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Petrology of Tertiary lavas from the western Kangerdlugssuaq area, East Greenland

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ABSTRACT. Whole-rock, minor element, rare earth, and electron microprobe data are presented for basaltic lavas from the western Kangerdlugssuaq area of East Greenland. Samples were obtained from Professor W. A. Deer's 1936 collection at Triangular Nunataks and Gardiner Plateau, and additional material obtained by sampling moraines on the surface of Kangerdlugssuaq Glacier. Both undersaturated and tholeiitic lavas are present at the Triangular Nunatak locality but the glacier suite is dominantly tholeiitic. The tholeiitic suite is less evolved than tholeiites from the Scoresby Sund area. Undersaturated lavas show enrichment in light rare earth elements and tholeiitic lavas show flat chondrite-normalized patterns. Tholeiites from the Gardiner Plateau show no Eu anomaly but others show a slight negative Eu anomaly. Chemical data and considerations of regional geology are consistent with Cox's (1980) model of flood basalt vulcanism.

DURING the well-known expedition to the Kangerdlugssuaq region in 1935-6 two lengthy sledging journeys were made to the inner reaches of Kangerdlugssuaq Fiord where nunataks on the inland ice were sampled. Wager, in 1935, examined the Prince of Wales Range while, in 1936, Deer travelled across the upper part of the Kangerdlugssuaq Glacier from the Prince of Wales Mountains (Prinsen af Wales Bjerge) and collected the basalts of Lindsay's Nunatak, the Triangular Nunataks (Trekant-Nunatakken), and the Gardiner Plateau (fig. 1). No further work was done on these basalts, which remained in the collections of the Universities of Oxford and Cambridge, except for a brief paper on some of the Prince of Wales lavas by Anwar (1955).

In 1975, as part of the joint geological field operations of the Universities of Toronto and Copenhagen in the same region, a party based on the ultra-potassic Batbjerg intrusion (Brooks *et al.*, 1981) was able to collect basalts from moraines on the Kangerdlugssuaq Glacier that had sampled otherwise inaccessible nunataks between the Prince of Wales Range and the Triangular Nunataks, as well as sampling, *in situ*, basalt dykes that cut the upper reaches of the fiord walls.

In the light of current theories on the evolution of the North Atlantic, the basalts of the entire North Atlantic Tertiary province have assumed a new significance but previous studies on the Greenland basalts are of specimens from the coastal region and a short distance inland (e.g. Fawcett *et al.*, 1973). The Geological Survey of Greenland has mapped in detail basalts of the western Scoresby Sund area (Watt and Watt, 1971; Henricksen, 1972), but the geochemistry and petrology of these samples is not yet available. Material from the nunataks of the inland ice now takes on added significance as it is the largest collection of basalts from the western extremity of the Thulean field. They are undoubtedly underlain by continental crust and must represent some of the very earliest vulcanism during the opening of this segment of the North Atlantic.

The present study is based on our 1975 collections, and upon the 1936 collections of Professor W. A. Deer which were made available to us through the kindness of Professor E. A. Vincent of Oxford University and of Professor P. E. Brown in whose laboratory isotopic study of the same material is progressing.

Petrography. Thin-section studies revealed a broad range of basaltic textures ranging from massive porphyritic and aphyric samples to vesicular and doleritic varieties. The samples are clearly derived from different heights within the lava flows, and the vesicular samples show only minor evidence of oxidation. Clinopyroxene is the common phenocryst reaching 25-30% in some specimens.

