DATE: 15 August 1984 SAMPLE:
CRUISE ID: SO 33 48 DK box dredge
LOC: VI
AREA: D (N of SP Lee Seamount)

	time (GMT)	LAT (N)	LON (W)	water depth (m)	wire o
ON BOTTOM =	2008	9° 14.80	164° 50.72		170
OFF BOTTOM =	2146				139

Mean dredge data (corrected): 9° 15' 04" 164° 50' 37" 1324 (724 fm)
time 1 hr 38 min.

RECOVERY WEIGHT = total 235 kg
crust 30 kg
200 kg basalt
5 kg sediment

CRUST THICKNESS = 0.4 to 5 cm Avg = 1 cm
2 generations

SUBSTRATE = basalt; conglomerate w/ white phosphate cement, basalt clasts and minor calcite
Many rounded cobbles as from talus pile

COMMENTS:
Good Crusts!
Guten Krusten!!
* 1 microbio sample
* Smear slides made

48 DK

*** Petrographische Daten Sediment

RV Sonne So 33 Midpac II 29.7 - 29.8.1984

Datum: 15.08.84 Areal: D Lokation: VI Station: 48 DK

Probennummer: 48 DK sediment

Längengrad, nk: GMT 2008 — k: -164° 50.74'

Breitengrad, nk: GMT 2146 — k: 9° 14.80

Wassertiefe (m): 13650 - 1250 Bereich (m):

Typ: lithic + calcareous Sediment Farbe: Salt and pepper - black, white, brown, gre grains

>63µm (Gew.%): < 63 um (Gew.%): 78.0% $CaCO_3$

(insoluble residue is dark, possibly contains M

Hpt. Bestd. Teile > 63µm.:

Neb. Bestd. Teile > 63µm.:

Hpt. Bestd. Teile < 63µm.:

Neb. Best. Teile < 63µm.:

H_2O-Gehalt (Gew.%):

Bemerkungen: Smear slides:
Forams are not fresh, micronodules on 60-70%, Fe-stain on 25%

315-500µ: 25% Lithic fragments (Mn micronodules + chips, palagonite phosphorite, other altered volcanic
25% broken forams
20% Globorotalia
15% Globogerina (sacculifer)
10% Pulleniatina
5% Globogerinella

125-200µ: (<10% with Fe-stain)
70% broken foram fragments
25% Lithic fragments (mostly Mn chips, also palagonit zeolite, smectite, other altered vol
5% Globogerinella + Globogerina
sharks TOOTH?

48 DK

Gesamtmenge: 235 kg
davon 30 kg Krusten

Substrat überwiegend aus Alkali-Olivin-Basalt bestehend, suffused(?)
mit iddingsitisierte Olivinen, stark alteriert
iddingsitized olivines, strongly altered
- Trachyt, alteriert
- Phosphorit massig, dendritisch, teils rein, teils mit vielen Einsprenglingen
- basaltische Brekzie phosphatisch, teils carbonatisch
- Mn-Krusten unterschiedlich dick, von 4-5 mm bis 4-5 cm, sowie dünne Kruste mit 1 Generation, dicke Kruste weise 2 Generationen auf, wobei das Dickenverhältnis gleich ist
alte Kruste - dicht, weist Phosphorit-Linse auf
junge Kruste - lagig, leicht porös
Oberfläche: knotig (0,5-1 cm) bedeckt mit 'white snow'

48 DK 1 50×40 cm basalt. Brekzie, phosphatisiert mit 3-4 cm Mn-Kruste, 2 Generation, beide gleichmächtig ausgebildet

48 DK 2 isolierte Mn-Kruste 4 cm 2 Generationen, beide gleichmächtig ausgebildet

48 DK 3 Alkali-Olivin-Basalt mit junger Krustengeneration 0,7 cm, flache knotige Oberfläche

48 DK 4 basaltische Breccie 30×20 cm, Hyaloklastit und AOB sowie Phosphorit Klasten, durchzogen mit Phosphorit, insgesamt stark alteriert
auflagernd 3-4 cm Mn-Kruste, 2 Wachstumsgenerationen, Oberfläche knotig

48 DK 5 Breccie mit trachytischen Bruchstücken, phoronit. zementiert, 4,5 cm Mn-Umkrustung mit 2 Krustengenerationen, knotige Krusten Oberfläche

