Sample Description

Cruise I.D: ~~L5-83-HW~~ L5-85-NC

Sample I.D: Sta: D29-M1 (my #)

Location: President Jackson Seamount

Size: 3 slices (sampled into) ≈ 21x14x5.5 cm

Weight: 1.7 kg (sample: scarf)

start: 42°50.35', -128°12.21'
end: 42° 52.00', -128° 12.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 4mm max: 5mm ave: 4mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: botryoidal

Internal structure:

layered:
laminated: some laminae visible
massive:
porous:
dendritic:
other: Fe colors more prominent in some layers

Mineralogy (XRD): crust [illegible] both sides of sample. bottom crust is more abraded & granular

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Hyaloclastic glass fragments in a green matrix of altered

Description: glass and other clays(?) some of the matrix looks suspiciously like altered basalt fragments

This sample seems to have 2 glass fragment beds separated by matrix (basalt fragment) bed

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

L5-85-NC

D29-M1

Sample Description

Cruise I.D: ~~L5-83-MW~~ L5-85-NC

Sample I.D: Sta: D29-M2 (my #)

Location: President Jackson Seamount

start: 42° 50.35', -128° 12.21'
end: 42° 52.00', -128° 12.50'
depth: 2150-1912 m

Size: already sawed into 4 slices Weight: 1.9 kg (sample is cut) @ 18x16.5x3.5 cm

Mn crust thickness:

Total: min: 6mm max: 10mm ave: 9mm

Inner crust: min: max: ave:

Outer crust: min: 6mm max: 10mm ave: 9mm

Surface texture: small grain granular

Internal structure: brownish black

layered:
laminated:
massive: ✓
porous: slightly (pores filled w/ Fe oxide)
dendritic:
other:

Mineralogy (XRD): very, very soft, difficult to remove crust from volcanic glass (ie some contamination is inevitable)

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: hyaloclastic volcanic breccia

Description: altered glass matrix w/ fairly fresh glass fragments ranging in size from coarse sand to cobbles

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
A Thin Section	
Bcrust REE CC, Pt, Au, XRD	0-9mm

35 mm

Sample Description

Cruise I.D: LS-85-NC ~~[illegible]~~

Sample I.D: Sta: D29-M3 (↑ my #)

Location: President Jackson seamounts

Size: 16x13.5x4.5 cm Weight: 2.0 kg (sample is small)

start: 42°50.35', -128°12.81'
end: 42°52.00', -128°12.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 3mm max: 10mm ave: 7mm

Inner crust: min: ____ max: ____ ave: ____

Outer crust: min: ____ max: ____ ave: ____

Surface texture: granular to botryoidal

Internal structure: ____

layered: ____
laminated: ____
massive: ____
porous: X lightly, rust-filled
dendritic: ____
other: ____

Mineralogy (XRD): ____

Associated alteration, phosphorite, or hydrothermal deposits: ____

Substratum:

Rock type: basaltic ash

Description: same as D29-M2

Mineralogy (XRD): ____

Anal[illegible] the subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: ~~L5-83-HW~~ L5-85-NC

Sample I.D: Sta: D29-M4 ↑ my #

Location: President Jackson Seamount

Size: sawed into 35 cm ~30.5x24x9 cm

Weight: 6.8 kg (sample is wet)

start: 42°50.35' -128°12.21'
end: 42°52.00' -128°12.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 5mm max: 8mm ave: 6mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: smoothed

Internal structure:

layered:
laminated:
massive:
porous: X (pores iron filled)
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: hyaloclastite

