

DREDGE

6

Sam Marcus
Seamant

San Marcos

2305 - 2170 mg

| SAMPLE ID | *Mn CHEM Pt. & Au | *REE * | Si Chem * | P. Sect. | 35mm Pho | Archive | Paleo | XRD | 414 EL |
|-----------|-------------------|--------|-----------|----------|----------|---------|-------|-----|--------|
| D6-1 | Top Pt Bottom | | | | | | | | |
| D6-2 | Bulk | | | | | | | | |
| D6-3 | | | | | | | | | |
| D6-4 | | | | | | | | | |
| D6-5 | | | | | | | | | |
| D6-6 | | | | | | | | | |
| D6-7 | | | | | | | | | |
| D6-8 | | | | | | | | | |
| D6-9 | | | | | | | | | |
| D6-10 | Bulk | Bulk | | | | | | | Bulk |
| D6-11 | | | | | | | | | |
| D6-12 | | | | | | | | | |
| D6-13 | | | | | | | | | |
| D6-14 | | | | | | | | | |
| D6-15 | | | | | | | | | |
| D6-16 | | | | | | | | | |
| D6-17 | | | | | | | | | |
| D6-18 | | | | | | | | | |
| D6-19 | | | Basalt | TS | | | | | |
| D6-20 | | | | | | | | | |
| D6-21 | | | | | | | | | |
| D6-22 | | | | | | | | | |
| D6-23 | | | | | | | | | |

* All chemistry samples have XRD mineralogy done also.

| SAMPLE ID | *Mn_CHEM | Pt. & Au * | REF * | Si Chem * | P. Sect. | 35mm Pho | Archive | Paleo | XRD |
|-------------------|----------|------------|-------|-----------|----------|----------|---------|-------|-----|
| D6-24 | | | | | | | | | |
| D6-25 | | | | | | | | | |
| D6-26 | | | | | | | | | |
| D6-27 | | | | | | | | | |
| D6-28 | | | | | | | | | |
| D6-29 | | | | | | | | | |
| D6-30 | | | | | | | | | |
| D6-31 | | | | | | | | | |
| D6-32 | | | | | | | | | |
| D6-33 | | | | | | slide | | | |
| D6-34 | quartz | pyrox | | | DPTS | | | | |
| D6-35 | | | | | | | | | |
| D6-36 | | | | | | | | | |
| D6-37 | | Bulk | | | | | | | |
| D6-38 | | | | | | | | | |
| D6-39 | | | | | | | | | |
| D6-40 | | | | | | | | | |
| D6-41 | | | | | | | | | |
| D6-42 | | | | | | | | | |
| D6-43 | | | | | | | | | |
| D6-44 | | | | | | | | | |
| D6-45 | | | | | | | | | |
| D6-46, 47, 48, 49 | | | | | | | | | |

* All chemistries completed have VDD mineralogy done also

SAMPLE DESCRIPTION

Cruise Id: F7-87-SC Size: 55 x 50 x 15 Location: San Marcos
 Sample Id: D6-1 Weight: 33 kg Depth: 2305 m - 2170 m

Mn Crust Description

Surface Texture: Top - smooth - dk brown
bottom - granular - black

Mn Crust Thickness:

Min: 5 Max: 25 Ave: 15 Top

Layers (Outer to Inner):

| | Min | Max | Ave | Texture |
|----|----------|-----------|----------|--------------------------------|
| 1. | <u>4</u> | <u>15</u> | <u>5</u> | <u>massive, granular</u> |
| 2. | | | | <u>outer mm, Bottom of Rx.</u> |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |



D6-1

Comments and XRD Mineralogy:

upper crust is laminated dk brown -
yellow-brown - crust rest on a
brecciated phosphatic cement of a
breccia matrix clasts -
large basalt clasts extend into
the lower crust -

Substrate Description

Rock Type: Volcanic Breccia

Description:

Vesicular Basalt clasts in
phosphatic cement, cement
cemented - upper part of
crust located + recemented
wt Mn or Mn filled fractures -
breccia matrix graded

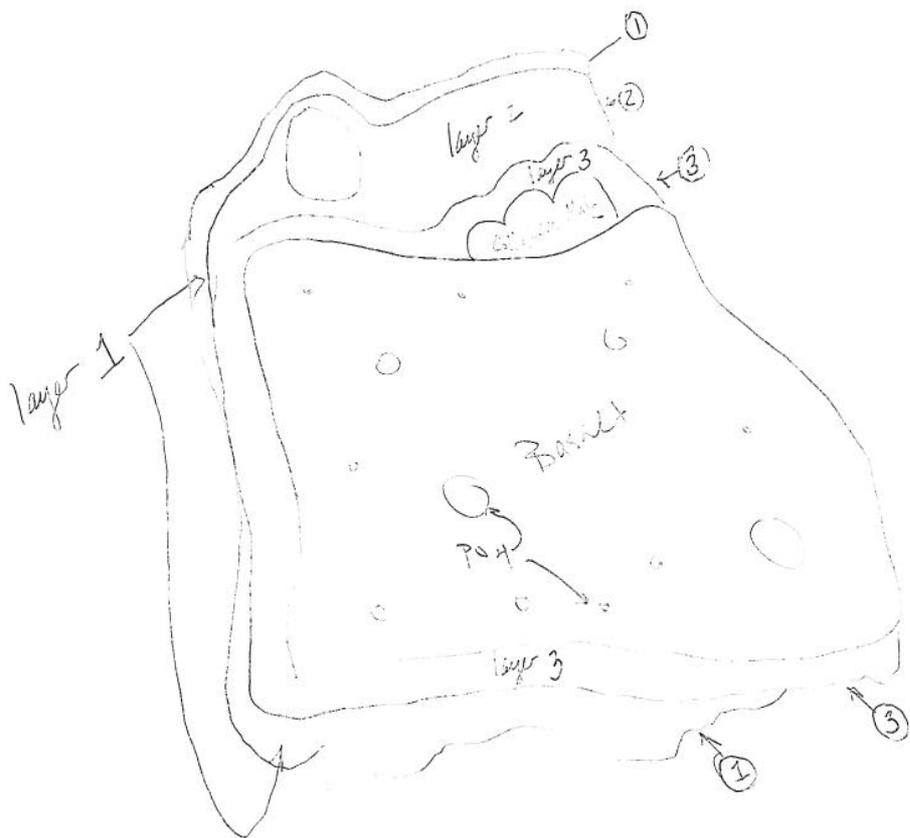
ANALYSES

| Subsample & Type | Analysis | Weight |
|------------------------------|---|----------------------------|
| <u>D6-1A, Bulb</u> | <u>CC</u> | <u>Top Crust - 15 m</u> |
| | <u>XRD</u> | |
| <u>D6-1B, Bulb</u> | <u>CC</u> | <u>Bottom Crust - 10 m</u> |
| | <u>XRD</u> | |
| <u>upper crust - surface</u> | | |
| <u>A</u> | <u>locally cemented v. dk. Breccia 4/11</u> | |
| <u>B</u> | <u>brown laminated crust</u> | |
| <u>C</u> | <u>Soft block Mn overprint</u> | |
| | <u>Cemented phosphatic cement</u> | |
| | <u>breccia -</u> | |
| | <u>B + Top of C included</u> | |
| | <u>in D6-1A</u> | |

Described By: J. R. Z.

Subsampled By: J. R. Z.





SAMPLE DESCRIPTION

Cruise Id: F7-87-SC Size: 12 x 8 x 8 cm Location: San Marcos
 Sample Id: D6-20 Weight: ~1kg Depth: 2305-2170m

Mn Crust Description

Surface Texture: smooth w/ granular < 10mm
botrioids in pits on bottom.

Mn Crust Thickness:

Min: 5 Max: 21 Ave: 16 mm

Layers (Outer to Inner):

| | Min | Max | Ave | Texture |
|----|-----|-----|-----|---------|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |



D6-20

Comments and XRD Mineralogy:

Layering is v. complicated. Brown
wavy layers toward outside on one side.
Underlying this is black, massive to wavy.
On thick part of crust, common volc. clasts
incorporated into black massive part,
although in that region lams are common.
Same PO4 layers near substrate

ANALYSIS

Subsample & Type Analysis Weight

layering is v. complicated. Brown wavy lams toward outside on one side
 Underlying this is black, massive to wavy.
 On thick part of crust, common volc. clasts incorporated into black massive part, although in that region lams are common
 Same PO4 layers near substrate

Substrate Description

Rock Type: vesicular basalt
Vesicular Basalt

Description:

polargic mud on surface.

(COVER)

Described By: LG

Subsampled By:



SAMPLE DESCRIPTION

Cruise Id: F7-87-SC Size: 32 x 22 x 13 cm Location: San Marcos
 Sample Id: DB-37 Weight: 10.5 kg Depth: 2305 - 2:70

Mn Crust Description

Surface Texture: Smooth boulders
3 to 7 cm diam. Smooth boulders are
spread in all directions, typically

Mn Crust Thickness: superimposed granular (4mm) texture.
 Min: 6 Max: 30 Ave: 18

Layers (Outer to Inner):

| | Min | Max | Ave | Texture |
|----|-----------------------------------|-----|-----|-------------------------------|
| 1. | | | 8 | brown laminated |
| 2. | | | 10 | dense, submetallic, blue-gray |
| 3. | The thickness of these two layers | | | |
| 4. | varies greatly | | | |
| 5. | | | | |
| 6. | | | | |



Comments and XRD Mineralogy:

crust is similar to layer 2, except
in one place is v. porous

one discontinuous layer of light
gray metallic ash

ANALYSES

| Subsample & Type | Analysis | Weight |
|---|-------------------------------|--|
| <u>D6-34A</u> | <u>CC</u> | <u>0-6 mm</u> |
| <u>with brown</u> <u>layers</u> | <u>XRD</u> | |
| <u>D6-34B</u> | <u>XRD</u> | <u>6-18 mm (12 mm)</u> <u>Thick</u> |
| <u>inner laminated</u> <u>submetallic</u> <u>layers</u> | | |
| <u>D6-34C</u> | <u>DPTS</u> | |
| | <u>Block</u> <u>masses</u> | <u>granular</u> <u>matrix</u> <u>light gray</u> <u>metallic</u> |
| | | <u>crust</u> <u>base</u> |

Substrate Description

Rock Type: Breccia

Description:

2 basalt (vesicular) cobbles
Cemented by and encrusted w/
Mn - small basalt clasts in the
Crust

Described By: Ward J. Subsampled By:



SAMPLE DESCRIPTION

1200 / 22000000

Run Id: F7-87-SC Size: several pieces (cm) Location: San Marcos

Sample Id: D6-37 Weight: 5 (Kg) Depth: 230.5 - 2170 (m)

Mn Crust Description

Surface Texture: smooth to porous w/ iron staining

Mn Crust Thickness: (in mm)

Min: 1 Max: 11 Ave: 3.5

Layers (Outer to Inner):

| | Min (mm) | Max (mm) | Ave (mm) | Texture, Color |
|----|----------|----------|----------|---|
| 1. | 1 | 6 | 3.5 | starts massive grades to porous & Fe stained |
| 2. | 1 | 5 | 3 | massive & grades porous & Fe stained |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |



D6-37

Comments and XRD Mineralogy:

ANALYSES

Subsample & Type

Analysis

thickness of layers sampled
and estimated % of
subsample location (if needed).

| | | |
|-------------|------------------|--------------------------------|
| <u>Bulk</u> | <u>CC,</u> | <u>10 mm - laminated &</u> |
| | <u>XRD</u> | <u>layered brown crust</u> |
| | <u>laminated</u> | <u>4 mm brown</u> |
| | <u>massive</u> | <u>2 mm dk brown</u> |
| | <u>laminated</u> | <u>1 mm brown</u> |
| | <u>massive</u> | <u>3 mm dk brown</u> |
| | | <u>Similar to outer part</u> |
| | | <u>of other, thicker</u> |
| | | <u>crusts, such as</u> |
| | | <u>D6-10 sampled</u> |

Substrate Description

Rock Type: Vesicular Basalts

Description:

Vesicular grey basalt with irregular
fracture. Some vesicles are filled with
reddish brown material (likely FeO)

Described By: JCM

Subsampled By: dj

SAMPLE DESCRIPTION

ruise Id: F7-87-SC Size: 13x9.5x5.5 (cm) Location: 30m Mar. 100

Sample Id: D6-39 Weight: 1 kg (Kg) Depth: 2305 - 2110 (m)

Mn Crust Description

Surface Texture: Smooth to granular

Mn Crust Thickness: (in mm)

Min: 2mm Max: 22mm Ave: 12mm

Layers (Outer to Inner):

| | Min (mm) | Max (mm) | Ave (mm) | Texture, Color |
|----|------------|-------------|------------|--|
| 1. | <u>1mm</u> | <u>10mm</u> | <u>5.5</u> | <u>porous w/ fibrous laminae, w/ fossils</u> |
| 2. | <u>1mm</u> | <u>12mm</u> | <u>6.5</u> | <u>massive</u> |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |



D6-39

Comments and XRD Mineralogy:

In thicker part of crust layering looks disturbed.

ANALYSES

Subsample & Type

Analysis

thickness of layers sampled and explanation of [redacted] and explanation of subsample location (if needed):

Substrate Description

Rock Type: basic ultra grey basalt

Description:

Same as other basalt in this dredge

Described By: JSM

Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F7-87-SC Size: 14x6.5x11 (cm) Location: San Marcos

Sample Id: D6-40 Weight: 1kg (kg) Depth: 2305-2170 (m)

Mn Crust Description

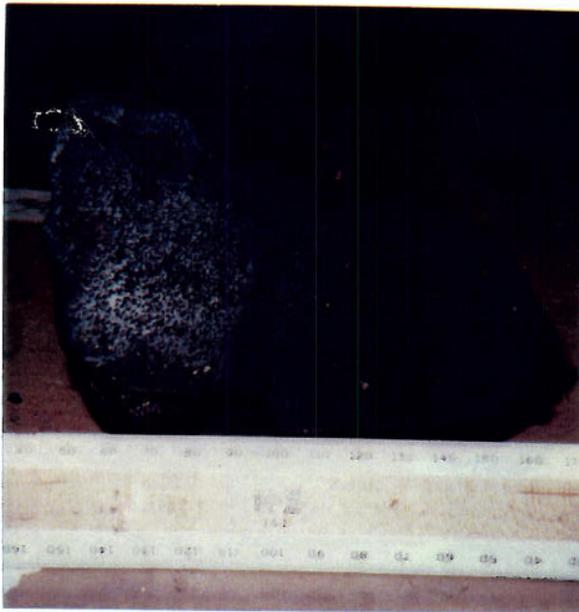
Surface Texture: smooth to porous with chipping
surface eroded, areas having no visible Mn crust

Mn Crust Thickness: (in mm)

Min: 3mm Max: 11mm Ave: 7mm

Layers (Outer to Inner):

| | Min (mm) | Max (mm) | Ave (mm) | Texture, Color |
|----|----------|----------|----------|----------------|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |



D6-40

Comments and XRD Mineralogy:

Mn between the samples the Mn crust was dark
the crust (on top) is laminated with Fe rich layers
Altered volcanic clasts in the crust

ANALYSES

Subsample & Type

Analysis

thickness of layers sampled
 and explanation of
 subsample location (if needed).

Substrate Description

Rock Type: Vesicular Basalt

Description:

This is either 2 separate boulders composed by
Mn or one basalt cobble with a Mn crust
filled by Mn. Containing rings on both basalt
cobbles. 10% of vesicles filled with Mn crust
<1% of vesicles filled with Mn crust

Described By: JSM

Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F7-87-SC Size: 12x3x10 (cm) Location: San Juan
 Sample Id: DG-42 Weight: 1 kg (kg) Depth: 2170 (m)

Mn Crust Description

Surface Texture: Smooth to Porous w/ Fe oxide

Mn Crust Thickness: (in mm)

Min: 4mm Max: 7mm Ave: 4mm

Layers (Outer to Inner):

| | Min (mm) | Max (mm) | Ave (mm) | Texture, Color |
|----|----------|----------|----------|----------------|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |



DG-42

Comments and XRD Mineralogy:

laminated with Fe rich layers

ANALYSES

Subsample & Type

Analysis

thickness of layers sample
 and explanation of
 subsample location (if needed).

Substrate Description

Rock Type: Vesicular Grey Basalt

Description:

Same as the rest of the basaltic to 4 ft depth

Some altered volcanic glass cemented in Mn Crust is growing around these

Described By: JSM

Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F7-87-SC Size: 6.4x6.4x5.5 (cm) Location: San Marcos
 Sample Id: D6-43 Weight: 0.5kg (kg) Depth: 2305-2170 (m)

Mn Crust Description

Surface Texture: Smooth to porous w/ Fe stain

Mn Crust Thickness: (in mm)

Min: 4mm Max: 6mm Ave: 3mm

Layers (Outer to Inner):

| | Min (mm) | Max (mm) | Ave (mm) | Texture, Color |
|----|----------|----------|----------|----------------|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |



D6-43

Comments and XRD Mineralogy:

(Crust contains more Fe than typical for Mn)
the surface, a few clasts are visible &
floating in the crust.

ANALYSES

Subsample & Type

Analysis

Thickness of layers sampled
 and explanation of
 subsample location (if needed):

Substrate Description

Rock Type: Vesicular Basalt

Description:

Vesicular basalt rubble filled with
iron colored mud(?)

Described By:

Subsampled By:

SAMPLE DESCRIPTION

Cruise Id: F7-87-SC Size: 11x10x11 cm (cm) Location: San Marcos
 Sample Id: D6-44 Weight: 2 kg (kg) Depth: 2305 - 2170 (m)

Mn Crust Description

Surface Texture: Smooth to granular

Mn Crust Thickness: (in mm)
 Min: 2 mm Max: 10 Ave: _____

Layers (Outer to Inner):

| | Min mm | Max mm | Ave mm | Texture |
|----|--------|--------|--------|---------|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |



D6-44

Comments and XRD Mineralogy:

laminar visible, between the two layers, clasts the Mn seems to be cemented. The top, very plastic texture in the Mn between clasts.

ANALYSES

Subsample & Type

Analysis

Thickness of layers sampled and explanation of sub location, if necessary

Substrate Description

Rock Type: Basalt & Volcaniclastic Breccia

Description:

Described By: JSM

Subsampled By:

