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1982/41. Major and trace element analyses of Triassic basalts, north-east Tasmania

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Abstract

The two Triassic basalt units of the St Marys district are chemically distinct, the lower unit being more highly fractionated than the upper. These basalts are characteristically high in TiO_2 , P_2O_5 and combined alkalis, and show clear chemical differences from petrographically similar Tertiary basalts; in particular, lower MgO, Ni, and Cr.

INTRODUCTION

This report presents major and trace element analyses of ten samples of Triassic basalt from the Nicholas Range-St Marys area. Field relationships and petrographic characteristics of the basalts are described in Baillie (1980), Calver (1980), and Calver and Castleden (1981).

PETROCHEMISTRY

The distribution of the basalt, and the locations of nine of the analysed samples are shown in Figures 1 and 2. The tenth sample (240) was collected near Slab Hut Creek [EQ912031] (to the west of the area shown in Figure 1). At this locality, a single 10 m thick unit of basalt occurs, like the figured examples, near the base of the Triassic section.

The analyses (Tables 1 and 2) reveal minor but significant differences between the lower and upper basalt units. The lower unit has significantly higher TiO_2 , and lower MgO, Ni, and Cr, indicating that it is more highly fractionated than the upper unit.

Samples 238 and 239, collected from one of the eastern localities where only one basalt unit is present, are chemically similar to the upper basalt samples and are tabulated with them. Conversely, sample 240, from Slab Hut Creek, has strong affinities with the lower unit, and is classified as such.

Overall, the Triassic basalts are notable for their high P_2O_5 , TiO_2 , and combined alkalis. In comparison with petrographically similar Tasmanian Tertiary alkali olivine basalts, these rocks also show higher Rb and Zr, lower MgO, and markedly lower Ni and Cr (see, for example, Spry, 1962; Brown and McClenaghan, 1982).

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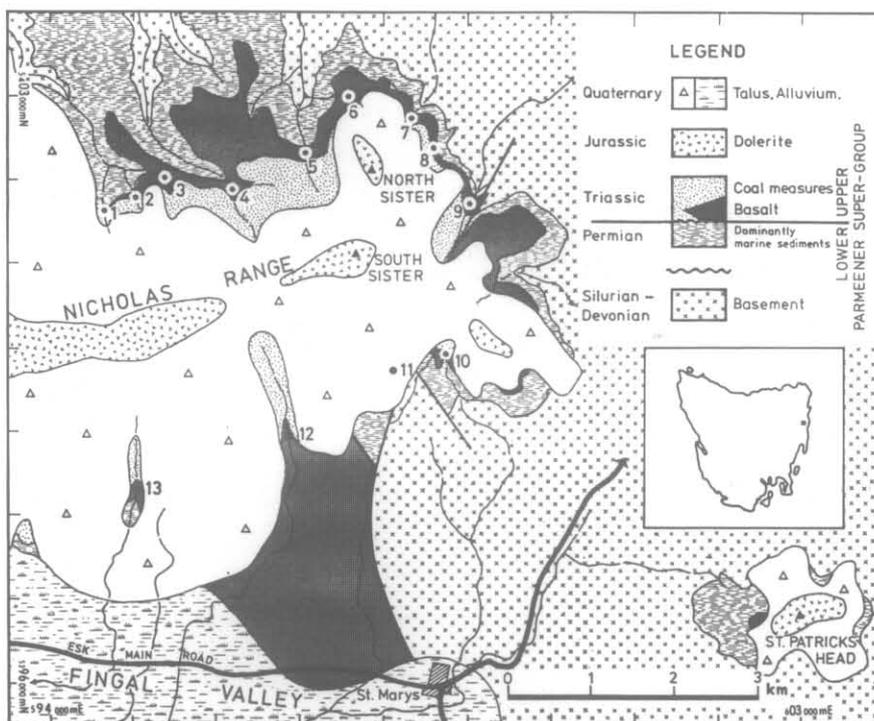


Figure 1. Locality map. Numbers refer to sections in Figure 2.

