DREDGE 4

USGS DREDGE LOG

SHIP/LEG FARNELLA

STATION # 4

DREDGE # D4

DEPTH INTERVAL(m) 2060 - 1990m

DEPTH(m)corrected 2025 - 2000m

DATE JD 258 LOCAL 15 September 1989

TIME GMT 10:24 LOCAL

LATITUDE 12° 10.8' TO 12° 11.2' N

LONGITUDE 166° 18.6' TO 166° 18.4' E

TOTAL WEIGHT: DREDGE 70 Kg CRUST 12-15 kg

PERCENTAGE OF ROCK COVERED BY CRUST 95%

PERCENT BROKEN FROM: OUTCROP 100% TALUS

THICKNESS OF M.N CRUST: MAXIMUM 50 mm MINIMUM < 1 mm AVERAGE 5 mm

DOMINANT SURFACE TEXTURE NONE DOMINANT. BOTYROIDAL, GRANULAR, IRREGULAR, SMOOTH.

SUBSTRATE LITHOLOGY VESICULAR BASALT, VESICLES FILLED WITH CALCITE; LIMESTONE, BRECCIA

NODULES PRESENT NONE

REMARKS: THICKEST CRUST ON BRECCIAS, THIN ON BASALTS AND LIMESTONES. NO NODULES. THREW 5 Kg OVERBOARD - GRANULE AND SMALL PEBBLE-SIZED STUFF.

Cruise Id: F10-89-CP Size: 30x34x21 (cm) Location: 3 Seamount

Sample Id: D4-1 Weight: 5 kg (kg) Depth: 2025-2000 (m)

Mn Crust Description

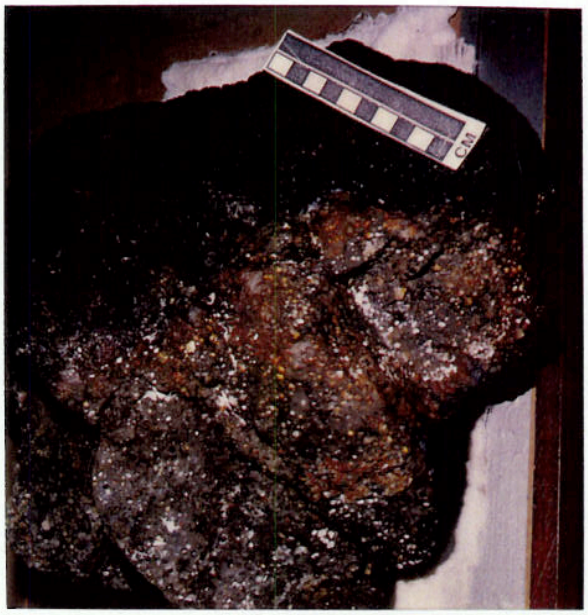
Surface Texture: granular and porous w/ suggestion of botryoids

Mn Crust Thickness (mm):

Min: patina Max: 10 Ave: 4

Layers (Outer to Inner)(mm):

Min	Max	Ave	Texture & Color
1.			
2.			
3.			
4.			
5.			
6.			



F10-89-CP

D4-1

Comments and XRD Mineralogy:

Crust is very granular black and porous Fe staining in the lower half and

ANALY

Subsample Number	Analysis	LayerThickness
D4-1	CC	outer .5mm scraped from crust 7gm

Substrate Description

Rock Type: Amygdaloid Hornblende-phyric Basalt amygdules filled w/calcite

Description:

Basalt is very green moderately fresh and slightly [illegible]

Sparsley Hornblende phyric

Biology ?: encrusting forams and foram sediment on crust

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: 29 x 28 x 22 (cm) Location: B Seamount

Sample Id: D4-2 Weight: 12 (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: Porous granular crust in some spots smooth with microbotryoids

Mn Crust Thickness (mm):
Min: 4 mm Max: 5 mm Ave: 3 mm

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

F10-89-CP-D4-2

Comments and XRD Mineralogy:

(7gm)

Substrate Description

Rock Type: Amygdaloidal sparsley hornblende phyric basalt, gray greenish

Description: Green colored phosphate between sample and much of the crust.