48 DK 6 Prosphorit mit vielen Rh-Krusten-Bruchstücken (Größe 0,5 cm), mit 0,8 mm Kruste, nur 1-ge Generation) knotige Oberfläche

48 DK 7 Alkali-Olivin-Basalt, stark alteriert, idd. Olivine, aufl agernd 4 cm Rh-Kruste (2 cm junge und 2 cm alte Kruste, knotige Krustenoberfläche alte Kruste: dicht, Prosphorit imprägniert mit Phosphoritlinsen junge Kruste: lagig, porös mit Hydratationsrisse

48 DK 8 alterierter Tuffgesit? darüber Prosphoritlage mit eingelagerten basaltischen Bruchstücken, umkrustet mit Rh-Präzipitat, 2 Krustengenerationen wobei beide gleich mächtig ausgebildet sind (3 cm) gesamt)

48 DK 9 isolierte Rh-Krusten 3,5-4 cm mächtig, 2 Krustengenerationen, 2,5 cm die junge, Rest alte Kruste Oberfläche knotig

48 DK 10 Alkali-Olivin-Basalt, alteriert, überzogen mit Prosphorit und 3-4 cm Rh-Kruste

48 DK 11 Prosphorit mit haucharmer Rh-Kruste, Einlagerungen von AOB-, hyaloklast.-Bruchstücke -d älteres Krustengenerationsstücke (Klastengröße ~ 5 cm)

48 DK 12 verschiedenes Hyaloklast., AOB, mit ~0,8 cm Krus

Sample Description

Cruise I.D: SO 33

Sample I.D: Sta: 48 DK

Location: SP Lee Sur area

Size: _____ Weight: _____

Mn crust thickness:

Total: min: _____ max: _____ ave: _____

Inner crust: min: _____ max: _____ ave: _____

Outer crust: min: _____ max: _____ ave: _____

Surface texture: _____

Internal structure: _____

layered: _____
laminated: _____
massive: _____
porous: _____
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: _____

Description: _____

Mineralogy(XRD):

Analyses and subsamples:

analysis:	analyst:

48DK1

48DK2

Rock Type: Olivine basalt, massive flow → -do-, perhaps trap rock

Color: Light olive gray (5Y 5/2) to medium gray (N5) → -do-

Texture: microporphyritic, intergranular → -do-

Phenocrysts: Olivine ± 15%, ± 0.5 mm
Augite(?) ± 0.25 mm, ± 1%
Plagioclase(?) ± 1 mm, ± 2% → -do-

Groundmass: Plagioclase, Olivine, Clinopyroxene, Opaques. not determined → -do-

Vesicles: % : Varies greatly over short distance (± 10% avge) (some areas scoriaceous)
Size: extremely variable (± 0.10 mm – ± 5 mm) (± 0.35 mm avge)
Shape: very irregular (vuggy to spongy)
Filling: calcite & zeolites (linings) ≠ dense

Alteration: extensive: (smectitization, oxidation of olivine crystals, zeolitization of feldspars(?), carbonation) → -do-

Remarks: pebble to large cobble-size rounded to angular clasts set in volcanogenic breccia and also free, unconsolidated. Appears to be highly altered, phenocrysts are often skeletonized, with only a lacework of smectite or calcite remaining or massive hematite powder; zeolites(?) apparent in the groundmass and lining vesicles; appear to have been flow basalt. fractures lined with todorokite(?) and $Fe(OH)_3$? stains; serves as substrate for encrustation of Mn-Oxide (± 5 mm thick) on free faces → -do-

appear, from degree of rounding, to have been subjected to considerable transport by water (wave action?) prior to final deposition and cementation.

≠ because of density and evenness of distribution of components, may be thought of as having been a dike or trap rock

Sample Description

Cruise I.D: SO 33

Sample I.D: Sta: 48 DK

Location: Spiess area

Size: _____ Weight: _____

Mn crust thickness:

Total: min: _____ max: _____ ave: _____

Inner crust: min: _____ max: _____ ave: _____

Outer crust: min: _____ max: _____ ave: _____

Surface texture: _____

Internal structure: _____

layered: _____
laminated: _____
massive: _____
porous: _____
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: _____

Description: _____

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample No: [illegible] 3 | 48 DK 4 4

Rock Type: Olivine basalt, (Trap?) → do, amyg dabasal (flow?)

Color: Brownish-gray (5YR 3/1) → - do -

Texture: Phyric, intergranular → - do -

Phenocrysts: Olivine ± 20 %, ± 0.75 mm dia
Augite(?) ± 3 %, ± 0.50 mm dia
Plagioclase(?) ± 2 %, ± 0.50 mm dia
→ - do -

Groundmass: Plagioclase?
Clinopyroxene?
Olivine?
Opaques?
(not determined) → - do -, + glass (?)

Vesicles: %: absent (dense) ≠

Size: <1 mm — ± 5 mm dia (± 2 mm large), ± 10 %
Shape: round to oval, coalescing
Filling: Smectite (Greenish-yellow), (± 90 % of vesicles are filled

Alteration: Extensive-intense (oxidation, iddingsitization & smectitization of olivine; hydration → + Smectitization of glass? Zeolitization

Remarks: Subround to subangular pebble to cobble-size clasts both free (loose) and cemented in volcanogenic conglomerate; most pieces are cut by veinlets filled with smectites, zeolites, and these perhaps served as conduits for late-stage alterations; most pieces show advanced reworking by water-currents (wave-action?) prior to final deposition and cementation; free pieces (and some cemented pieces) serve as substrate for encrustation (± 1 mm thick) by ferromanganese oxide-hydroxide → ! - do - → - do - but very thick (± 40 mm) deposits found on this substrate

Note: samples 48 DK 1a, b & 2 a, b are very similar except vesicle content and kind and degree of alteration — may all be from the [illegible] but [illegible]

Sample Description

Cruise I.D: 5033 Sample I.D: Sta: 48 DK Location: SP. Lee surface

Size: _____ Weight: _____

Mn crust thickness:

Total: min: _____ max: _____ ave: _____

Inner crust: min: _____ max: _____ ave: _____

Outer crust: min: _____ max: _____ ave: _____

Surface texture: _____

Internal structure: _____

layered: _____
laminated: _____
massive: _____
porous: _____
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: _____

Description: _____

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

	5	6
Rock Type:	Volcanogenic Breccia	→ -do-
Color:	Moderate Brown (5YR 4/4)	→ Grayish-brown (5YR 3/2) to Moderate brown (5YR 4/4)
Texture:	Clastic	→ -do-
Matrix:	Olivine basalt rock fragments ±15%	→ ±60%
	" " glass fragments, ±15%	
	" " ash, ±60%	
Cement:	calcite, ±10%	→ open space between grains, cement ±10
		→ -do-, but probably ±25% calcite
Average grainsize:	extremely variable (±2mm avge)	±3mm, avge
range:	(silt size — large pebble-size)	(fine to coarse gravel size)
grain shape:	angular	angular
Sorting:	very poorly sorted	moderately sorted
porosity:	±80%	±20%
Permeability:	±80%	±20%
Alteration:	extensive — complete(?)	→ -do-
	(oxidation, hydration, smectitization, zeolitization, carbonation,	→ -do-
Remarks:	Cobble-to-boulder-size clasts dislodged from outcrop by dredge(?); rock gives appearance of various grade size components having been mixed, but not to homogeneity, before final deposition and lithification; angularity of the components suggests rapid deposition from high-energy environment with no further disturbance; highly altered (particularly oxidation) condition of rocks and cementation with calcite and zeolites suggests infiltration by hydrothermal fluids; serves as substrate for deposition of ferromanganese crust (<1mm thick)	→ -do-
		→ -do-, but better sorting and homogeneity of composition of matrix components suggests deposition without further disturbance except for infiltration by hydrothermal fluids
		→ -do-, but deposit is thicker (±2mm), knobby, wirty in form

Sample Description

Cruise I.D: S033

Sample I.D: Sta: A8 DK

Location: SP Lee Sea area

Size: _____ Weight: _____

Mn crust thickness:

Total: min: _____ max: _____ ave: _____

Inner crust: min: _____ max: _____ ave: _____

Outer crust: min: _____ max: _____ ave: _____

Surface texture: _____

Internal structure: _____

layered: _____
laminated: _____
massive: _____
porous: _____
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: _____

Description: _____

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

	7	8
Rock Type:	Volcanogenic Breccia	→ -do-
Color:	Dark yellowish-brown (10YR 4/2)	White (N9) (cement) to Dark gray (N3) (predominant color of matrix rocks)
Texture:	clastic	→ -do-
Matrix:	Volcanic rock clasts.	→ -do-
Cement:	phosphorite	calcareous ooze
Average grain size:	extremely variable (±2mm avge) range. (fine silt to large Pebble-size)	→ -do-
" grain shape:	subangular-subround	subrounded to angular
Sorting:	extremely poor	→ -do-
Porosity:	±15%	± 10%
Permeability:	±5%	± 5%
Alteration:	extensive (phosphorization of original calcareous ooze cement ← most other alteration prior to formation of breccia →	superficial (phosphorization(?) resolution reposition of calcite in cement?)
Remarks:	pebble-to-boulder-size clasts dislodged from outcrop by dredge. Original cement was apparently calcareous ooze (→ chalk) subsequently replaced by apatite, colored by $Fe(OH)_3$(?). The cement carries a large amount of fine volcanic detritus, very unevenly distributed throughout. rounding of most matrix constituents indicates a period of reworking by water currents (wave action?) prior to final deposition and cementation. a number of different rock types are represented in the matrix material indicating concentration of detritus from a (probably) large area over an extended period of time; fresher, less-altered chalk found in certain open spaces in the rock; serves as substrate for Mn-Oxide encrustation (± 1mm thick)	→ -do-, apparently post-dates #8 DK b, because angular pieces of its phosphorite cement are included as matrix material in this rock.

Sample Description

Cruise I.D: 5033

Sample I.D: Sta: 48 DK

Location: SPLee Cut area

Size: _____ Weight: _____

Mn crust thickness:

Total: min: _____ max: _____ ave: _____

Inner crust: min: _____ max: _____ ave: _____

Outer crust: min: _____ max: _____ ave: _____

Surface texture: _____

Internal structure: _____

layered: _____
laminated: _____
massive: _____
porous: _____
dendritic: _____
other: _____

Mineralogy (XRD): _____

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: _____

Description: _____

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample No.: 30 [illegible] Same as 48DK2

Rock Type: ~~Trachyte~~, vesicular

Color: Light olive gray (5Y 5/2)

Texture: Microphyric, intergranular, subtrachytic (approaching pegmatoid)

Phenocrysts: Sanidine(?), ±5%, ±0.50mm
Amphibole, ±3%, ±0.75mm

Groundmass: Sanidine(?), amphibole, opaques } not determined

Vesicles: %: ±10%
Size: ±0.50 mm
Shape: irregular, angular to rounded, almost diktytaxitic
Filling: zeolites(?) (lining only)
calcite(?)

Alteration: extensive(?) (zeolitization, smectitization, hydration) carbonation

Remarks: coarse gravel to pebble-size subangular clasts set in phosphorite-chalk cement, forming, along with several other igneous rock types, a volcanogenic breccia; both feldspar and amphibole euhedra found projecting into the cavities in the rock (pegmatoid texture(?)) cross-cut by fractures filled with calcite, dendritic Mn-oxide.

Interesting to see what kind of amphibole! where is it now.

Missing! 2-12-85

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Volcanogenic breccia
pale greenish-yellow (10Y 8/2)

Clastic

(Matrix): olivine basalt, tuff fragments } (not determ
" " glass fragments }

(Cement): phosphorite

(Avge grain size:) ±3mm

(" grain shape:) angular

(Sorting:) moderately poorly sorted

(porosity:) ±35%

(permeability:) ±30%

(Alteration:) complete; (zeolitization, smectitization, hydration, oxidation; phosphorization of calcareous cement)

(Remark) pebble to cobble-size clasts dislodged from outcrop by dredge. angular of grains and sorting indicate probable primary deposition from volcanic eruption, rapid cementation, alteration subsequent to primary induration; probably ascending hydrothermal fluids have altered most every to zeolites and smectite; serves as substr. for encrustation by ferromanganese oxi (±2 cm thick, knobby, warty surface)