DATE: 31 July - 1 August SAMPLE:
CRUISE ID: SO 33 3DK Box dredge
LOC: I
AREA: A (Cross Seamount)

	time (GMT)	LAT (N)	LON (W)	water depth (m)	wire out
ON BOTTOM =	0045	18°38.2150	158°18.7701	2002	3301
(uncorrected) OFF BOTTOM =	0241	18°38.7466	158°18.5422	1663	2689
Mean dredge data (corrected):		18°38'03"	158°18'56"	2140 (1170 fm)	

RECOVERY WEIGHT = Total 400 kg Crust 40 kg

CRUST THICKNESS = Veneer to 4 cm
Avg = 1 cm
Small nodules + polynodules (1-4 cm)

SUBSTRATE = trachyte cobbles 40 cm to 2 cm
and boulders

COMMENTS:

* 1 microbio sample
* 1 bio sample (in plastic box)
* 2 bio sample

3DK

P R O T O K O L L D R E D G E

SAMPLE

Schiff	Fahrt-Nr.	Stat.-Nr.	Gerät	Lok.	Areal
S O	33	3	DK	1	A

Datum: 31.07. 1984 to 32.07. 1984 GMT Protokoll: Halbach, Commeau

	Zeit	N	W	Tiefe	Seil (m)	Seilzug (t)
Beginn Operation	2325	18°37.754	158°18.988	2463	0	1.0
Beginn Fieren	2330	18°37.757	158°19.004	2498	0	1.0
1. Bodenkontakt	0045	18°38.210	158°18.548	1966	3301	2.1
Ende Bodenkont.	0301	18°38.754	158°18.601	1506	1760	4.0
Hieven	0241	18°38.665	158°17.878	1650	2689	4.0
2. Bodenkontakt						
Ende Bodenkont.						
Hieven						
3. Bodenkontakt						
Ende Bodenkont.						
Beginn Hieven						
Ende Hieven					0	
Ende Operation	0341	18°38.610	158°18.678	1528	0	

Kurs Schiff: 42.96 ° Geschwindigkeit Schiff: ~~1-1.5~~ .5-1 kts

Ge samtzeit am Boden: 2 hr 1 min Länge des Dredgezuges: 1.02 Km

Bodentopographie: Total amount of sample 400 Kg 10% Mang. Crusts

Ergebnis:

Knollen Kg
Krusten
Basalt
Sediment
Sonstiges (Bims, Org. u.a.)

Echogramm:
Seil Ø : 18mm
Winde: Fishery
Fotos:

Weitere Bemerkungen siehe Anlageprotokoll

Pinger on wire 500m above dredge

Time GMT	Tension (t)
0058	4.25
0108	7.0
0112	8.0
0138	4.0
0158	6.0 t
0214	7.0

Dredge fast free

Time GMT	Tension (t)
0230	6.0
0239	6.0
0240	6.7
0245	9.0

3DK

(over)

Manganese coated Rocks (trachyte) 40 cm to
Small nodules and polynodules (1-4 cm) ~2 cm

3 DK

Gesamtmenge: 400 kg

überwiegend trachytisches Substrat, etwas stärker alteriert als 2DK (grünlich grau), rauer dünne Fe-Kruste

einzelne Stücke weisen dickere Fe-Kruste auf, bis 4 cm mächtig

meistens ist die Kruste auf exponierten Stellen auf dem Substrat aufgewachsen (meistens große Bruchstücke), fast alle total umkrustet

3DK 1 50 × 50 cm groß, Trachyt, 4 cm dicke, glatte Kruste
3DK 2 isolierte Fe-Kruste 2-3 cm dick, massig
3DK 3 trachytische Breccie mit Apatit umkrustet, zementiert mit Apatit und Fe-hydroxid, überkrustet mit 4 cm Kruste, winkelmäßig ausgebildet. Oberfläche knubbelig gewachsen
3DK 4 massiver Trachyt, überzogen mit unterschiedlicher dicker Fe-Kruste (0,5-3 cm), knotige Oberfläche
3DK 5 massiger Trachyt, einseitig mit massiger Kruste überzogen (3-4 cm dick), unterseite rauer dünne Fe-Kruste überzogen, Oberfläche knotig
3DK 6 Trachyt mit große Biotit (0,5 cm) und Hornblende (0,5 cm) Kristalle, rauer dünne Fe-Kruste
3DK 7 15 × 15 cm großes Bruchstück - Trachyt - Fließgefüge

- Krustenoberfläche knotig, scheint korrodiert zu sein

ca. 10 kg Kruste

3

Sample Description

Cruise I.D: So 33

Sample I.D: Sta: DK 3

Location: Cross Sm

158°18'56"W
18° 38'03"N
(-) 2140 m.

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:

	3DK1	3DK2 trackyte, breccia
Rock Type:	Trackyte, massive	[illegible], breccia
Color:	medium gray (N5) to pale olive (10Y 6/2) to grayish-orange pink (5YR 7/2) to very pale blue (5B 7/2)	medium gray (N5
Texture:	intersertal to pilotaxitic subaphyric to porphyritic	intersertal, subaphyric,
Phenocrysts:	Biotite, — ~1% — 20%, 0.5-3mm hornblende — <1% — 2%, 1-2mm Oxyhornblene — <1% — 2%, 1-2mm Plagioclase? — <1% — 5%, 1-8mm Sanidine? — <1% 2%, 1-3mm	Biotite — ~1%, ~2mm Fayalite(?) <1-1%, ~1mm hornblende <1%, ~1mm Oxyhornblende <1%, ~1mm plagioclase? <1%, ~1.5mm Sanidine(?) <1%, ~1mm
Groundmass:	tabular feldspar, ferromagnesians, ~99 — 69%, ore 1-29%, 0.25mm — 0.50mm	tabular feldspar, ferromagnesi. ~85-95%, ore — ~1-2%, ~0.10 — 0.25mm, Glass — 15-3%
Vesicles:	absent to ~7%	absent
Size:	~1mm — ~15mm	
filling:	none — absent	
shape:	elongate elliptical	
Clasts:	———	Subangular — subrounded ~1 — 4 cm dia.
Remarks:	subangular clasts generally coated with δ-MnO_2(?) ~ 1 cm avge (max 5-7 cm) smooth, finely granulose surface texture, sometimes current scoured or polished flat; alteration varies considerably but has progressed in all cases to a marked state — most glass in the matrix appears to be altered to smectites, in some cases to a decidedly greenish phase (nontronite?); evidence of perhaps several flow units as the textures, phenocryst abundances and ratios, and degree and type of alteration vary distinctly; contact with MnO_2 coatings generally sharp — no glassy rinds noted; — MnO_2 often appears as spots along fractures in the rock; phosphorite sporadically interlayered with δ-MnO_2 on some surfaces; also sporadically abundant chalk deposits on some surfaces	rock seems fresher than in the larger uncemented clasts; the breccia, composed of coarse gravel to pebble-size trachyte pieces, is cemented quite well with phosphorite chalk, smectite more or less; coated with (often) very thick (up to 40mm) laminated deposits of δ-MnO_2 (?)

Sample Description

Cruise I.D: S033

Sample I.D: Sta: 3.DK

Location: Cox Seat
158°18'56" W
18°38'03" N
(-) 2140 m.

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:

3DK3	3DK4	3DK5	3DK6	3DK7
Rock Type: Chalk ≠	Phosphorite	Ferromanganese Crusts w/o Substratum	Ferromanganese nodules	Trachyte Brec
Color: White (N9) ≠	Dark yellowish-brown (10YR 4/2)	≠ Brownish-black (5YR 2/1)	→ -do-	≠ like colors 3DK1
Texture: granular-clastic →	-do-	≠ (surface) rough, cuspate	(surface) finely nodose, granular	≠
Matrix: foraminiferal tests - ± 85% ± 0.5mm	→ -do-, ± 5%, ± 0.5mm			
trachyte frags - ± 5%, ± 1mm	→ do, ± 20%, ± 2mm			
biotite flakes - < 1%, ± 0.5mm	→ do, < 1%, ± 0.5mm	≠	≠	→ trachyte frags, ± 75%, ± 3
feldspar frags - < 1%, ± 0.5mm	→ do, < 1%, ± 0.5mm			→ -do-
	phosphorite frags, ± 5%			
Cement: Calcite (re-xld), Phosphorite(?) } ± 10% ≠	→ -do- { Phosphorite, calcite(?) } ± 75%	≠	≠	→ similar to 3DK but ± 25%
Avge grain size: ± 0.20 mm (range: ± 0.001 — ± 1mm) ≠	± 0.01 mm (< 0.001 — 8 mm)			→ exactly similar to 3DK3
" grain shape: rounded - angular ≠	subangular - subrounded			→ -do-
Sorting: moderately well sorted ≠	very poorly - sorted			→ -do-
Porosity: ± 50% ≠	± 10%			→ -do-
Permeability: ± 40% ≠	± 5%			→ -do-
Alteration: superficial (recrypt. of calcite incipient phosphorz(?)) ≠	Intense (smectitization, zeolitization, oxidation, hydration of volcanogenic components, ± total phosphorization of carbonate component)			→ -do-
Remarks: subrounded pebble-size clasts of rather well-indurated chalk ≠	-do-, but cobble-size (phosphorite)	loose frags. of thick ferromanganese crust, showing two generations, both with fairly low porosity, fairly well indurated and compressed, usually separated by thin (± 1mm) layer of yellowish phosphorite. considerable evidence of dendritic growth in upper crust; varies greatly in thickness, but total crust usually ± 1 - ± 5cm thick.	Similar, but formed around (completely enclosing) trachyte fragments (pebbles); may simply represent uppermost exposed surface of trachyte breccia, loosened by tectonism	Similar to 3DK (+trachyte) 3DK1 = matrix 3DK3 = cement & to 3DK
composed of (mostly) foraminiferal tests admixed with volcanogenic components; do not appear to have been dislodged from outcrop by dredge because of the general roundness of the clasts and the general soot-like coating of (1) $Fe(OH)_3$(?) followed by (2) black α-MnO_2(?) (partially removed by abrasion in the dredge(?)) much of the chalk is cavernous due to worm(?) burrows (± 3mm dia) developed ∥ to bedding(?) (this is the case in piece #3C, which retains an original Mn-coated upper exposed surface)	-do-, but appears to be a fragment of trachyte hyaloclastite/breccia (lowest bed) (thoroughly altered to nontronite & zeolites) grading upward into tuffaceous chalk (completely phosphorized) and phosphorized chalk coated (all over clast) with thin veneer of α-MnO_2(?) - fairly-well-bedded - nice cross-section			appears that h trachyte clasts (generally very angular) have been incorporate into foraminifera calcareous ooze which has indur to chalk like 3D the cement in t rock type is mu more abundant t in 3DK2, which has largely smec and zeolites(?) for cementing material.