DATE: 11 August 1984 SAMPLE:
CRUISE ID: SO 33 30 DK box dredge
LOC: IV
AREA: C

	time (GMT)	LAT (N)	LON (W)	water depth (m)	wire
ON BOTTOM =	0930	6°16.4220	162°53.1702	2217	292
OFF BOTTOM =	1053	6°16.9367	162°52.9532	1388	138
Mean dredge data (corrected):		6° 16' 19"	162° 52' 57"	2045 (1118 fm)	

RECOVERY WEIGHT = Total 30 kg Crusts <1 kg

CRUST THICKNESS = 0-.5 cm
Avg = veneer
1 generation

SUBSTRATE = Breccia, basalt, trachyte

COMMENTS:

* 1 bio sample
* smear slides made of sediment

30 DK

*** Petrographische Daten Sediment

RV Sonne So 33 Midpac II 29.7 - 29.8.1984

Datum: 11.08.84 Areal: C Lokation: IV Station: 30 DK

Probennummer: 30 DK Sediment

Längengrad, nk: Lat = 6°17.375 - 6°16.908 N k: 6°16,422

Breitengrad, nk: Lon = 162° 54.105 - 162° 53.07 W k: - 162° 53,17

Wassertiefe (m): 2231 - 1387 Bereich (m):

Typ: white foraminiferal ooze with brown and black pebbles Farbe: white sediment (brown pebb

>63µm (Gew.%): <63 um (Gew.%): 56.4% $CaCO_3$

Hpt. Bestd. Teile >63µm.:

Neb. Bestd. Teile >63µm.:

Hpt. Bestd. Teile <63µm.:

Neb. Best. Teile <63µm.:

H_2O-Gehalt (Gew.%):

Bemerkungen: Smear slides:

315-500µ: (<10% with Fe-stain)
30% Pulleniatina
30% Globogerina (sacculifer)
25% Globogerinella (siphonifera)
10% Broken foram fragments
5% Lithic fragments ± micronodule, zeolites, clays, fresh glass

125-200µ: (10% forams with Fe-stain)
50% Lithic fragments - fresh glass, zeolites, Mn chips, altered volcani
25% Globogerinella
15% Broken foram fragments
10% Globigerina
1% Dorothia + corroded Diatom

30 DK

Gesamtmenge: 200 kg
1% Krusten
5% Sediment
Rest basaltisches Material, basalt. Breccie
(Rest)

Basaltisches Substrat, stark brekziiert (strongly brecciated), carbonatisch zementiert
zeolithisiert, oder stark (strongly) alteriert (altered), montmorillonitisiert

Basaltflow Stücke 50 × 20 cm - Zopfstruktur

hauchdünne Mn-Kruste, dicht, feinstenospig

30 DK 1 Basaltflow Stück, dünne Mn-Kruste

30 DK 2 Basaltflow -" , schwarze Mn-Umkrustung

30 DK 3 "

30 DK 4 umgelagerter Nontronit, speckstein ähnlich (bacon-stone?)

30 DK 5 Hyaloklastit oder (or rather) basalt. Breccie, carbonatisch zementiert, auf Klüften Nontronit und Zeolith, hauchdünne Mn-Kruste

Sample Description

Cruise I.D: S033

Sample I.D: Sta: 30 DK

Location: "Bo do" Su

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]	[illegible]
Color: Olive Black (5Y 2/1)	Dark Gray (N 3)
Rock Type: Olivine Basalt (AOB?)	Olivine - Plagioclase Basalt
Texture: Phyric; subtrachytic, intersertal - intergranular(?)	Micro Phyric; subtrachytic intersertal - intergranular
Phenocrysts: Olivine ± 7%, ± 3 mm dia (mostly single euhedra, some glomerocrysts)	Olivine, ± 5 %, ± 1 mm Plagioclase, ± 5, ± 0.50 mm (acicular) (single euhedra)
Groundmass: Plagioclase - Clinopyroxene, Olivine, glass ?, opaques — not determined (average size ± 0.25 mm)	- do - avge grain size ± 0.10 mm
Vesicles: absent (dense)	extremely variable in size, shape, distribution; generally flattened irregular, directed with the flow of the basalt, usually lined with zeolites, smectites
Alteration: superficial - moderate (smectitization, iddingsitization, hydration, carbonation, oxidation) most of the olivine pxts are altered to pale green chlorophaeite and calcite; a large number are iddingsitized as well, often concommitent with chlorophaeite; a few are still largely unaltered (or merely oxidized) olivine; interstitial glass(?) may be altered partly to smectite.	moderate - extensive (smectitization, zeolitization, oxidation, hydration, iddingsitization) all olivine is converted to iddingsite or (more rarely) chlorophaeite; oxidation extensive along fractures, and as weathering inward ± 5 mm from exposed surfaces
Remarks: bears a strong resemblance to AOB II in DK 33 - perhaps from [illegible] → same flow, different locus; occurrence here is as ± cobble size angular fragments from an extremely poorly-sorted volcanogenic breccia; traces of which still adhere to surfaces of fragments. (perhaps a dike rock ?)	Large boulder of flow basalt recovered in dredge, served as substrate for deposition of thin (± 1 mm) deposit of Mn-oxide on exposed surfaces; $Fe(OH)_3$(?) staining into substrate from ferromanganese deposit ± 5 mm