Description: Same as D29-M4

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: ~~L5-83-HW~~ L5-85-NC

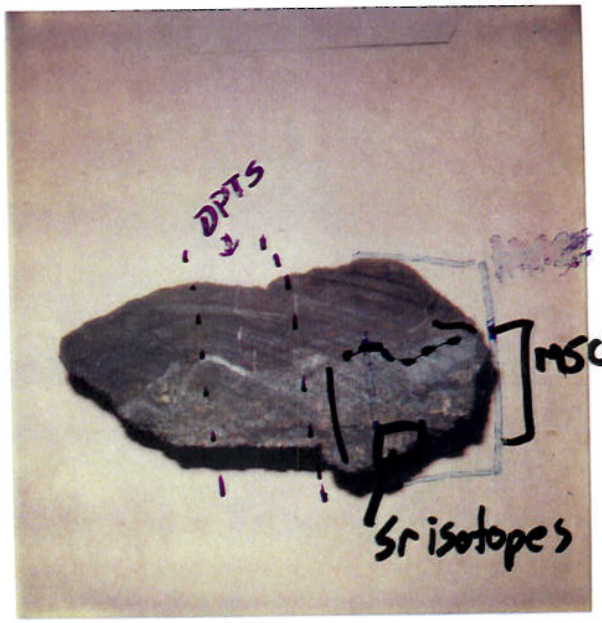
Sample I.D: Sta: D29-M5 ← my #

Location: President Jackson Sea mounts

Size: 5 pieces Weight: [illegible] kg [illegible]

start: 42°50.35', -128°12.21'
end: 42°52.[illegible] -12[illegible]
depth: 2150 - 1912 m

Mn crust thickness:



L5-85-NC D29-M5C
Gorda Ridge

3 mn crusts w/o substrates, 1 mn crust w/ substrates, one piece of basalt w/ mn coating.

A + B
2 of the mn crusts w/o substrates are very similar. They are labelled "A" and "B". Both are dark brown w/ orange Fe oxide in fractures + between laminations. A is finely laminated, laminations are wavy. Thicker (~5mm), finely fractured layer near bottom. B may be laminated on one side, but hard to tell. Finely fractured w/ orange Fe oxide in fractures.

Surface texture of both is fairly smooth to irregular. Under hand lens granular in places.

Thickness of A (cm): min 2.0; max 3.0 ave 2.5 (sort of semi-circular shaped)
B " : min ___ max ___ ave ~3.0

"A"

← finely laminated
← thicker, fractured layer

OVER →

L5-85-NC D29-M5C
Gorda Ridge

I = 0-6 mm
II = 6-11 mm
III = 11-15 mm
IV = bulk upper (laminated)
V = bulk lower (porous, dull gray layer)

Analyses and subsamples:

analysis:	analyst:
"B" - XRD - bulk	L. Morgenson
"C" - P.T.S.	
"C" - crust chemistry + XRD: I = 0-6 mm (to 0-10 on right side of sample); ~~II = 6-11 mm~~; ~~III = 11-15 mm~~; ~~IV = bulk upper (laminated layer)~~; ~~V = bulk lower (porous, dull gray layer)~~	
We are missing samples M5C II through V; They were probably never taken.	
D29-M5CA (Metallic looking hydrothermal) Sr isotopes, CC, Pt, Au, REE, XRD	0-23m
D29-M5CB bulk crust CC, Pt, Au, REE, XRD	0-15m
D29-M5CB II 6-11mm CC, XRD	
D29-M5CB III 11-15mm CC, XRD	

a's pling

crust

35 mm

C:

The third crust w/o substrate has 2 distinct layers. Top is dark brown w/ wavy, faint laminations w/ some orange Fe-oxide esp. near bottom of this layer. Top layer separated from bottom layer by dense, steel gray, coarsely xtlline, hydrothermal Mn. Below this layer the Mn becomes very porous w/ much sediment infilling it.