Biology ?:

ANALY

Subsample Number	Analysis	LayerThickness
D4-2A	CC, XRD	Bulb 0-4mm
D4-2B	OC, XRD	Substrate (20gm)

One Bag Taken Acc-ac, Isogrey Standigel

Malcolm Pringle Cut up and subsampled fore dating

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: 22 x 10 x 8 (cm) Location: B Seamount

Sample Id: D4-3 Weight: 2 kg (kg) Depth: 2025-2000 (m)

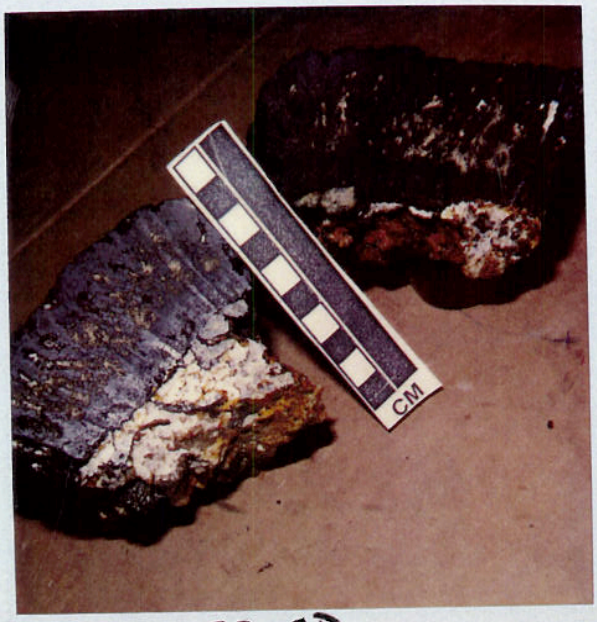
Mn Crust Description

Surface Texture: granular, porous botryoidal, very open texture.

Mn Crust Thickness (mm):
Min: 40 Max: 45 Ave: 43

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.	9	10	9	Dense Black w/ iron stain at bottom
2.	18	23	20	Open porous columnar, Fe staining and clay in between columns
3.	10	14	12	Dense Black on top, porous Fe stain on bottom
4.				
5.				
6.				



F10-89-CP

D4-3

Comments and XRD Mineralogy:

ANALY

Subsample Number	Analysis	LayerThickness
D4-3-A	CC	0-9 mm
D4-3 B	CC	9-27 mm
D4-3 C	CC	27-37 mm
D4-3 D	BULK CC	0-37 mm
D4-3 E	OC	

Substrate Description

Rock Type: Breccia w/ limestone and phosphate cement

Description: Clast are altered and fresh volcanics, limestone and phosphate, and some Mn crust fragments. Angular to rounded. Some matrix of Foraminiferal shell and Fe rich matrix

Biology ?:

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: 14 x 12 x 8.5 (cm) Location: B Seamount

Sample Id: D4-4 Weight: < 1 kg (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: porous and granular botryoidal

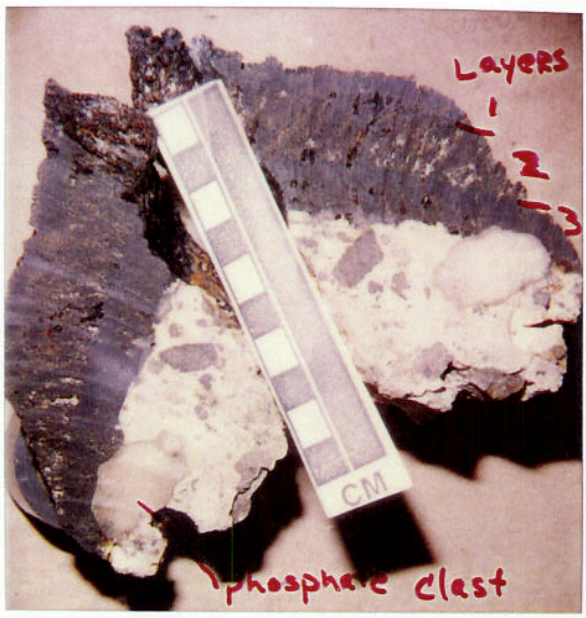
Mn Crust Thickness (mm):