Sample Description

Cruise I.D: S033

Sample I.D: Sta: 30 DK

Location: "Boda" Smt

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:

	3	4
Rock Type:	Olivine Basalt (AOB?) (pillow lava)	– do – – do ? –
Color:	(fresh break) olive gray (5Y 4/1)	medium Grayish-brown (5YR 4/2)
Texture:	Phyric, varcolitic	intersertal
Phenocrysts:	olivine, ±5%, ±1mm dia. (single euhedra)	olivine, ±5%, wide range of crystal size, ±3 mm dia. (large glomerocrysts, small single euhedra)
Groundmass:	glass, olivine } (not determined)	plagioclase, olivine, clinopyroxene, glass, opaques } not determined
Vesicles:	absent	(iddingsitized olivine pits weather out on exposed surfaces to resemble vesicles
Alteration:	extensive (smectitization, palagonitization, oxidation, hydration, zeolitization(?)) Olivine crystals are converted completely to smectite, glass is partially palagonitized, though oddly, much fresh glass remains, groundmass glass probably totally devitrified	moderate – extensive (iddingsitization, oxidation) all olivine phenocrysts are completely iddingsitized
Remarks:	large, rounded pebble-size clasts (pillow fragments) with chilled margins up to 1 cm thick; oddly, in one specimen, zone of palagonitization is in the center of the chilled margin and is not continuous; thin Mn-Oxide crusts (<1mm) on sides ⊥ to chilled glassy margins of the pillow fragments.	large cobble-sized, subrounded clasts, (free?; uncemented in breccia); may be a pillow lava fragment, but grain size is remarkably uniform (dike-rock?) thin, soot-like coating of Mn-ox on exposed surfaces

Sample Description

Cruise I.D: 5033

Sample I.D: Sta: 30 DK

Location: "Bob's Seat"

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 50 55 50 DR 5 5 6

Rock Type Olivine Basalt (~~Tholeiitic?~~) → -do-, but probably AOB

Color: Medium gray (N5) (brown tinge) → -do-, but no brownish tinge

Texture: Phyric intergranular → -do-, but perhaps intergranular

Phenocrysts: Olivine ±15%, ±3 mm (avge) (Glomerocrysts & single euhedra) → ±25% (olivine)
Plagioclase ±20% (short, stubby euhedra) 0.5 mm dia

Groundmass: Plagioclase, clinopyroxene, olivine, glass (?), opaques (not determined) → -do-
→ (more?)
→ (more?)

Vesicles: %: ±10% (loss of smectite/iddingsite after olivine in surface weathering give appearance of more vesicles than really are) ≠ -dense-
Shape: irregular
Size: ±5 mm dia
Filling: ± empty (some smectite/zeolite mixture)

Alteration: moderate (smectitization, iddingsitization, oxidation, hydration, zeolitization?) → moderate/extensive (smectitization, iddingsitization, oxidation, hydration)
Olivine (pots & groundmass) completely altered to mustard yellow smectite and iddingsite (combination, usually) → -do-, but more iddingsitized

Remarks: subrounded cobble-sized clasts (free? - from being cemented in a breccia?) appear to have been erupted subaerially and reworked by water currents (wave action?) also subaerially; no Mn-Oxide deposits on exterior; no cross-cutting veins of mineralization. → subangular - subrounded cobble-size clasts displaying extreme variation in phenocryst size and distribution (dike rock?); does not have Mn-Oxide coating → -do-

Cruise I.D: SO 33

Sample Description

Sample I.D: Sta: 30 DK

Location: "Bodo" Sm

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: basalt, massive (tholeiitic?) → do — Hawaiian Trap?