Surface texture smooth to irregular, granular in "valleys" in the crust surface. Crust thickness (cm):

Total: max 4.3 min 3.0 ave 3.7

outer: max 2.0 min 1.6 ave 1.8 (laminated layer)

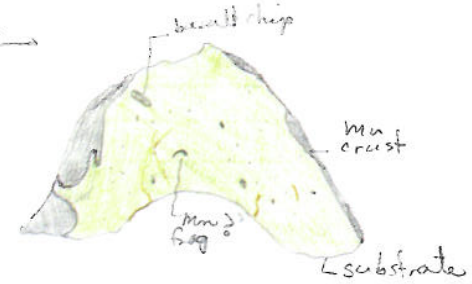
inner: max 2.6 min 0.4 ave 1.7 (porous ")

C was cut into 3 pieces, a central slice plus 2 end pieces. The central slice was sent for P.T.S. One of the end pieces was used for XRD and chemistry.

D:

Thin Mn crust w/ green substrate. Substrate is altered basalt (?) w/ small glass(?) + basalt chips and possible Mn crust fragments, +/- thic frags (?). Fractures filled w/ whitish sediment. Surface texture smooth. Crust massive but fractured in places w/ orange Fe-oxide in fractures. Crust thickness (mm):

max 6 min 0 ave 2



E:

Basalt w/ thin Mn coating. Basalt has almost a ropy texture on one side.

Sample Description

Cruise I.D: ~~L5-83-MW~~ L5-85-NC

Sample I.D: Sta: D29-M6 ← m4#

Location: President Jackson seamounts

Size: broken ≈20x14x9cm

Weight: 3.2kg (sample is dry)

start: 42°50.35', -128°12.21'
end: 42°52.00', -128°12.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: max: 45mm ave: 40mm

Inner crust: min: 3mm max: 7mm ave: 4mm

Outer crust: min: max: ave:

Surface texture: smoothed botryoidal surface

Internal structure:

layered:
laminated:
massive:
porous: w/ Fe colored material in pores
dendritic:
other:

Mineralogy (XRD): inner crust is denser and laminated when broken it is [illegible]

Associated alteration, phosphorite, or hydrothermal deposits:

[illegible]

Substratum:

Rock type: Gray [illegible] basalt cobble w/ alteration rim

Description:

Hydrothermal layered Mn to one side of sample, the hydrothermal layers are perpendicular to the basalt not clear how hydrothermal Mn and [illegible] and basalt [illegible] to each [illegible]. [illegible] to hydrothermal layers

Mineralogy (XRD):

L5-85-NC

D29-M6

Analyses and subsamples:

analysis:	analyst:

hydrothermal
Mn
Layer
surface contact
w/basalt

Sample Description

Cruise I.D: ~~L5-83-NW~~ L5-85-NC

Sample I.D: Sta: D29-M7 ← my #

Location: President Jackson Seamounts

Size: 9x7.5x6cm Weight: 0.3 kg (sample is dry)

start: 42°50.35' -128°12.21'
end: 42°52.00' -128°12.60'
depth: 2150-1912 m

L5-85-NC
D29-M7

Mn crust thickness:

Total: min: max: ave:

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture:

Internal structure: Botryoidal

layered:
laminated:
massive:
porous: w/ Fe staining in pores
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Basalt clasts, gray; partially altered.

Description: Clasts are cemented by hydrothermal Mn

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Cruise I.D: ~~B5-83-HW~~ LS-85-NC

Sample Description

Sample I.D: Sta: D 29-M8 first

Location: President Jackson Seamounts

Size: [illegible] Weight: 12kg (sample + dup)

start: 42° 50.25', -128° 18.21'
end: 42° 52.00', -128° 18.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 20 mm max: 21 mm ave: 21 mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture:

Internal structure: Varies from smooth to botryoidal

layered:
laminated: X
massive:
porous: X vuggy
dendritic:
other: very light & crumbly

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: basalt

Description: fresh high aphanitic

Mineralogy (XRD):

D29-M8 piece sent to Halliday

analysis:	analyst:
1	

Sample Description

Cruise I.D: ~~85-03-MW~~ LS-85-NC

Sample I.D: Sta: D29-M9 my ±

Location: President Jackson Seamounts

Size: 14x11x9cm Weight: 0.8 kg (sample is dry)

start: 42°50.35', -128°12.2'
end: 42°52.00', -128°12.6'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 2mm max: 7mm ave: 5mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: botryoidal

Internal structure:

layered:
laminated:
massive:
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: basalt

Description: See D29-M2

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: ~~L5-83-NW~~ L5-85-NC

Sample I.D: Sta: D29-M10 (my #)

Location: President Jackson Seamounts

Size: 7x6.5x5cm Weight: 0.4 kg (sample is dry)

start: 42°50.35', -128°12.21'
end: 42°52.00', -128°12.60'
depth: 2150-1912 m

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: Basalt cobble w/ hyaloclastite (like D29-M1) [illegible]

Description: to order surface. cobble coated w/ patina of Fe and Mn

Mineralogy (XRD):

L5-85-NC
D29-M10

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: ~~L5-83-NW~~ L5-85-NC

Sample I.D: Sta: D29-M11 ← my #

Location: President Jackson Seamounts

Size: only one slabbed piece Weight: 0.1 kg (sample in dry)

length/width 11 X thickness 4.5 cm

start: 42°50.35', -128°12.21'
end: 42°52.00', 128°12.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 8mm max: 10mm ave: 8mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: smoothed hydrogidal

Internal structure:

layered:
laminated: dark Mn layers alternate with porous
massive: Fe rich layers
porous:
dendritic:
other:

L5-85-NC
D29-M11

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Hyaloclastic glass fragments in altered matrix (Eameas

Description: D29-M1, M2 & M3)

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: ~~85-03-RM~~ LS-85-NC

Sample I.D: Sta: D29-M12

Location: President Jackson Seamount

Size: ~~7x7x5.5cm~~ Weight: 0.25 kg (sample is dry)

start: 42° 50.35', -128° 12.21'
end: 42° 52.00', -128° 12.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 3mm max: 5mm ave: 4mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: varies from smooth to botryoidal-granular

Internal structure:

layered:
laminated:
massive:
porous: very (rust filled)
dendritic:
other:

Mineralogy (XRD):

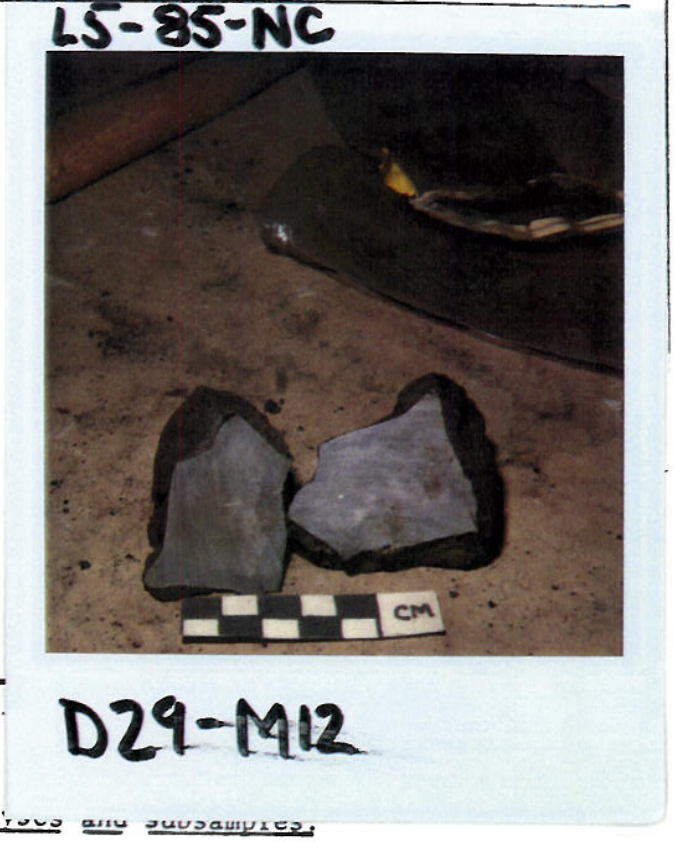
Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Aphanitic, freshish, basalt

Description:

Mineralogy (XRD):



Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: ~~L5-83-NW~~ L5-85-NC

Sample I.D: Sta: D29-M13 ← my #

Location: President Jackson Seamounts

Size: broken into 2 pieces ≈ 8x5x3 cm

Weight: 0.10 kg (sample is dry)

start: 42° 50.35', -128° 12.21'
end: 42° 52.00', -128° 12.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 4 mm max: 8 mm ave: 5 mm

Inner crust: min: ____ max: ____ ave: ____

Outer crust: min: ____ max: ____ ave: ____

Surface texture: botryoidal porous

Internal structure:

layered:
laminated: steel gray laminae alternating w/ porous
massive: iron stained layers
porous:
dendritic:
other:

L5-85-NC
D29-M13

Mineralogy (XRD): Top crust is typical crumbly, junky stuff of the rest of the dredge. The metallic looking Mn is very coherent.

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Steel gray metallic Mn w/ dense and porous areas

Description: the crust at first observation appears to be an iron rich hydrogenous type crust however it has thin dense laminae of gray metallic Mn, alternating w/ black iron stained laminae

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:
A crust CC, XRD	0-5 mm
B metallic CC, XRD	5-21 mm

note: there is not enough sample to get Au, Pt

35 mm Photo

Sample Description

Cruise I.D: ~~L5-83-NW~~ L5-85-NC

Sample I.D: Sta: D29-M14 (my #)

Location: President Jackson Seamounts

Size: slabbed in 2 ≈ 4.5x4x3cm

Weight: 41gms (sample in dry)

start: 42°50.35', -128°12.21'
end: 42°52.00', -128°12.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 22mm max: 24mm ave: 23mm

Inner crust: min: 22mm max: 24mm ave: 23mm

Outer crust: min: max: ave:

Surface texture: smoothish

Internal structure:

layered:
laminated:
massive:
porous: X (rust filled)
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

The bottom layer appears to be hydrothermal Mn, the top layer accreted crust.

Substratum:

Rock type: Hydrothermal Mn

Description:

The bottom layer has acted as the subsrate for the accretion of the crust. It is a shiny, metallic Mn with botryoidal or dendritic growth patterns.

Ranges from 5 to 10mm with an average of 9mm.

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: ~~25-83-MW~~ LS-85-NC

Sample I.D: Sta: D29-M15 ← mt #

Location: President Jackson Seamount

Size: slabbed into 2 pieces ≈5x4x3 cm

Weight: 44 gms (sample in dry)

Start: 42° 50.35', -128° 12.21'
end: 42° 52.00', -128° 12.60'
depth: 2150-1912 m

Mn crust thickness:

Total: min: 4mm max: 7mm ave: 6mm

Inner crust: min: 4mm max: 7mm ave: 6mm

Outer crust: min: max: ave:

Surface texture:

Internal structure:

layered:
laminated:
massive:
porous: X very, Fe filled
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

"Substrate" is hydrothermal Mn

Substratum:

Rock type: Hydrothermal Mn

Description: This shiny, metallic Mn acted as the substrate for the accreted crust. See D29-M14

This one ranges from 7-14mm, with an average of 9mm.

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: LS-85-NC ~~85-03-HW~~

Sample I.D: Sta: D29-M16 (my #)

Location: President Jackson Seamounts

Size: 7.5x4x3 cm Weight: 769 gms (sample is dry)

start: 42°50.35', -128°12.21'
end: 42°52.00', -128°12.60'
depth: 2150-1912 m

Mn crust thickness: Nodule

Total: min: 4mm max: 8mm ave: 7mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Smooth-ish

Internal structure:

layered:
laminated:
massive:
porous: very; rust filled
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: laminated Mn nodule? (broken, so it is difficult to tell if it is for sure a nodule)

Description: rust follows the laminations

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst: