musc rock. Quartz W-Mica, minor Chlorite minor gypsum

Quartz W-Mica Chlorite Carbonate-Ca-Mg  
Gypsum

SWIR 13 active E D I T C L S T S A Clear

VNIR 0 active C L S T S A Clear

TIR 15 active C L S T S A Clear

Aux S n/a C L S Clear

Aux T n/a C L S Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo C L S Export Undo Close

**Domain Editor**

Current sample=42785, depth=318.82  
Domain 12 of 12

Prev D11 - Mafic tran, Next (none)

Start  Linked 42785 (318.82) Curr Goto

End  Linked 47481 (350.7) Curr Goto

Colour R 224 G 0 B 40

Name D12 - Sst/Qzt

Pink oxidised qtz, musc, kaol, hm sst/qtzite?  
Quartz Kaolin W-Mica Chlorite Carbonate-Fe-Mn-Zn Fe-oxide. Only minor congl.

Quartz Kaolin W-Mica Chlorite Carbonate-Fe-Mn  
Carbonate-Ca-Mg Gypsum Oxide-Fe

SWIR 20 active E D I T C L S T S A Clear

VNIR 3 active C L S T S A Clear

TIR 23 active C L S T S A Clear

Aux S n/a C L S Clear

Aux T n/a C L S Clear

New Split Copy attributes Delete

Fill above Fill below Merge above Merge below

Init Auto TSA Redo C L S Export Undo Close

# TSG Version 8 Displays

For readers with access to TSG files for this dataset, previously saved Layout displays are available. These are listed below. These are shown on the lower left for the primary VNIR/SWIR dataset, and for those saved in the secondary TIR dataset on the lower right.

## Primary file hydrous mineral layouts

- Load file 1: Hydrous mineral groups
- Load file 2: Dominant hydrous mineral groups
- Load file 3: Dominant anhydrous mineral grps
- Load file 4: Carbonate analysis
- Load file 5: W-mica + chlorite distribution
- Load file 6: Chlorite analysis
- Load file 7: Iron oxides
- Load file 8: TIR Offsett, Temp + FMI
- Load file 9: FeOx + core colour+domains
- Manage...

## Secondary file anhydrous mineral layouts

- Load file 1: Standard uTSAT and S summary
- Load file 2: Dominant anhydrous mineral grps
- Load file 3: Quartz abundance
- Load file 4: Carb distribution + composition
- Load file 5: TIR Special Scalars
- Load file 6
- Load file 7
- Load file 8
- Load file 9
- Manage...

# Selina 1 Conclusions - 1

- The HyLogging data provide excellent objective discrimination of the major lithological units and importantly their subdivision. Subtle alteration is indicated.
- The data indicate that Selina 1 comprises several distinct major spectro-mineralogical domains.
  - *The upper three domains show the effects of weathering and oxidation down to 45 m (on fracture surfaces) and covering the colluvium & the upper part of the logged schist with iron oxides and kaolinite.*
  - *Domain 4 comprises the logged schist with quartz, k-spar, white-mica, chlorite and little or no plagioclase.*
  - *Domain 5 comprises the upper part of the logged volcanoclastic unit which, on spectro-mineralogical grounds can be divided into three distinct domains (D5, D6 & D7). Domain boundaries are often transitional. The presence of plagioclase are characteristic. Further minor subdivisions of D5 & D6 are also evident on the basis of white-mica, chlorite and k-spar abundances. Near the base of D6 a subtle alteration zone is identified.*
  - *The most obvious variation observed over the previously logged lithologies is between D6 & D7 on the basis of the abundance of feldspar and thus the proportion of quartz. Below 243m quartz is dominant (+ w-mica + chlorite +/- kaolinite) in domains D7 to D12 and little or no feldspar.*
  - *Domains 8, 9 & 10 are only separable in minor ways related to the abundance of white mica. D12 however is distinguished by the presence of kaolinite.*
- White mica (sericite) and chlorite are ubiquitous throughout the hole but show important variations in composition between and within domains. Similarly, while restricted to certain units, the relative proportions of k-spar and plagioclase also provide significant differentiation. All these variations may be due to multiple events, including hydrothermal alteration, and fundamental lithological / metamorphic properties. These variations can be used for subdivision and refinement of the logged lithological units.

# Selina 1 Conclusions - 2

- A probable, though subtle, alteration zone is discovered from 229-240 metres, primarily defined by the development of illite, rather than muscovite, plus a ferroan carbonate (ankerite). Other even more subtle versions of the same style are also observed in domain D6.
- The more prominent quartz veins are easily mapped spectrally. No spectral evidence of sulphides or magnetite were detected. No evidence of more acid (pyrophyllite) or acid-sulphate (alunite) alteration, as known from the immediate vicinity of Mt Lyell were discovered.
- Domains 8 and 10 are equivalent to logged conglomerate lithologies indicated as possibly equivalents of the Mt Jukes Conglomerate. Conglomerates on Mt Jukes and Mt Owen further south contain extensive pyrophyllite. Also drill hole 14993\_DD88MS1\_Mt\_Sedgewick a few km SW of Selina 1 comprises extensive Mt Owen conglomerate with abundant pyrophyllite and some dickite. Notwithstanding these conglomeratic associations no pyrophyllite or dickite is observed in Selina 1.
- The HyLogging data provide a long-lasting, digital, mineralogical and image record of the Selina drill hole that can be used in regional characterisation and stratigraphic correlation as more drill holes become available.
- This drill hole, along with Selina 2, have been interpreted independently with only limited external input, other than the provided summary logs included here and which were compared and incorporated after the hyperspectral interpretation.

# Recommendations

- Any interpretations requiring confirmation or unusual features validated should be checked with QXRD analysis.
- HyLogging of drill hole data generates its greatest benefit when conducted as soon as possible after drilling. It is then that the logging geologist can take best advantage of the objective mineralogical characterisation provided, while the core is easily available, and may guide further sampling strategies and help identify subtle or cryptic alteration zones.
- Comparative HyLogging of spatially and stratigraphically contiguous drill holes should greatly help understanding the lateral continuity of changes observed in these data, however the distance to the Selina-2 hole, and the absence of further holes, has not made this possible on this occasion. In time additional logging of drill holes from this region and this specific sequence will help build a knowledge base of alteration zones and volcanic stratigraphy.
- A free TSG-Viewer is available from [www.thespectralgeologist.com](http://www.thespectralgeologist.com) for examining the digital HyLogging and processed TSG data, including the high resolution drill core and core tray images.



**HUNTINGTON**  
HYPERSPECTRAL

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