Color: dark brownish-gray (5YR 3/1) Dark gray (N3)

Texture: Aphyric, intergranular-intersertal? Subaphyric intergranular

Phenocrysts – extremely rare Olivine Olivine, ±1% ± 1mm dia
Augite? ≪1% ± 1mm dia.
(glomeroporphyric to single euhedra)

Groundmass: Plagioclase → An 42
Clinopyroxene → Augite for (N1) Ski to (N1)
Olivine → Olivine Pxt (N1) → do —
Olivine
glass?
Opaques } not determined

Glass, unalt
Glass, alt
Magnetite
Ilmenite?

Andesine	24	24%
Augite	35	35%
Olivine, fld	51	5%
Olivine, alt	27	3%
Glass, unalt	21	2%
Glass, alt	15	2%
Magnetite	47	5%
Ilmenite	52	5%
	100	101%

Vesicles: absent (dense) → do — (confirm)

Alteration: moderate (infiltration by fluids along fractures has produced oxidation, hydration, smectitization, zeolitization?; rare olivine pxts altered to yellow-green chlorophaeite

superficial – moderate (iddingsitization of olivine) (confirm)
perhaps smectitization of glass)

Remarks: very cobble-size angular–subangular clasts displaying weathered surfaces (exposed); texture and orientation very uniform (dike rock?); abundant augite? crystals slightly larger than average grain size of the components visible with hand lens; exposed surfaces coated with thin (<1 mm thick) layer of Mn oxide; no residual volcanic breccia cement on exterior. ≠ → do — (confirm)

Curious sheet-jointing of rock, develops rhomboid clasts

≠ → do —

Augite is neutral, zoned, often displaying octagonal sections, [illegible]

Glass is colorless fresh in groundmass interstitial pools, brown in color otherwise altered to brown palagonitic

Andesine is short stout but generally > 2X longer than augite, twinning is generally simple Carlsbad-albite-types, zoned

Magnetite is generally elongate rhombic in shape, often lying // to andesine laths or augite grains, sometimes cubic

Ilmenite? is similar to Mgt in habit, but is even longer on edgewise sections, tends to have hexagonal platy form on basal sections sometimes subophitically intergrown with augite.

Olivine is rare, [illegible] to yellow, interstitial to andesine and augite, euhedral, hexagonal to rhombic in section, usually altered to dark brown iddingsite (probably an Fe-rich olivine) (some is zoned, with apparently more Fe-rich material as rinds on Fe-rich cores)

Sample Description

Cruise I.D: 5033

Sample I.D: Sta: 30 DK

Location: "Bodo Sut

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):

4 4
377
335
74
52
51
45
27
21
18
1000

Analyses and subsamples:

analysis:	analyst:

9

10

Rock type: basalt, massive (holocrystic?) → -do-

Color: Medium dark gray (N4) | Dark gray (N3)

Texture: Subaphyric intergranular-intersertal (microphyric) | phyric, intergranular - intersertal (glomerocrysts & single euhedra)

Phenocrysts: Olivine ±1%, ±0.75 mm (single euhedra) | Olivine ±25%, ± 1 mm dia.
Augite(?) ±5%, ± 1 mm dia

Groundmass: Plagioclase, clinopyroxene, olivine, glass(?), opaques (not determined) → -do-

Vesicles: ±<1%

Size: extremely variable; <1 mm - ±2 mm
Shape: irregular
Filling: empty

absent (dense)

Alteration: Superficial - moderate (all the olivine is iddingsitized and smectitized (more the latter) glass(?) may be smectitized; superficial oxidation and hydration) | moderate - extensive → -do-

Remarks: Cobble-size subangular clasts apparently free from volcanogenic breccia (residue on exposed surfaces, as in samples 6-8, extremely uniform grain size, but quite unequal distribution of (size), phenocrysts and vesicles (like rock?); fracture faces bear deposits of thin coating of smectite, goethite(?) & calcite(?) and yellowish smectite; exposed exterior surfaces coated thinly (<1 mm) with Mn-Oxide

-do-

-do-

-do-

Sample Description

Cruise I.D: So 33

Sample I.D: Sta: 30 DK

Location: "Bo do" Sea

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:

	11	12
Rock Type:	Basalt, scoriaceous (AOB?)	-do-
Color:	Dark brownish-gray (5YR 3/1)	Brownish-gray, (5YR 4/1)
Texture:	Aphyric; aphanitic, microlitic	subaphyric, intergranular / intersertal
Phenocrysts:	± absent (rare olivine glomerocrysts)	olivine, 5%, 0.75 mm dia
Groundmass:	glass (devitrified), plagioclase(?), olivine, clinopyroxene(?), opaques(?) (not determined)	-do ?-
Vesicles:	%: ± 40%	-do-,
	shape: oval to irregular, coalescing	round
	size: ± 1 mm	± 2 mm
	filling: lined with bluish-white zeolite(?) powder	lined with pale green zeolite(?) powder
Alteration:	extensive - complete (all olivine is iddingsitized or oxidized to goethite/hematite(?); groundmass glass(?) is devitrified probably to iron oxides, smectite and zeolites.	-do-
Remarks:	pebble-to-cobble-size subrounded to rounded aggregates of welded(?) lapilli (smaller pebbles apparently joined together intimately without visible cement); vesicle content, distribution, size vary slightly from piece to piece, as do presence/absence of phenocrysts; very light coating (dusting) of Mn-Oxide on some exposed surfaces; no volcanogenic breccia residue adhering to exterior	-do-

phenocrysts of olivine (iddingsite) more abundant, grainsize of groundmass larger; more oxidized than DK11; no Mn-Oxide coatings, no volcanogenic breccia residue on exterior

Sample Description

Cruise I.D: 5033 Sample I.D: Sta: 30 DK Location:

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:

+3

Rock Type: Basalt, massive (AOB?)

Color: Light yellowish-brown (10YR 6/4)

Texture: Phyric, intergranular(?)

Phenocrysts: Olivine ±15%, ±1 mm dia. (single euhedra & glomerocrysts)

Groundmass: Plagioclase (?)
Olivine (?)
Clinopyroxene (?)
Glass (?)
Opaques (?)
} (not determined)

Vesicles: absent

Alteration: Probably Complete (smectitization, zeolitization?, oxidation, hydration)

Rock color: pebble to cobble-size subrounded clasts set in medium olive-gray (5Y 4/2) highly altered vent agglomerate(?) hyaloclastite; affected by hydrothermal activity (bleached, smectitized). generally resembles DK10, but much more intensely altered (dike rock?) No Mn-Oxide coating, but covered with covered with spots of incipient Mn-Oxide growth cover exposed surfaces of the rock

30 33 30 DK 14

Basaltic(?) Hyaloclastite ventagglomerate?

Medium olive gray (5Y 4/2)

Pyroclastic

olivine, rare:
(single euhedra)

Glass

absent – rare localized in incorporated lapilli of other rocks

Intense (smectitization, zeolitization?) (complete?)

massive slabs torn loose by dredging from outcrop and loose, subangular cobble to boulder size casts of vent agglomerate(?); has the appearance of an ignimbrite – perhaps is the basaltic equivalent. contains numerous lapilli and rock fragments of diverse origins, often forming a volcanogenic breccia; exposed surfaces (to seawater) are coated with thin (1 mm) layer of undose Mn-Oxide.

Sample Description

Cruise I.D: So 33

Sample I.D: Sta: 30 DK

Location: "Boda Sea"

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:

	15	16
Rock Type:	Volcanogenic Breccia	→ - do -
Color:	Pale greenish-yellow (10Y 8/2)	yellowish-gray (5Y7/2)
Texture:	Clastic	→ - do -
Matrix:	basaltic rock, glass fragments ±20% planktonic calcareous fossils(?) (not deter.)	→ ± 35 %
Cement:	calcareous (foraminiferal?) ooze ±30% Zeolites(?) Smectite(?) Calcite apatite? } (not determined)	→ - do - much more foraminiferal content (10-15 %) ? → not determined
Large grain size:	extremely variable (± 5mm(?)) (fine sand to cobble size)	± 1mm (fine sand - coarse gravel)
Sorting:	extremely poor	→ poor, but much better than DK15
Grain Shape:	angular to subround	angular (mostly) to round (fossils)
Porosity:	± 25 %	± 45 %
permeability:	± 15 %	± 25 %
Alteration:	phosphorization(?) (postdepositional) zeolitization ? carbonization ?	→ - do -
Remarks:	massive slabs (broken by dredge from outcrop) to loose cobble and boulder-size clasts; vast variability in sorting, grain size, and shape indicate high energy environment of deposition, rapid deposition and cementation (induration); rounded fragments indicate reworking of part of the components in water currents (wave action?) prior to final deposition with other components; surfaces exposed to seawater environment bear thin (± 1 mm) coating of Mn. oxide.	pebble to cobble size, subangular to subround could belong with DK15 and simply be a better size-sorted bed; better preservation of fossils contain in rock and poorer induration could indicate more recent deposition than DK15; exposed surfaces, like DK14, bear thin coating of Mn oxide.