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 o
ON BOTTOM =	0045	18°38.2150	158°18.7701	2002	3301
OFF BOTTOM =	0241	18°38.7466	158°18.5422	1663	2689

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

	SO33 3DK1	SO33 3DK2
Rock Type:	Trachyte, massive	breccia
Color:	medium gray (N5) to pale olive (10YL/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 oxyhornblende — <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, ferromagnesian ~85 - 75%, 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(?) in 1 cm avge (max 5-7cm) smooth, finely granulose surface texture, sometimes corrugated 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 intergrown 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 (?)

Intergrown with δ-MnO_2 on some surfaces; also sporadically abundant chalk deposits on some surfaces

SO33 3DK3	SO33 3DK4	SO33 3DK5	SO33 3DK6	SO33 3DK7
Rock Type: Chalk ≠	Phosphorite	Ferromanganese Crusts w/o Substratum	Ferromanganese nodules	Trachyte Breccia
Color: White (N9) ≠	Dark yellowish-brown (10YR 4/2)	Brownish-black (5YR 2/1)	→ -do-	like colors in 3DK1
Texture: granular-clastic →	-do-	(surface) rough cuspate	(surface) finely nodose, granular	
Matrix: foraminifeal tests - ± 85%, ± 0.5mm →	do, ± 5%, ± 0.5mm			
trachyte frags - ± 5%, ± 1mm →	do, ± 20%, ± 2mm			trachyte frags, ± 75%, ± 3cm d.
biotite flakes - < 1%, ± 0.5mm →	do, < 1%, ± 0.5mm			-do-
feldspar frags - < 1%, ± 0.5mm →	do, < 1%, ± 0.5mm			
	phosphorite frags, ± 5%			
Cement: Calcite (re-xld), Phosphorite(?) } ± 10% ≠ →	-do- { Phosphorite, calcite(?) } ± 75%			Similar to 3DK2, but ± 25%
Avge grain size: ± 0.20 mm (range: ± 0.001 — ± 1mm) ≠	± 0.01 mm (< 0.001 — 8mm)			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 frag's. 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 3DK2 (+trachyte) (3DK1 = matrix m... 3DK3 = cement & to 3DK3)
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 here trachyte clasts (generally very angular) have been incorporated into foraminiferal calcareous ooze which has indurated to chalk like 3DK... the cement in this rock type is much more abundant than in 3DK2, which has largely smectite and zeolites(?) for cementing material.

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° 18.568	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 16 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

Magnanese coated rocks (trachyte) 40 cm to