Min: 10 Max: 39 Ave: 25

Thin areas are broken

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.	4	10	7	Black Dense w/ increasing porosity towards bottom
2.	10	16	14	Porous columnar structure w/ fractures and clay between columns
3.	8	15	10	Dense Black w/ porosity increasing towards bottom
4.				
5.				
6.				



F10-89-CP
D4-4

Comments and XRD Mineralogy:

ANALYSI

Subsample Number	Analysis	LayerThickness

Substrate Description

Rock Type: Limestone cemented breccia

Description: Altered and fresh basalt clasts & phosphorites cemented by 2 limestone types (one has a pinkish color) Also may have a matrix of foraminiferal ooze.

Biology ?:

TO KORDI sample

Similar to D4-3, may be the same substrate

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: 17x13x7 (cm) Location: B Seamount

Sample Id: D4-5 Weight: 1.5 kg (kg) Depth: 2025-2000 (m)

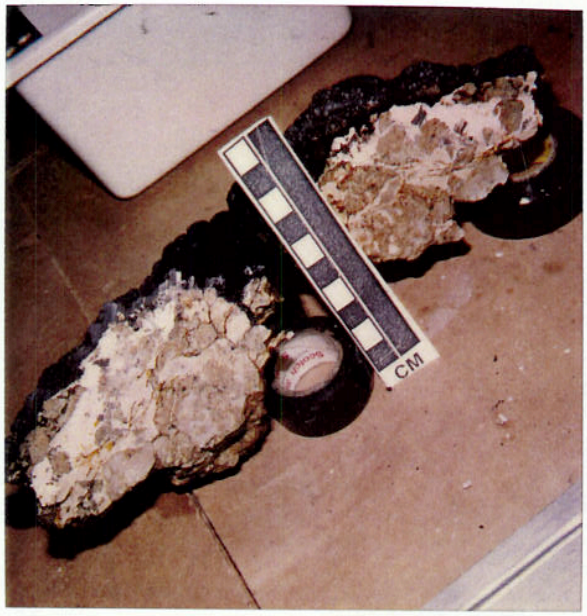
Mn Crust Description

Surface Texture: porous, granular botryoidal

Mn Crust Thickness (mm):
Min: 2 Max: 7 Ave: 4

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.	2	7	4	Dense Black
2.				
3.				
4.				
5.				
6.				



F10-89-CP

D4-5

Comments and XRD Mineralogy:

ANAL

Subsample Number	Analysis	LayerThickness

Substrate Description

Rock Type: Limestone and phosphate cemented Breccia

Description: Altered and fresh basalt clasts (was basalt erupted into carbonate mud?) lots of phosphorite

Biology ?:

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Crust Id: F10-89-CP Size: [illegible] (cm) Location: [illegible]

Sample Id: D4-6 Weight: [illegible] (kg) Depth: [illegible] (m)

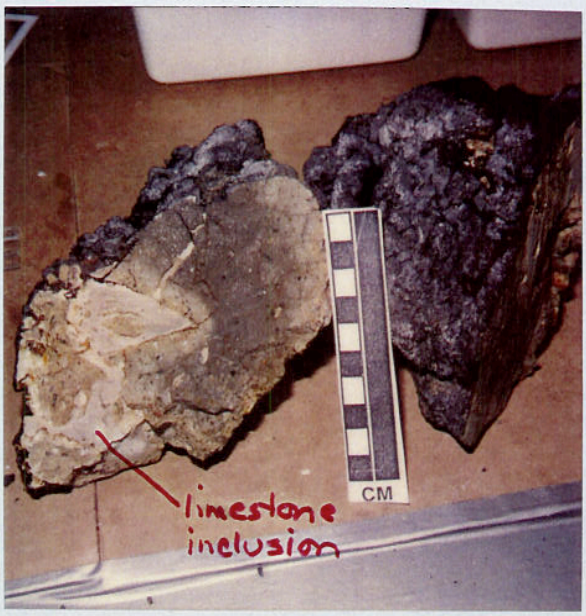
Mn Crust Description

Surface Texture: granular porous botryoidal texture

Mn Crust Thickness (mm):
Min:_____ Max:_____ Ave:_____

Layers (Outer to Inner)(mm):

Min	Max	Ave	Texture & Color
1.			
2.			
3.			
4.			
5.			
6.			



F10-89-CP
D4-6

Comments and XRD Mineralogy:
Dark Black Dense Crust

Substrate Description

Rock Type: Vesicular Hornblende phyric basalt with limestone inclusion

Description:
Appears to have more altered cooling (?) rims near the limestone inclusion and near top(?) of flow(?)

Biology ?: Mounting Forams

ANAL

Subsample Number	Analysis	LayerThickness

TO KORDI

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: 15 x 30 x 27 (cm) Location: B Seamount

Sample Id: D4-7 Weight: 5 kg (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: Porous Granular Botryoidal

Mn Crust Thickness (mm):
Min: 2 Max: 7 Ave: 3

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

F10-89-CP
D4-7

Comments and XRD Mineralogy:
Dense Black Crust, vitreous

ANAL

Subsample Number	Analysis	LayerThickness

Substrate Description

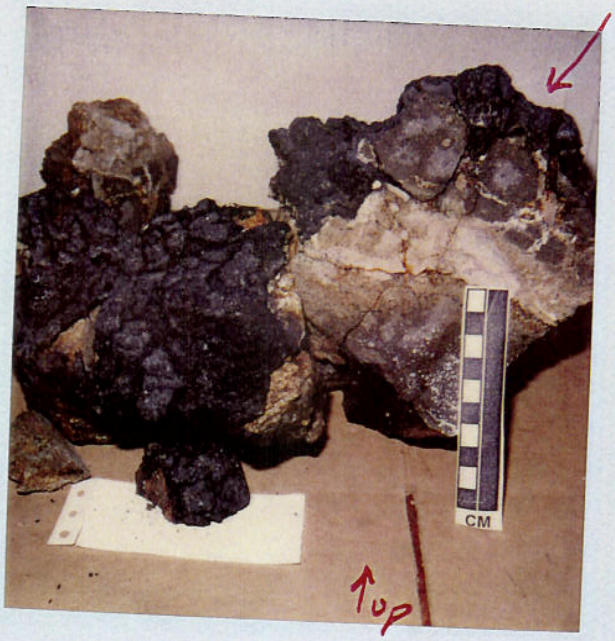
Rock Type: Vesicular amygdaloidal hornblende phyric basalt. amygdules filled w/ calcite

Description:
Two areas of "fresh" basalt w/ altered glassy edges separated by "infilling" of limestone. (Calcareous ooze between lobes or pillows?)

Biology ?: Encrusting Foraminifera

Sample is several pieces from the dredge that fit together

Described By: JS Subsampled By:



D4-7

Close up of this piece on front block

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: 26 x 12 x 9 (cm) Location: B- Seamount

Sample Id: D4-8 Weight: 2 (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: smoothed botryoids to granular botryoids

Mn Crust Thickness (mm):
Min: 2 Max: 5 Ave: 3

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

F10-89-CP
D4-8

Comments and XRD Mineralogy:

A layer of green colored phosphate lies between basalt and crust <1mm to 1mm thick

Crust is Dense Black

Substrate Description

Rock Type: Amygdoidal Basalt

Description:
Basalt is fresh, gray green, sparsely hornblende phyric. Amygdules are filled by Calcite

Biology ?: encrusting foraminifera, [illegible] on crust

ANALY

Subsample Number	Analysis	LayerThickness

To KORDI [illegible]

To O & C isotopes on Calcite

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

largest 7x5x5

Cruise Id: F10-89-CP Size: 4 small pieces (cm) Location: B Seamount

Sample Id: D4-9 Weight: <1 (kg) Depth: 2025 - 2000 (m)

Mn Crust Description

Surface Texture: porous and [illegible] stupidal

Mn Crust Thickness (mm):
Min: 1mm Max: 4 Ave: 2

Layers (Outer to Inner)(mm):

Min	Max	Ave	Texture & Color
1.			
2.			
3.			
4.			
5.			
6.			

F10-89-CP
D4-9

Comments and XRD Mineralogy:

The piece has no crust the 3 others do

ANAL

Subsample Number	Analysis	LayerThickness

Substrate Description

Rock Type: Very altered vesicular hornblende phyric basalts with phosphorite and limestone infillings; phosphorite -

Description:

Some of the basalt has the appearance of altered glassy rinds

phosphorite

Biology ?: encrusting forams

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: largest 21 x 15 x 7, smallest 9 x 3.5 x 2 (cm) Location: B Seamount

Sample Id: D4-10 Weight: 10 kg total (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: No crusts. Fe & Mn patina on a few pieces

Mn Crust Thickness (mm):
Min: Max: Ave:

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

Comments and XRD Mineralogy:

ANALYSES

Subsample Number	Analysis	LayerThickness

1/3 TO HORDI

Malcolm Pringle has taken subsamples → just hand picked some HbL, numbered 4-10-1

Substrate Description

Rock Type: Hornblende phyric, amygdoidal greenish-gray basalt.

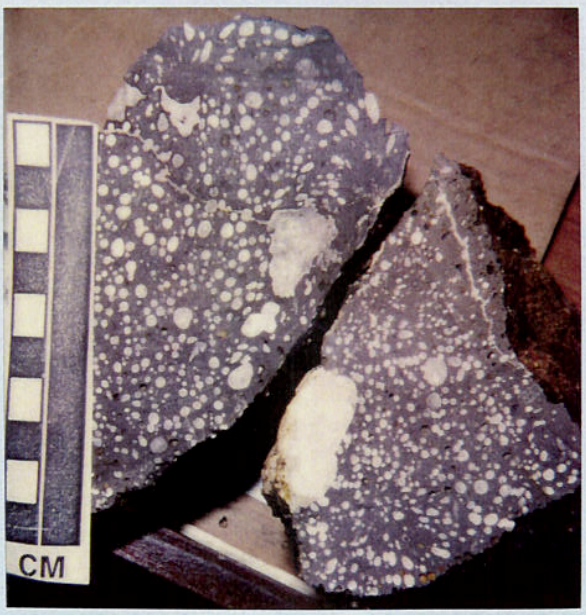
Description: Calcite filled amygdules

One piece has phosphorite clast on it.

Biology ?:

Described By: JS Subsampled By:

O & C on calcite



F10-89-CP

D4-10

CLOSE UP OF 2 PIECES

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: largest 15x14x10 Smallest 6.5x4.5x3 (cm) Location: B Seamount

Sample Id: D4-11 Weight: 7 kg (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: granular and porous botryoidal

Mn Crust Thickness (mm):

Min: patina Max: 10 Ave: 4

Layers (Outer to Inner)(mm):

Min	Max	Ave	Texture & Color
1.			
2.			
3.			
4.			
5.			
6.			