5 cm

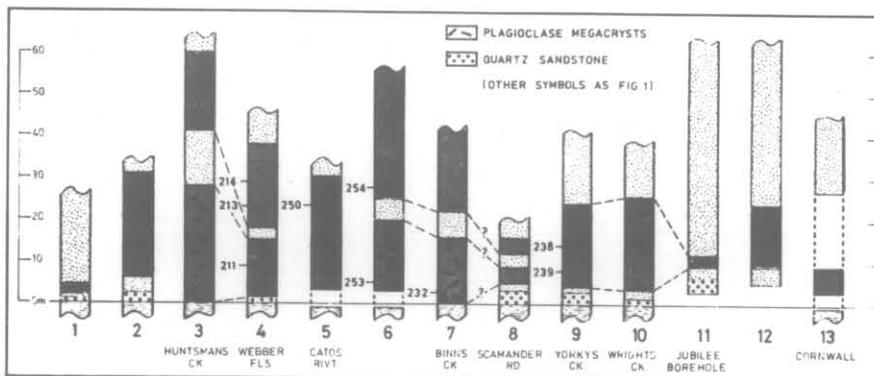


Figure 2. Measured sections through the basalts, showing locations of analysed samples. Datum is at base of Upper Parmeener Super-Group.

Table 1. MAJOR ELEMENT ANALYSES

Lower basalt unit

Field No.	211	232	240	253	Average-
Analysis No.	802960	802963	802966	802968	Lower unit
	(%)	(%)	(%)	(%)	(%)
SiO ₂	45.24	45.12	45.20	47.32	45.72
TiO ₂	3.63	3.34	3.65	2.43	3.26
Al ₂ O ₃	16.32	16.27	16.18	15.55	16.08
Total Fe as Fe ₂ O ₃	13.07	13.25	13.13	13.17	13.16
MnO	0.22	0.15	0.17	0.18	0.18
MgO	5.51	5.01	4.98	3.09	4.65
CaO	7.72	7.50	7.66	6.37	7.31
Na ₂ O	2.42	2.40	3.09	3.17	2.77
K ₂ O	1.75	2.03	1.99	2.60	2.09
P ₂ O ₅	0.75	0.75	0.74	1.80	1.01
Loss on ignition	3.72	3.74	2.67	3.40	
Other	0.23	0.45	0.33	0.28	
Total	100.58	100.01	99.79	99.36	

Upper basalt unit

Field No.	213	214	238	239	250	254	Average-
Analysis No.	802961	802962	802964	802965	802967	802969	Upper unit
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
SiO ₂	46.07	46.07	46.27	46.77	47.36	47.30	46.64
TiO ₂	2.38	2.48	2.47	2.45	2.39	2.51	2.45
Al ₂ O ₃	14.57	14.86	14.77	14.73	14.57	15.63	14.86
Total Fe as Fe ₂ O ₃	11.75	11.91	12.22	11.88	12.07	12.04	11.98
MnO	0.22	0.16	0.17	0.17	0.15	0.16	0.17
MgO	6.76	5.96	5.90	5.81	6.37	5.15	5.99
CaO	7.27	6.86	7.09	7.19	7.12	6.85	7.06
Na ₂ O	2.65	2.40	2.89	3.57	4.10	3.32	3.16
K ₂ O	2.07	2.35	2.37	2.33	2.12	2.32	2.26
P ₂ O ₅	1.36	1.58	1.56	1.51	1.34	1.60	1.49
Loss on ignition	4.14	4.72	3.54	2.93	2.48	3.29	
Other	0.24	0.25	0.30	0.26	0.26	0.37	
Total	99.48	99.60	99.25	99.60	100.33	100.54	

Analyst: H.K. Wellington

Table 2. TRACE ELEMENT ANALYSES

Lower basalt unit

Field No.	211	232	240	253	Average-
Analysis No.	802960	802963	802966	802968	Lower unit
	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
Ba	681	2600	1560	1060	1475
Co	32	38	38	24	33
Cr	21	20	11	48	25
Nb	57	56	58	77	62
Ni	34	29	32	37	33
Rb	30	39	34	42	36
Sc	15	20	22	19	19
Sr	849	1037	947	860	923
V	216	234	234	90	194
Y	22	18	22	32	24
Zn	107	104	108	126	111
Zr	257	262	261	337	279

Upper basalt unit

Field No.	213	214	238	239	250	254	Average-
Analysis No.	802961	802962	802964	802965	802967	802969	Upper unit
	(ppm)						
Ba	771	961	1260	941	931	2040	1151
Co	32	21	30	32	31	25	29
Cr	186	141	155	169	197	148	166
Nb	60	64	67	67	62	67	64
Ni	115	85	79	88	114	78	93
Rb	38	40	37	39	39	43	39
Sc	13	13	17	18	13	13	15
Sr	725	736	815	688	710	738	735
V	119	115	118	119	126	117	119
Y	26	26	27	28	25	28	27
Zn	109	108	116	108	111	114	111
Zr	283	299	296	292	278	309	293

Analyst: H.K. Wellington