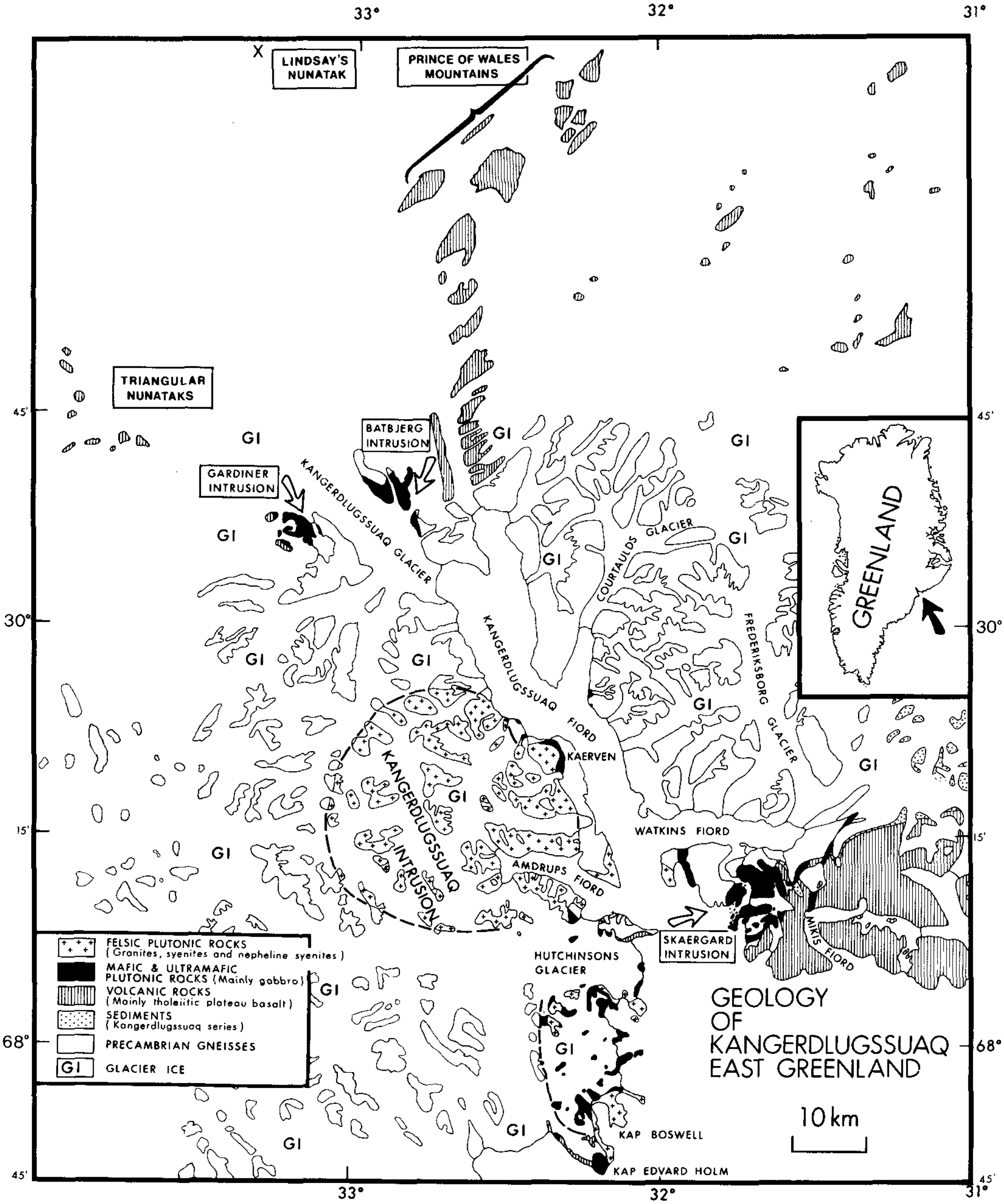

FIG. 1. Generalized geological map of the Kangerdlugssuaq region, East Greenland.

Olivine phenocrysts are present in only two samples—one from Lindsay's Nunatak and the other from the Triangular Nunatak locality. Plagioclase phenocrysts are present in several samples, commonly as complex glomeroporphyritic aggregates with clinopyroxene. Groundmass material ranges from medium to very fine grained intergrowths of pyroxene, plagioclase, and opaque phases with glass preserved in some samples. Some glass is apparently fresh but devitrification and probable hydration features are also present. Subcalcic augite was not definitely identified in thin

Table I. Major Element Analyses

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Field Number	29515	29516	29518	29519	29522	29523	29524	29525	29526	29527	29529	29530	29531	29532	29534	29535
SiO_2	48.23	46.97	45.89	46.57	47.67	48.17	47.80	47.56	47.18	46.96	47.60	47.24	47.21	47.57	46.51	47.87
TiO_2	2.66	2.09	2.04	2.05	2.24	2.21	2.16	2.13	3.03	2.23	2.70	2.72	3.31	2.13	2.04	2.27
Al_2O_3	13.84	14.12	13.80	14.05	13.67	13.97	13.74	13.67	13.63	13.68	13.93	13.78	13.29	13.99	13.93	13.80
Fe_2O_3	4.57	6.07	6.26	5.40	4.63	5.94	5.63	6.70	4.79	6.60	4.84	5.26	5.90	6.27	5.50	5.42
FeO	8.92	6.94	7.09	7.85	8.94	7.64	7.89	6.94	8.48	7.12	8.04	8.08	8.16	7.35	7.52	8.01
MnO	0.20	0.20	0.18	0.19	0.21	0.21	0.20	0.20	0.20	0.17	0.16	0.19	0.22	0.18	0.20	0.18
MgO	6.79	6.97	7.19	7.40	7.05	7.86	7.21	7.31	6.50	7.02	7.09	7.00	6.39	7.34	7.51	7.09
CaO	10.66	11.26	11.27	11.32	10.91	11.39	11.11	11.17	10.15	10.75	10.58	10.25	10.17	11.15	11.12	10.88
Na_2O	2.40	2.18	2.13	2.07	2.39	2.12	2.31	2.31	2.48	2.31	2.41	2.37	2.47	2.31	2.13	2.33
K_2O	0.33	0.20	0.18	0.18	0.30	0.23	0.28	0.28	0.44	0.34	0.35	0.39	0.68	0.38	0.21	0.31
P_2O_5	0.33	0.26	0.25	0.26	0.25	0.31	0.23	0.21	0.36	0.26	0.26	0.28	0.35	0.24	0.28	0.23
Loss	1.59	2.13	2.29	3.27	1.11	2.85	1.62	1.41	1.76	2.66	2.15	2.24	1.52	1.54	2.91	2.10
Total	100.52	99.39	98.57	100.61	99.37	102.90	100.14	99.89	99.00	100.10	100.11	99.80	99.67	100.45	99.86	100.49

	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Field Numbers	WR 3384	WR 3389	29520	29521	29528	29536	WR 3383	29517	WR 3351	29533	WR 3352	WR 3335	WR 3360	WR 3359
SiO_2	49.32	47.54	47.96	47.98	47.51	47.93	48.78	43.81	45.87	44.67	44.70	44.30	42.93	38.92
TiO_2	2.49	2.21	2.31	2.25	2.16	2.31	2.54	5.42	4.41	4.53	3.84	1.80	3.74	3.59
Al_2O_3	14.66	14.78	13.73	13.81	14.51	14.09	14.51	10.07	9.03	12.06	7.88	9.46	7.70	5.01
Fe_2O_3	8.68	6.20	6.64	3.65	7.74	5.53	4.39	6.72	10.29	4.62	6.53	3.79	5.49	7.54
FeO	3.84	5.70	7.44	9.85	6.14	8.47	8.26	8.93	4.23	7.96	6.52	8.38	8.74	7.83
MnO	0.15	0.18	0.20	0.19	0.19	0.23	0.14	0.19	0.13	0.18	0.19	0.17	0.18	0.19
MgO	5.63	6.65	7.07	7.25	7.04	7.45	6.61	6.85	9.30	5.93	11.53	19.01	13.67	23.11
CaO	10.27	10.81	11.20	11.17	10.80	11.28	10.47	9.68	10.42	8.29	12.08	8.35	10.88	8.38
Na_2O	2.39	2.34	2.42	2.46	2.73	2.33	2.38	3.09	2.49	4.74	1.94	1.33	1.58	0.35
K_2O	0.45	0.24	0.24	0.25	0.22	0.17	0.20	1.61	1.48	2.74	1.94	0.19	1.39	0.51
P_2O_5	0.24	0.23	0.26	0.25	0.22	0.26	0.28	0.70	0.62	0.95	0.63	0.18	0.52	0.42
Loss	2.39	3.37	0.99	2.08	1.86	1.18	2.04	2.70	3.31	4.92	2.85	2.73	3.74	4.20
Total	100.51	100.02	100.46	101.19	101.12	101.23	100.60	99.77	101.58	101.59	100.63	99.69	100.56	100.05

XRF analyses by A.J. Hamud and M.P. Gorton

section but, as shown later by microprobe analyses, is present in several of the tholeiites.

Whole-rock chemistry. Tables I and II show the major element data and CIPW norms for thirty samples. Each analysis is an average of two independent determinations. Field numbers in the 29000 series are for samples collected in 1975 near the Batjberg Complex and the WR series of field numbers are Professor Deer's samples from the Triangular Nunatak locality. (CIPW norms were calculated on a computer program provided by Dr W. R. A. Baragar (Geological Survey of Canada) and adapted for use on a Commodore PET Minicomputer by Mr J. Rylaarsdam). Fe_2O_3/FeO was adjusted to 0.15 before the norm calculation (Brooks, 1976).

Analyses 1 to 18 belong to the average tholeiitic series of the Irvine and Baragar (1971) classification. Seventeen of the eighteen samples are hypersthene and olivine normative, and only one (number 18 from Triangular Nunataks) is quartz normative. This may be a function of the arbitrary adjustment of Fe_2O_3 for norm calculations. Analyses 19 to 23 belong to Irvine and Baragar's low-potassium tholeiitic series and the last seven analyses (24 to 30) are all undersaturated: 24 and 25, alkali basalt; 26, trachy basalt; 27, ankaramite; 28, tholeiitic picrite; 29, alkalic picrite basalt; 30, ultramafic; all on the Irvine and Baragar classification.

The tholeiites show a typical fairly narrow spectrum of composition illustrated by the very tight cluster of data on the AFM plot (fig. 2) and the MgO variation diagrams (fig. 3). Open-circle symbols on fig. 2 are for undersaturated samples in the present study, and sample numbers refer to the analyses in Table I. Fig. 2 shows that our data for tholeiites plots within the range of the Scoresby Sund lavas, but inspection of the data indicates that most of the Scoresby Sund lavas are more Fe-rich than our Kangerdlugssuaq samples (Fawcett *et al.*, 1973). This diagram also shows the data of Anwar (1955) for five samples from the Prince of Wales Bjerge lavas. Samples A, B, and C in this group are alkalic and D and E tholeiitic according to the Irvine and Baragar classification. The Prince of Wales mountains consist of a lower flood basalt unit unconformably overlain by steeply dipping flows apparently derived from a

Table II. CIPW Norms

Field Numbers	1 29515	2 29516	3 29518	4 29519	5 29522	6 29523	7 29524	8 29525	9 29526	10 29527	11 29529	12 29530	13 29531	14 29532	15 29534	16 29535
Q																
Or	1.98	1.22	1.11	1.10	1.81	1.37	1.69	1.69	2.68	2.07	2.12	2.37	4.12	2.28	1.29	1.87
Ab	20.58	19.05	18.81	18.06	20.64	18.00	19.90	19.95	21.65	20.16	20.88	20.63	21.38	19.85	18.66	20.11
An	26.37	29.08	28.77	29.41	26.22	28.03	26.78	26.64	25.54	26.77	26.79	26.55	23.70	27.10	28.82	26.81
Ne																
Di	11.44	12.41	12.86	12.50	12.43	12.69	12.70	13.16	11.05	12.05	12.07	11.17	11.51	12.71	12.51	12.30
Hd	9.23	9.74	10.12	9.54	10.16	9.23	10.08	10.35	8.73	9.82	8.67	8.49	9.62	9.95	9.22	9.74
En	10.22	8.57	6.64	8.12	7.64	9.68	8.14	7.16	9.52	7.54	9.19	9.54	7.70	6.41	8.08	8.79
Fs	9.46	7.72	6.00	7.12	7.16	8.08	7.42	7.46	8.62	7.04	7.57	8.32	7.39	5.75	6.83	7.98
Fo	1.13	2.53	4.26	3.57	3.17	2.86	2.98	3.73	1.45	3.44	2.31	2.25	2.28	4.39	3.85	2.47
Fa	1.15	2.51	4.24	3.44	3.27	2.63	2.99	3.71	1.44	3.54	2.09	2.16	2.41	4.35	3.59	2.47
Mt	2.53	2.45	2.54	2.51	2.56	2.50	2.53	2.54	2.53	2.58	2.43	2.53	2.64	2.53	2.47	2.52
Il	5.12	4.10	4.04	4.02	4.34	4.21	4.18	4.13	5.94	4.37	5.25	5.31	6.43	4.11	4.01	4.40
Ap	0.78	0.62	0.61	0.62	0.59	0.72	0.61	0.50	0.86	0.62	0.62	0.67	0.83	0.57	0.67	0.54
M^1	50.9	52.7	52.9	53.7	51.7	54.6	52.5	52.8	50.2	51.7	53.3	52.1	48.5	52.9	54.5	52.3
D.I.	22.6	20.3	19.9	19.2	22.4	19.4	21.6	21.6	24.3	22.2	23.0	23.0	25.5	22.1	19.9	22.0
C.I.	50.3	50.0	50.7	50.8	50.7	51.9	51.0	51.2	49.3	50.4	49.6	49.8	50.0	50.2	50.7	50.7

Field Numbers	17 WR 3384	18 WR 3389	19 29520	20 29521	21 29528	22 29536	23 WR 3383	24 29517	25 WR 3351	26 29533	27 WR 3352	28 WR 3335	29 WR 3360	30 WR 3359
Q	2.41						0.80							
Or	2.73	1.47	1.43	1.49	1.32	1.01	1.20	9.86	8.99	16.82	11.79	1.16	8.52	3.17
Ab	20.76	20.54	20.68	21.04	23.41	19.78	20.49	18.81	20.15	14.35	7.13	11.63	8.01	3.11
An	28.69	30.20	26.16	26.19	27.05	27.58	28.81	9.16	9.33	3.67	7.26	19.93	10.17	11.12
Ne								4.47	0.80	14.77	5.28		3.17	
Di	9.81	11.40	12.74	12.95	11.68	12.35	10.34	17.16	21.43	16.10	29.17	13.57	24.72	18.94
Hd	8.39	8.22	10.60	10.29	9.62	9.81	7.93	12.28	10.74	10.59	11.26	3.78	9.37	4.73
En	9.85	10.43	7.09	6.67	3.94	7.49	11.96					8.62		0.68
Fs	9.65	8.63	6.77	6.08	3.72	6.82	10.52					2.76		0.19
Fo		1.02	3.35	3.91	5.90	3.79		6.80	9.70	5.51	11.20	23.84	16.70	35.69
Fa		0.93	3.53	3.92	6.14	3.80		6.15	6.14	4.58	5.47	8.40	8.00	11.26
Mt	2.29	2.24	2.60	2.54	2.55	2.58	2.38	2.97	2.65	2.41	2.44	2.34	2.72	2.94
Il	4.86	4.35	4.43	4.32	4.16	4.40	4.91	10.66	8.60	8.93	7.50	3.53	7.36	7.16
Ap	0.57	0.55	0.61	0.59	0.52	0.61	0.66	1.68	1.48	2.29	1.50	0.43	1.25	1.02
M^1	49.0	53.9	51.2	52.3	51.7	52.4	51.9	47.7	58.0	46.6	64.9	76.2	66.5	75.9
D.I.	25.9	22.0	22.1	22.5	24.7	20.8	22.5	33.1	29.9	45.9	24.2	12.8	19.7	6.27
C.I.	44.8	47.2	51.1	50.7	47.7	51.0	48.0	56.0	59.3	48.1	67.0	66.8	68.9	81.6

M^1 - 100 Mg/Mg + 0.85Fe_T (Cox, 1980, Wilkinson and Binns, 1977); D.I. - Differentiation Index (Thorton and Tuttle, 1960); C.I. - Crystallisation Index (Poldervaart and Parker, 1964).

relatively close central vent (Wager, 1947). Each of the samples analysed by Anwar came from the upper unit and the two tholeiites (D and E) are distinctly more alkali-rich than any of the flood basalts. The restricted compositional range of the tholeiitic rocks is also reflected in the narrow range of values calculated for the differentiation index (19.2 to 25.9) and the crystallization index (42.9 to 51.2) also presented in Table II.

An interesting comparison can be made with the Parana flood basalts of South America (Cox, 1980). The Greenland basalts reported here have a more restricted composition in terms of CaO, Al_2O_3, and Fe_2O_3 (total) plotted against MgO variation (fig. 3). Of course it is not known how many separate flows, and hence magma samples, are represented by the Kangerdlugssuaq specimens reported here since our samples were collected from moraines and those of Deer under difficult late-winter snow conditions. However, the Scoresby Sund data, also plotted on fig. 3 represents thirty-seven separate flows and shows a much more restricted compositional range than the Parana lavas. In addition the Scoresby Sund lavas generally have higher total Fe and lower Mg contents than the Kangerdlugssuaq suite.

The undersaturated group of lavas (anals. 24 to 30) contains samples from the Triangular Nunatak area and from the Kangerdlugssuaq Glacier collection. Five of these seven samples are nepheline

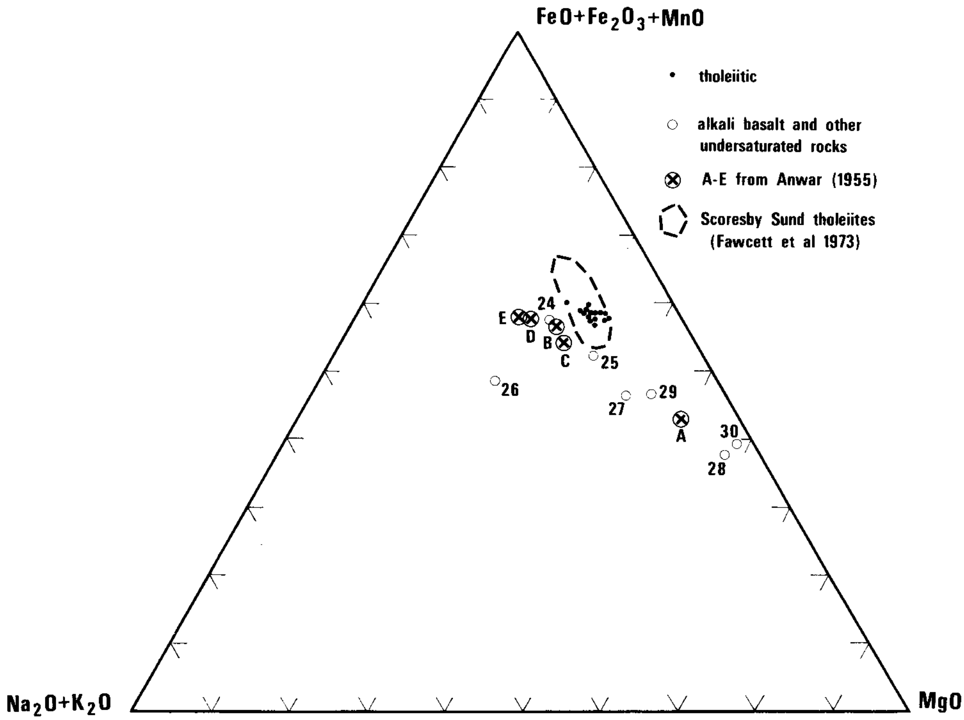

FIG. 2. AFM plot for the lavas from western Kangerdlugssuaq, solid and open circles, and Scoresby Sund (Fawcett *et al.*, 1973) with data for the Prince of Wales Mountains from Anwar (1955). Numbers on open circles refer to analyses in Table I.

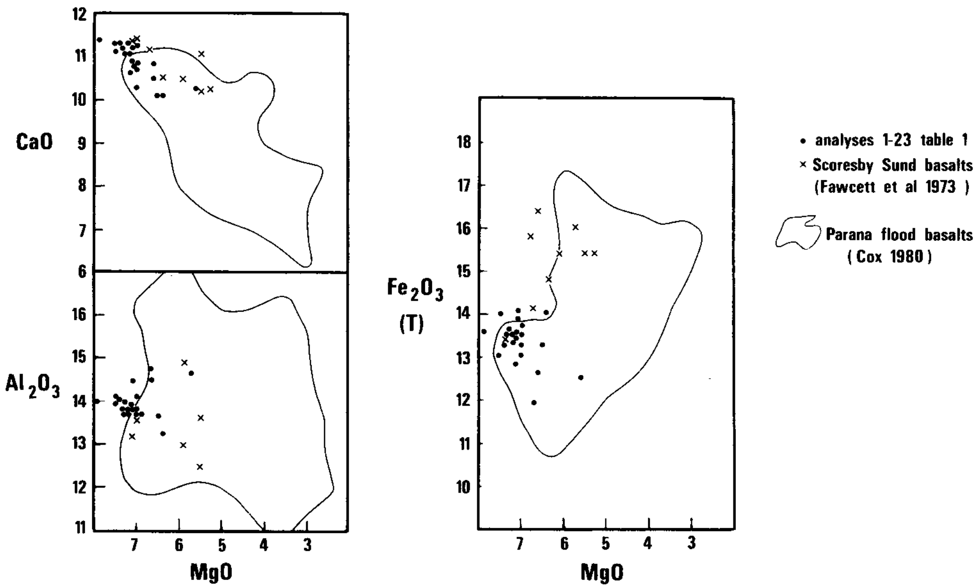

FIG. 3. MgO variation diagrams for tholeiitic lavas of western Kangerdlugssuaq. The solid line encloses the composition area for the Parana flood basalts (Cox, 1980) and crosses are selected data for Scoresby Sund basalts (Fawcett *et al.*, 1973).

normative (0.80 to 14.8 % Ne). Most of these samples are porphyritic with phenocrysts of olivine and clinopyroxenes occurring in great abundance in samples 27, 28, 29, and 30 (25–40 %). Plagioclase phenocrysts are less abundant in each of these samples (15–20 %).

Calculated values of M^1 ($= 100\ Mg/[Mg + 0.85\ Fe_T]$) are shown in Table II for each analysis. The range for tholeiitic samples is from about 48.0 to 54.5 and from about 47 to 76 for the undersaturated lavas. However, only analyses 24 and 25, of the undersaturated group can be considered as approximating liquid compositions as the others are substantially porphyritic. The significance of the M^1 value in basalt petrogenesis has been discussed most recently by Wilkinson and Binns (1977), Frey *et al.* (1978), and by Cox (1980). Values calculated for the tholeiitic lavas and for the two least porphyritic undersaturated lavas are clearly too low to suggest derivation by partial melting of an upper-mantle periodotite composition. The problem becomes more acute for the Scoresby Sund basalts that show greater iron enrichment than the present samples. Fe-rich lherzolite xenoliths of the type described by Wilkinson and Binns (1977) have not been found in East Greenland, nor, to our knowledge, in any part of the North Atlantic tertiary volcanic province.

Trace element analyses. The XRF analyses presented in Table III are average values from two separate determinations. Analyses 17, 18, 23, and 28 are all tholeiitic according to the Irvine and Baragar classification and numbers 25, 27, 29, and 30 are alkalic. The two groupings, based on major element chemistry, are clearly reinforced by the trace element analyses. The data for Zr, Sr, Rb, and Th are particularly useful in distinguishing these two groups of lavas but examination of similar analytical data from other areas (e.g. Frey *et al.*, 1978, table 6) shows that such a distinction is not always present.

Rare earth elements. Nine samples were selected for rare earth analyses with selection based on the major element chemistry, sample location, and, in the case of the small size of the Oxford material, sample availability. From the Triangular Nunataks and Gardiner Plateau locations we selected three tholeiitic (anals. 18, 23, 28) and two undersaturated samples (anals. 25, 27). From the Kangerdlugssuaq Glacier collection two tholeiitic (anals. 1, 22) and one undersaturated sample (anal. 24). Chondrite-normalized data for these samples are presented in fig. 4. The data clearly reflect divisions noted in

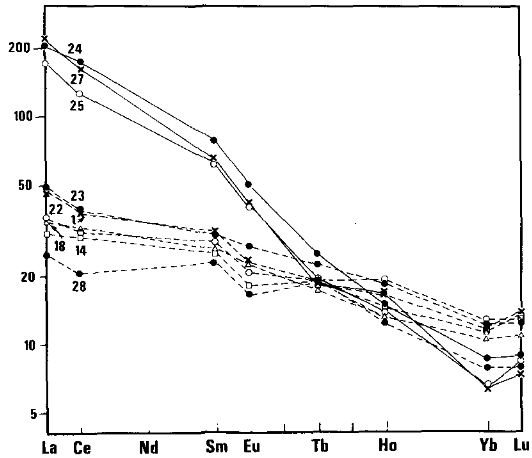

FIG. 4. Chondrite-normalized *REE* data for nine basalts from western Kangerdlugssuaq. Solid lines are for undersaturated lavas and broken lines for tholeiitic lavas. Sample numbers refer to analyses in Table I. Analyses by A. J. Hamud and M. P. Gorton.

Table III. Trace Element Analyses

	17 WR 3384	18 WR 3389	23 WR 3383	25 WR 3351	27 WR 3352	28 WR 3335	29 WR 3360	30 WR 3359
Zr	149	136	159	325	275	107	239	233
Y	26.3	25.8	28.4	21.6	19.5	19	18.1	15.6
Sr	256	266	272	740	902	194	922	1183
U	1.7	2.4	3.6	4.8	6.9	4.1	4.7	6.3
Rb	10.5	3.5	4.0	24.0	38.0	3.3	26.4	16.1
Th	1.8	3.8	2.0	9.02	5.75	2.7	5.9	5.36

XRF analyses by A.J. Hamud and M.P. Gorton the major and minor element chemistry. Undersaturated lavas show light *REE* enrichment and no Eu anomaly. The relative *REE* abundances for all three samples are quite similar and fall within the range of values previously reported for alkali olivine basalts (see, for example, Frey *et al.*, 1978; Van Kooten, 1980; Kay and Gast, 1973). Enrichment in light *REE* is significantly greater than shown by undersaturated lavas of the Deccan province (Alexander and Gibson, 1977).

The tholeiitic samples show *REE* patterns that are generally similar to many continental tholeiites, also coinciding approximately with the range of values for Hawaiian tholeiites (Frey *et al.*, 1978). Analyses 18 and 23 show no Eu anomaly but the others each show a slight negative anomaly. It may be significant that these two samples are from the Gardiner Plateau location according to Professor Deer's field notes (Professor P. E. Brown, pers. comm.).

Mineral analysis. Fig. 5 shows the results of electron microprobe analyses of plagioclase, pyroxene, and olivine in the analysed lavas (data from the Lindsay's Nunatak sample will be discussed separately). Plagioclase shows a normal range of composition for basaltic rocks. The two alkali feldspar analyses (X on fig. 5) are both from a very undersaturated sample in the Kangerdlugssuaq Glacier collection (anal. 26, Table I). Alkali lavas contain pyroxene that, on the basis of seventy-five analyses, shows only a small range of composition. Tholeiitic lavas show a greater range of clinopyroxene composition than the alkali lavas and some contain subcalcic augite or pigeonite in addition to augite. Compositional fields for clinopyroxenes from the two lava types show only a small overlap with significantly more Fe enrichment in the tholeiitic suite.

Modest compositional zoning of single clinopyroxene crystals was detected by the microprobe but was not visible in thin section. In addition to a 5–10% range in the Mg/Fe ratio, significant Na contents were detected on the rims of several clinopyroxene grains. 5–7% of the jadeite component is present in the rims of clinopyroxenes from undersaturated lavas with less common values ranging up to about 20%.

A polished thin section is the only sample

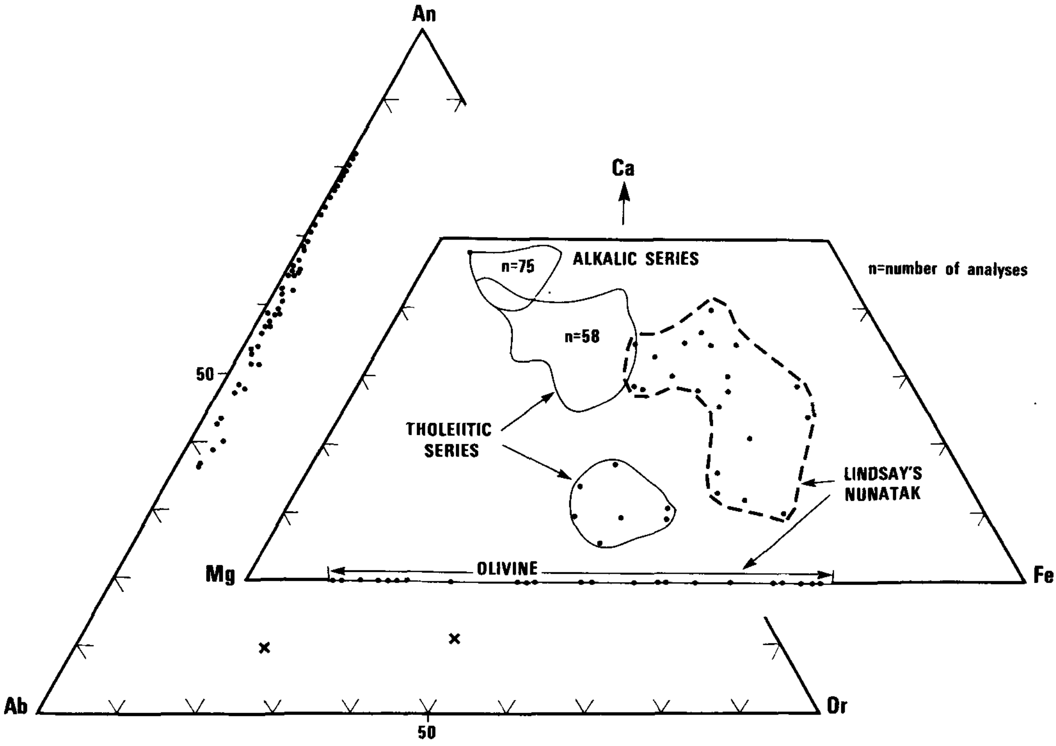

FIG. 5. Electron microprobe analyses of feldspar, pyroxene, and olivine from western Kangerdlugssuaq basalts. The solid symbol closest to the diopside composition represents pyroxene phenocrysts in the basalt from Lindsay's Nunatak.

available to us from Professor Deer's collection made at Lindsay's Nunatak (fig. 1). Although we have no whole-rock chemistry, the microprobe data is worth recording because it presents such a contrast to our other data. The outcrop was described as a dolerite. It is composed of phenocrysts of plagioclase, olivine, and clinopyroxene but of particular interest is the presence of minute grains of clinopyroxene and olivine that are interstitial to the large plagioclase grains and have a very large range of composition. Whereas the phenocryst olivine and clinopyroxenes are $Mg_{89}Fe_{11}$ and $Ca_{48}Mg_{47}Fe_5$ respectively, the interstitial grains extend to $Mg_{25}Fe_{75}$ and $Ca_{10}Mg_{26}Fe_{64}$. Such a range of compositions in a single thin section is, of course, well known in lunar basalts. These interstitial grains are, presumably, the result of disequilibrium crystallization attendant upon extrusion of the lavas or intrusion to a high crustal level, following a period of equilibrium crystallization at greater depth.

Discussion. Although the correlation between flood basalt volcanism and continental rifting is now fairly widely accepted, there is still no tectonic and petrogenetic model that can reconcile all geological factors. Volcanic activity in areas such as Iceland has given insight into the processes related to oceanic basaltic volcanism. Further complications are added to the models of oceanic volcanism when the lavas overlay continental crust.

The purpose of this paper is not to present new models of flood basalt generation but to document the nature of the volcanic products in a remote area of this lava field. We have shown that the Triangular Nunataks area consists of both undersaturated and tholeiitic lavas and these tholeiites together with the Kangerdlugssuaq suite show small differences in composition compared to the Scoresby Sund tholeiites. Rare earth data suggests tholeiites from the Gardiner Plateau may be a third distinctive subgroup. Consequently the East Greenland tertiary flood basalt sequence is not uniform and further study may be able to relate the groups noted above to petrogenetic processes. Cox's (1980) arguments in favour of the role of picrite and his generalized model of the continental crust during flood volcanism is generally consistent with the data from East Greenland. Picritic rocks reported from the coastal regions may represent the basalt parent of Cox's model.

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