PROTOCOL DREDGE 57

Cruise No. SO 37	Stat. No. Equipm. 40 ~~DK~~ DS	Location IV	Area E
Date 29.5. 1985	Protocol written by : Sattler, Schwab		

bis 30.5. 1985
Pinger on wire 300 m from dredge

	Time GMT	Latit. N	Longit. W	Water depth	Wire length	Tension (t)	Remarks
begin operation	2041	15°37.99	169°06.26	3385	—	—	über die Seite gedredgt
begin lowering	2045	15°38.00	169°06.23	3399	—	—	
+1. bottom contact	2146	15°39.03	169°04.80	3443	3402	3.5	A MAP OF THE DREDGE SITE IS NOT AVAILABLE BECAUSE THE "NEAKY" AMERICANS MAY PHOTOGRAPH IT
SHIP TURNING FROM 090 TO 190	2154	15°38.96	169°04.98	3446	3712	3.5	
SHIP TURNING TO 221	2210	15°38.76'	169°04.98	3395	3746	3.8	
	2241	15°38.38	169°05.37	2932	3896	4.2	EVEN I CAN UNDERSTAND SOME GERMAN
	2242	15°38.36'	169°05.39	2897	3896	4.4	
	2244	15°38.35	169°05.41'	2864	3896	5.4	BILL SCHWAB
	~~2248~~	~~15°38.36~~	~~169°05.47~~	2842	3896	4.7	
	2250	15°38.28	169°05.51	2864	3896	4.5	
STOP SHIP	2255	15°38.22	169°05.50	2780	3896	4.0	
	2305	15°38.19	169°05.71	2666	3776	5.7	
	2315	15°38.211	169°05.778	2577	3543	4.5	
	2322	15°38.31'	169°05.85	2534	3360	4.5	
	2325	15°38.39	169°5.86'	2490	3307	5.5	
	2326	"	"	2487	3296	6.2	
	2326	"	"	"	3282	5.0	
	2327	15°38.39	169°5.87	2493	3269	8.9	
	2328	"	"	2488	"	7.8	
	2330	15°38.45	169°05.88'	2488	3183	7.4	
	2332	15°38.49	169°05.89	2526(?)	3137	7.4	
OFF BOTTOM?	2340	15°38.46	169°05.89	2479	2918	[illegible]	
begin heaving	2300	15°38.21	169°05.63	2475	3010	4.0	
end heaving	0047	15°38.98	169°05.72	2602	—	—	
end operation	0052	15°39.00	169°05.71	2577	—	—	

+Corrected data 15° 40.51'N 169° 7.42'W

ship course 210° calcul. mean water depth.....m
total time of bottom contact 120 min ship velocity 0.5-1.0 kts
bottom topography rel. steiler Hang length of dredge section .....m

Result
35 kg Total
....kg Nodules
33 kg Substrate
....kg Sediment

30 37 40 DS

Pinger on wire 300 m from dredge

	Time (GMT)	Lat N	Lon W	Water Depth	Wire Length	Tension
Begin operation:	20:41	15°37'.99"	169°06'26"	3385	—	—
Begin lowering:	20:45	15°38'.00	169°06'23"	3399	—	—
+ bottom Contact:	21:46	15°39'03"	169°04'80"	3443	3702	3.5
Begin heaving:	23:00	15°38'21"	169°05'63"	2475	3010	4.0
End heaving:	0047	15°38'98"	169°05'72"	2602	—	—
End operation:	0052	15°39'00"	169°05'71"	2577	—	—

Ship course: 210°

total time of bottom contact 70 min ship Veloc 0.5 - 1.0 kts

35 kg. total dredge wt

~2 kg. crust

-33 kg Substrate

+95% Crust coverage

.00% talus

one generation - densely dendritic

surface topography: subdued botryoidal to smoothly nodose

Thickest Crust - 1.5 cm

thinnest Crust - 1 mm

} avge: ~1.0 cm

encrusting organisms: none

photos: ?

Substrates: AoB

AoB Hyaloclastite

AoB Volcanogenic Breccia

ock Type: Alkali Olivine Basalt	→ -do-	→ -do-
olor: Medium light gray (N6)	→ -do-	≠ → Medium dark gray (N4) (brownish)
ex..re: Intergranular	→ -do-	→ -do-
enocrysts: -Absent-	→ -do-	→ -do-
roundmass: Plagioclase ± 18%, Pyroxene ± 18%, (iddingsite) olivine ± 10%, Opaques ± 3%	→ -do-	→ -do-, but PC > PX >> OL
vesicles: ± 50% round, coalescing, ± 1mm dia empty (the lava is scoriaceous)	≠ → ± 10% fusiform, ± 5mm dia, up to sev. cm long, lined w/ phillipsite druses	≠ → extremely variable w/ location; → very irregular, elongate (large) to round (sm.); → -do-
lteration: slight - moderate (iddingsitization of olivine), palagonitization of chilled rind(?)	→ -do-, but no palagonite	→ -do-, seems more altered (smectitization?)
emarks: apparently, our sample is a wedge of pillow lava, occurring as a large pebble-size talus clast; apparently once completely encrusted with a patina of (1) white, crumbly phosphorized foram(?) chalk(?) dendritic ferromanganese oxide, now largely removed by abrasion(?); sample bears a nice cm-thick scoriaceous palagonite (from which hyaloclastite may have derived?) rind; the lava is apparently aphyric, but rhombic iddingsite and shiny black augite(?) grains, and tabular PC visible w/ handlens.	-do-, (?) has tubular vesicles like pillow lava, but these may simply be related to flow texture. Our samples are cobble-size, subrounded clasts with adhering AOB hyaloclastite and may be xenoliths contained in such deposit; probably represent interior fragments of the parent pillow lava which generated the hyaloclastite as these seem compositionally related.	→ -do-; Same patina of phosphorite $Fe(OH)_3$(?) / $Mn(O,OH)$(?) as in 40 DS 1 & 2; -do-; grain size here is considerably smaller - olivine content seems less

= Nice fresh basalt in abundance! →

all looks about the same composition, but radically different textural and habitual modes — may all be different — study in T.S. to confirm.

Rock Type: Alkali Olivine/Pyroxene Basalt → -do- → AOB Hyaloclastite

Color: Dark Gray (N3) (fresh) to moderate yellowish-brown (10YR 5/4) (altered) → -do- → light to dark yellowish-orange (10YR 7/6 - 10YR 6/6)

Texture: Intergranular → -do- → Pyroclastic

Phenocrysts: Olivine ± 1%, ≤ 2 mm dia; Pyroxene < 1%, ≤ 1 mm dia; Plagioclase < 1%, ≤ 2 mm dia → (glomeroporphyritic with olivine) -do-, but Olivine = 15%, ± 4 mm dia; Pyroxene = 15%, ± 3 mm dia; (no plagioclase seen)

(Framework Grains): AOB hyaloclasts, ± 53%; Open space, ± 10%, ± 2 mm

Groundmass: Olivine, Pyroxene, Plagioclase, Opaques (not determined) → -do-, but Olivine = ± 10%, ± 0.25 mm; Pyroxene = ± 10%, ± 0.20 mm; Plagioclase = ± 10%, ± 0.20 mm; Opaques = ± 10%, ± 0.10 mm

(Cement): Phillipsite, ± 15%; Montmorillonite, ± 15%; Tobermorite(?), ± 5%; *Rel fibrous min., ± 1%; Goethite(?) ± 1%

(Average grain size): extremely variable (range: ≤ 0.20 mm - 3 cm)

Vesicles: -absent- (dense) → ± 20%, round, ± 5 mm dia, usually amygdales of calcite & phillipsite

(Average grain Shape): subangular (many are angular, many are subrounded)

(Sorting:) Extremely poor

(Porosity): extremely high

(Permeability): high

Alteration: Extensive - Penultimate (Oxidation, zeolitization, smectitization) → extensive (iddingsitization, smectitizating, carbonation of olivines, smectitization, zeolitization of feldspars in particularly altered zones) → Similar, but carbonation is not represented. Neither are megascopic replacements of plagioclase, or analcite.

Marks: our sample is a cobble like body, rounded, with a sinuous harmonic swell-and-swale topography: perhaps this piece was a pillow lava bud, as the mesostasis is very dense, displays a distinct flow structure, is extensively fractured and veined with phillipsite(?) and contains a single, vug-like cavity at its center; contains patches here and there of fairly unaltered material; most material is almost completely altered; was once completely encrusted with phosphorite // $Fe(OH)_3$(?) / MnO(OH) patina, now mostly removed by abrasion.

Our sample is a fragment of what perhaps was once a rounded small boulder (slope talus?), was completely encrusted with a ± 1 cm-thick layer of dense-to-open, dendritic (internal) one generation, Fe-rich, finely nodular and smooth superotopography ferromanganese oxide; the substrate basalt is rather coarsely-crystalline, as if from a flow interior, with an abundance of pyroxene (augite?) and olivine phenocrysts and glomerocrysts (completely iddingsitized or hydrothermally altered (locally) to saponite/montmorillonite(?) and calcite

our sample came from a large boulder (outcrop?) encrusted w/ dendritic (internal) botryoidal (external), $Fe(OH)_3$(?)-rich, ± 5 mm-thick ferromanganese oxide; the hyaloclasts display extreme variability in size, shape, composition, completely unsorted; much open space is present and this is lined with (1) montmorillonite (2) phillipsite (3) tobermorite (4) unidentified red mineral which resembles chalcotrichite (5) goethite in successive layers. The chalcotrichite-like phase occurs most frequently as formless lumps associated w/ MnO vug deposits

* See asterisks on previous page

ock Type: AOB Hyaloclastite (Ankaramite?)	AOB Volcanogenic Breccia	-do-
olor: Moderate yellowish-orange (10YR 5/4) (Grains) to Pale yellowish-orange (10YR 8/6) (Cement)	Pale yellowish-brown (10YR 7/2) to grayish-orange (10YR 7/2) (Grains) to very pale orange (10YR 8/2) (Cement)	moderate Brown (5YR 4/4) to Light Brown (5YR 5/6) (Grains) to medium light gray (N6) (Cement)
exture: pyroclastic	-do-	
ramework Grains: Ankaramite(?) Hyaloclasts, ±35%	AOB(?) pillow/ava rind clasts, ±5mm, ±65%; AOB Hyaloclasts, ±10%, ±3mm; AOB volcani clasts, ±10%, ±2cm	-do-, ±5%, ±10 mm; ±20%, ±5 mm dia.; ±50%, ±2 cm
ement: Phosphorite, ±45%	-do-, ±15%	-do-; but ±25%
verage grain size: ±2mm	(enormous range - undetermined)	-do!-
range: 0.25 mm – 5mm)	(range: ≤1mm – 2 cm)	(range: ±1mm – 6 cm)
verage grain shape: subangular	angular	angular, but many range to subroun
orting: poor	very poor	extremely poor
orosity: high	-do-	-do-
ermeability: moderately low	-do-	-do-
l' ation: Penultimate (smectitization, zeolitization, Oxidation of matrix, phosphorization of cement; pyroxenes probably superficially-partially altered)	extensive	-do-
	-do- but much less in matrix; same as 40DS7 in cement	-do-
emarks: our sample is a tabular, subangular, large pebble which was once encrusted with a patina of dendritic ferromanganese oxide, now extensively removed by abrasion(?); quite different from 40 DS 6, especially in that the hyaloclasts display abundant, fairly unaltered pyroxene grains (perhaps 40 DS 7 represents hyaloclastite derived from 40 DS 4 lithology	Our sample is a large cobble-size subrounded talus clast which was once differentially encrusted (thicker upper[?] surface with ferromanganese oxide similar to that described from the previous lithologies of 40 DS; it is composed of basalt/palagonite hyaloclastite fragments (gradational) of material which seems most like lithology 40 DS 2 cemented with dense, porcellanous phosphorite.	l. pebble-size; patina encrustation; -do- but varying mostly in proportions of component grain size distribution, and cement; perhaps this is the same lithology as 40 DS 8