F10-89-CP

D4-11

Comments and XRD Mineralogy:

Crists are dense black

ANAL

Subsample Number	Analysis	LayerThickness

Substrate Description

Rock Type: Hornblende phyric amygdaloid greenish-gray basalts.

Description:

Amygdules filled w/calcite.

One sample has an alteration rind

Biology ?: encrusting Foraminifera

O + C on calcite

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: largest 13x8x7 smallest 8x5x4 (cm) Location: B Seamount

Sample Id: D4-12 Weight: 2 (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: granular, porous botryoidal crusts

Piece w/ the thickest phosphate has least porous crust

Mn Crust Thickness (mm):
Min: 1 Max: 6 Ave: 3

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

F10-89-CP
D4-12

Comments and XRD Mineralogy:

Crust are black and feel the most part dense.

Phosphorite is up to 5 mm thick

Substrate Description

Rock Type: Group of hornblende phyric amygdoidal Basalts.

Description: This group of basalts has a cream colored phosphorite layer between the basalt and crust.

Amygdules are calcite filled

Biology ?: encrusting forams

ANAL

Subsample Number	Analysis	LayerThickness

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: largest 9x7.5x6 smallest 5x5.5x3 (cm) Location: B Seamount

Sample Id: D4-13 Weight: ~2 (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: porous, granular, botryoidal

Mn Crust Thickness (mm):
Min: 1 Max: 5 Ave: 2.5

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

F10-89-CP ← TOP
D4-13

Comments and XRD Mineralogy:

Substrate Description

Rock Type: Hornblende-phyric amygdaloidal basalts. Some vesicles also present

Description:

Mainly samples of altered basalts calcite filled amygdulas. A few of the samples have phosphates in fractures.

Biology ?:

ANALY

Subsample Number	Analysis	LayerThickness

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: _____ (cm) Location: B Seamount

Sample Id: D4-14 Weight: ~1 (kg) Depth: 2025-2050 (m)

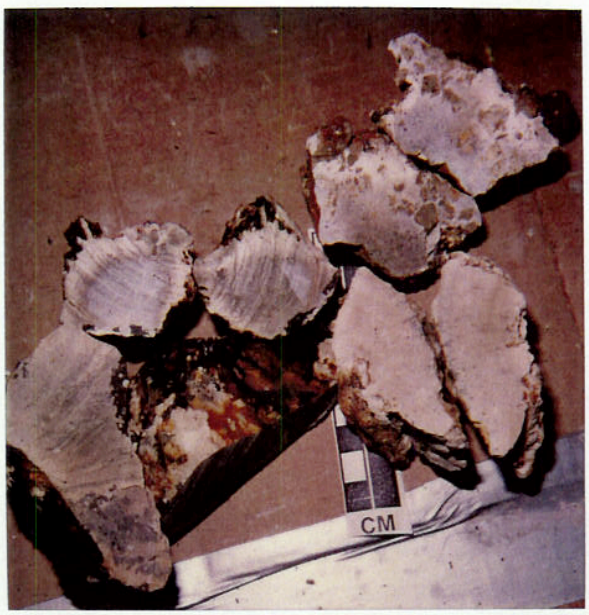
Mn Crust Description

Surface Texture: None to granular patina, Fe staining

Mn Crust Thickness (mm):
Min: _____ Max: _____ Ave: _____

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				



F10-89-CP

D4-14

Comments and XRD Mineralogy:

ANAL

Subsample Number	Analysis	LayerThickness
D4-14	Thin section through sample of Replacing Basalt	

Substrate Description

Rock Type: Micrites, several samples pinkish tan colored. Two of the samples are laminated with a

Description: gray micrite, one of these has what appears to be limestone encasing vesicular basalt(?) One piece has pebbles or weathered basalt in the limestone 4th piece is fairly massive w/faint laminations

Biology ?: _____

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: 7.5 x 6 x 4 (cm) Location: B Seamount

Sample Id: D4-15 Weight: <1 (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: None

Mn Crust Thickness (mm):

Min: Max: Ave:

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

F10-89-CP

D4-15

Comments and XRD Mineralogy:

ANAL

Subsample Number Analysis LayerThickness

Substrate Description

Rock Type: Gray green amygdaloidal basalt with limestone (micrite) infilling

Description: Basalt is very altered and reacts to HCl (mildly)

Biology ?:

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CF Size: largest: 11.5x7x4 Smallest: 3.5x4x1.5 (cm) Location: B Seamount

Sample Id: D4-16 Weight: 1.5 (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: porous, granular texture

Mn Crust Thickness (mm):
Min: 10 Max: 50 Ave: 20

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

F10-89-CP
D4-16

Comments and XRD Mineralogy:

Thicker Crusts have layers like D4-3 and D4-4
Most of the others are broken chips

Substrate Description

Rock Type: Some have breccia substrate
must have no substrate.

Description:

Biology ?: Encrusting Forams

ANAL

Subsample Number	Analysis	LayerThickness

1/2 To KORDI

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F10-89-CP Size: 16 x 10.5 x 9 (cm) Location: B Seamount

Sample Id: D4-17 Weight: 2 kg (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: Porous and granular botryoidal

Mn Crust Thickness (mm):
Min: 2 Max: 5 Ave: 3

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

F10-89-CP
D4-17

Comments and XRD Mineralogy:

ANAL

Subsample Number	Analysis	LayerThickness
Rock Taken	Ar-Ar, Isotopes	Staudigs
Lower portion of basalt to M. Pringle		

Substrate Description

Rock Type: Hornblende phyric amygdoidal & vesicular Gray Green Basalt

Description: amygdules and Fractures Filled w/ calcite

Biology ?: Foraminifera encrusting

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Largest 15x8.5x5

Cruise Id: F10-89-CP Size: smallest 25x24x1.8 (cm) Location: B Seamount

Sample Id: D4-18 Weight: 1.5 kg (kg) Depth: 2025-2400 (m)

Mn Crust Description

Surface Texture: granular, porous botryoidal

Mn Crust Thickness (mm):
Min: 1 Max: 9 Ave: 2

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

To Sy

F10-89-CP
D4-18

Comments and XRD Mineralogy:

ANALYS

Subsample Number	Analysis	LayerThickness
1 piece to Sy Schlanger		

Substrate Description

Rock Type: Breccias, cemented w/ micrite and phosphorite, 2 pieces have phosphorite as clasts.

Description: Clasts are predominately altered basalts, a few fresh basalts and phosphorite

Biology ?: encrusting forams.

Described By: JS Subsampled By:

SAMPLE DESCRIPTION

Largest 12x9x8

Cruise Id: F10-89-CP Size: Sample 3x2x1 (cm) Location: B Seamount

Sample Id: D4-20 Weight: 1 kg (kg) Depth: 2025-2000 (m)

Mn Crust Description

Surface Texture: Patina & Fe Stain

Mn Crust Thickness (mm):

Min:_____ Max:_____ Ave:_____

Layers (Outer to Inner)(mm):

	Min	Max	Ave	Texture & Color
1.				
2.				
3.				
4.				
5.				
6.				

F10-89-CP

D4-20

Comments and XRD Mineralogy:

ANAL

Subsample Number	Analysis	Layer Thickness
D4-20	OC	17gm
one piece sent to Sy Schlanger		
thin section made		TS

Substrate Description

Rock Type: Ochre to Buff Micrite (large pieces)

Rounded pebbles of Fe-Mn oxide (sandballs) → Paleo

Description:

Several rounded pebbles (most patina of Mn) of and two larger samples of micrite

Several of the samples have altered basalts knobs in them.

Biology ?:

Described By: JS Subsampled By: