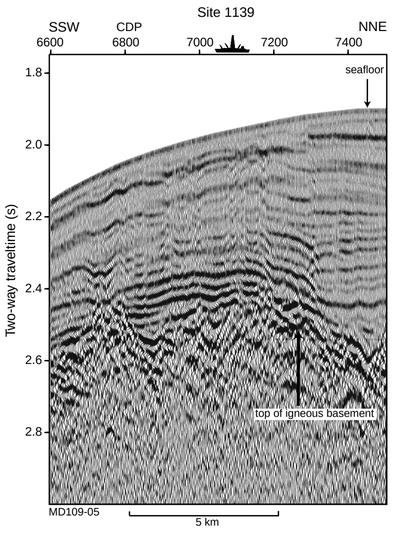
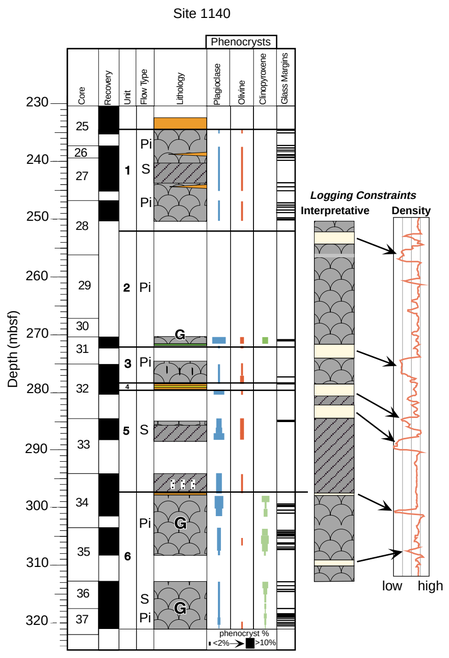
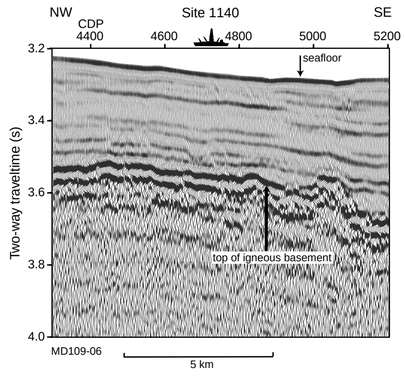
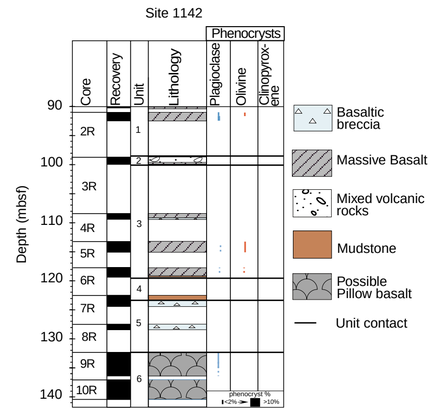
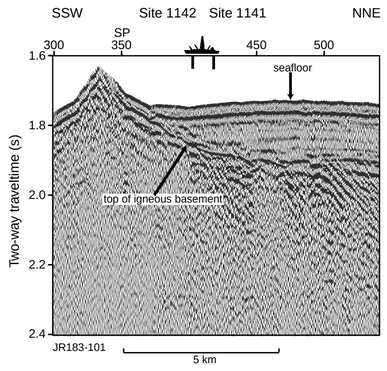
ODP *Proceedings, Initial Reports,* Volume 183: Chapter 1, Figure 4B. Plate reconstruction of the Kerguelen Plateau and Broken Ridge free-air gravity field (Sandwell and Smith, 1997) at C18n.2n$_o$ (40.1 Ma) using rotation poles of Royer and Rollet (1997). Broken Ridge is outlined in red, and Kerguelen Plateau sector boundaries are outlined in black. The axis of breakup between the Australian (Broken Ridge) and Antarctic (Kerguelen Plateau) plates is indicated by a dashed black line. Leg 183 drill sites (stars), Legs 119 and 120 drill sites (circles), and dredge or piston core locations (squares) where igneous basement was recovered are in black; where only sediment was penetrated, the symbols are white. A seismic profile and downhole hardrock lithologic summary diagram is shown for each of the Leg 183 drill sites where basement was recovered. The portion of the northern Kerguelen Plateau that overlaps with Broken Ridge at 40.1 Ma has been eliminated in this reconstruction because drilling results from Site 1140 indicate that the igneous crust postdates breakup of the two features. Similarly, the southernmost portion of Ninetyeast Ridge, which overlaps with the northern Kerguelen Plateau at 40.1 Ma, has been eliminated because drilling results from Site 254 indicate that the igneous crust postdates breakup of the two features. CDP = common depth point, SP = shotpoint, MD = *Marion Dufresne,* JR = *JOIDES Resolution,* RS = *Rig Seismic.*

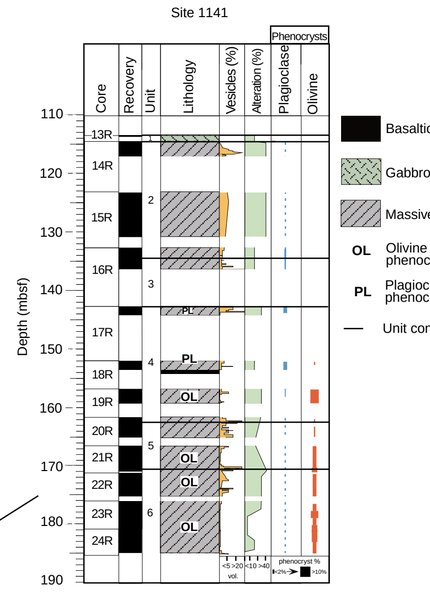


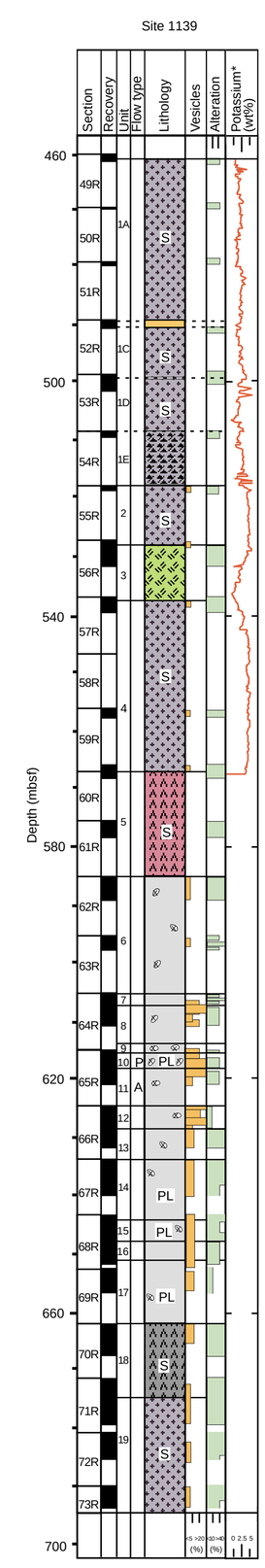


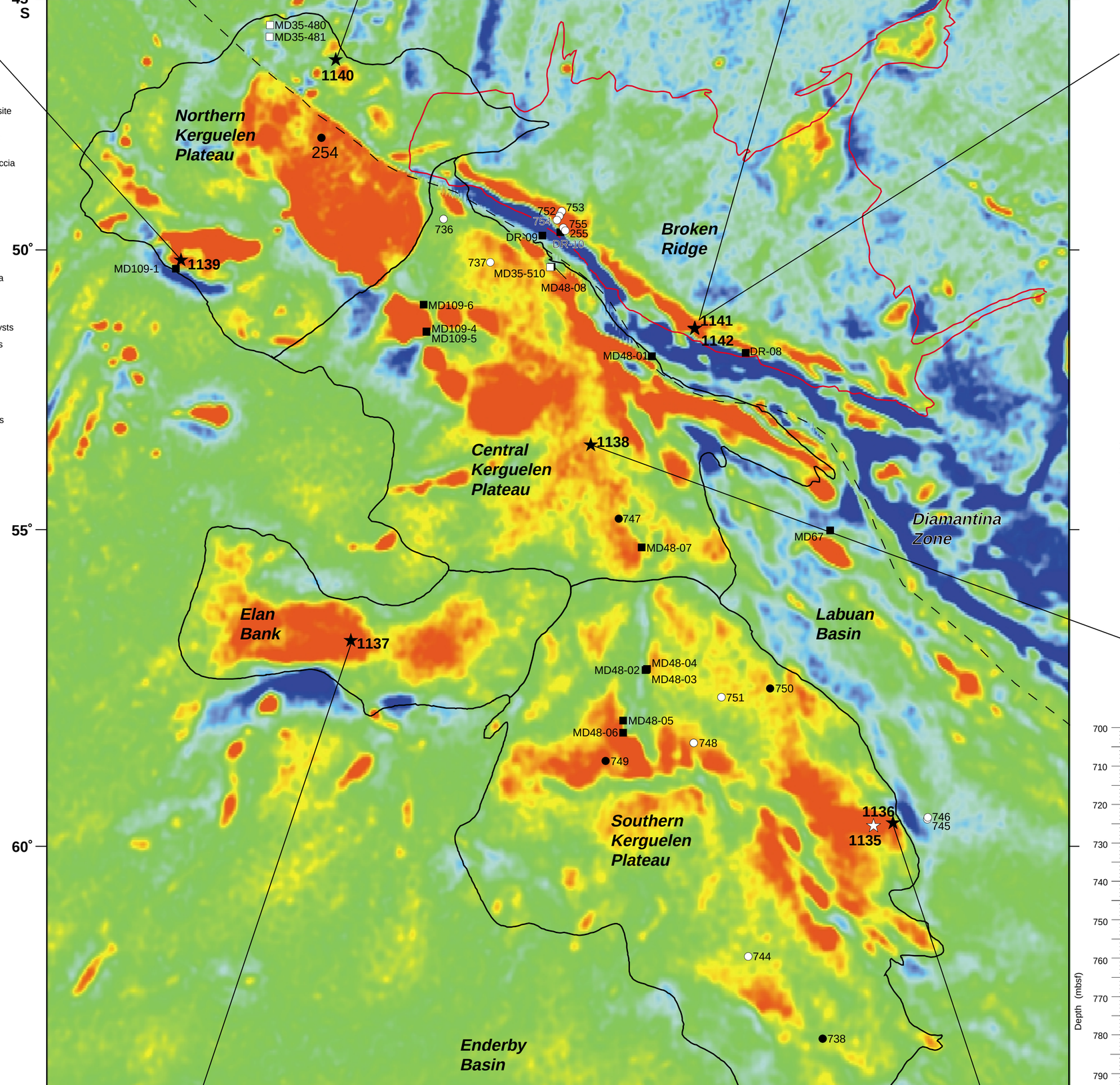


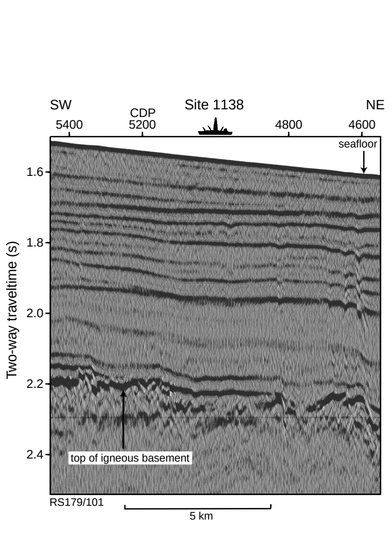


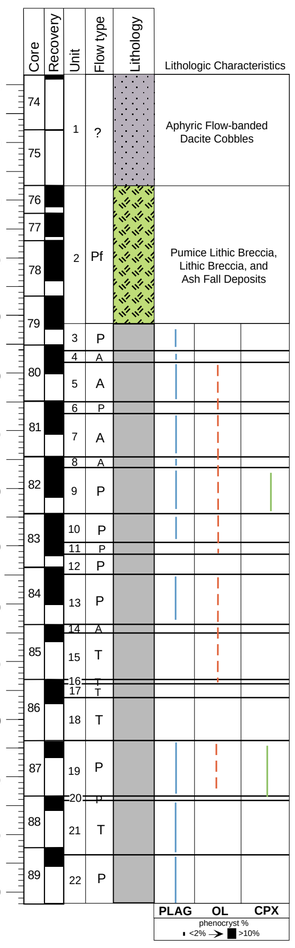


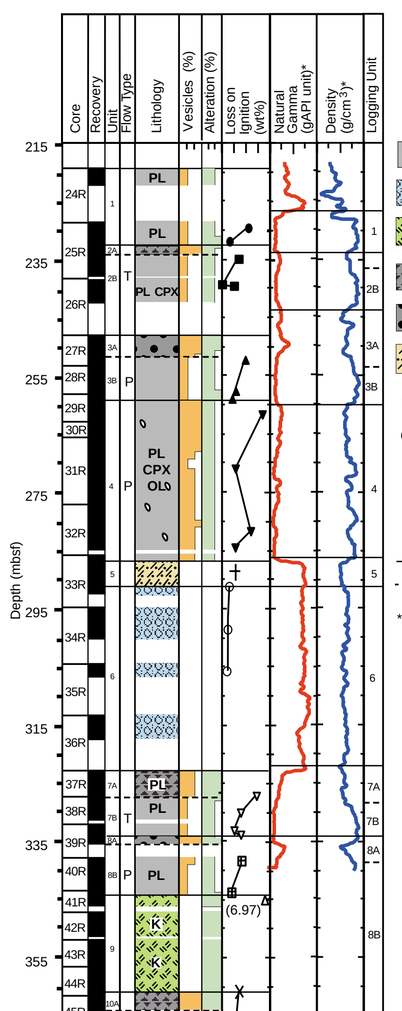


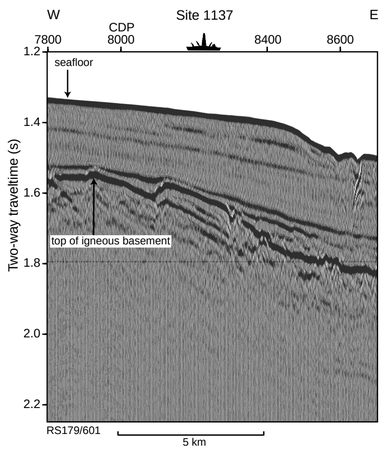


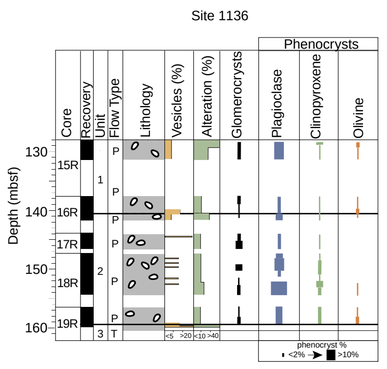


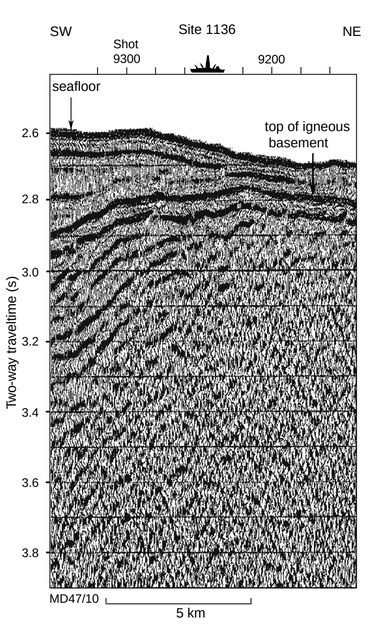




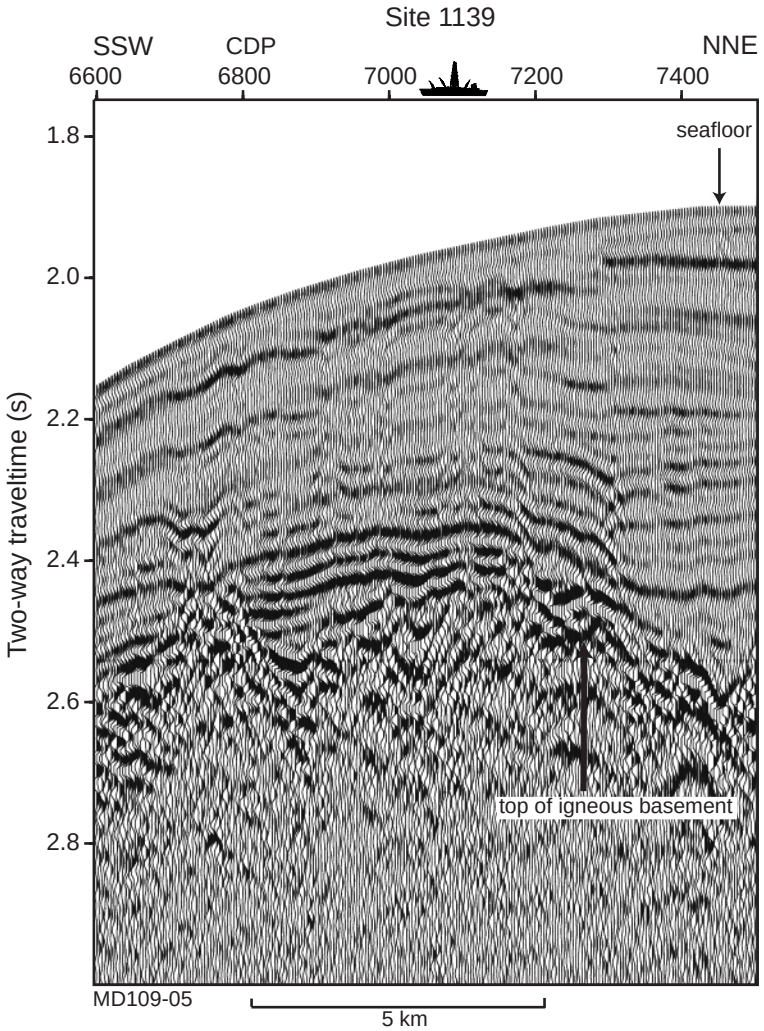


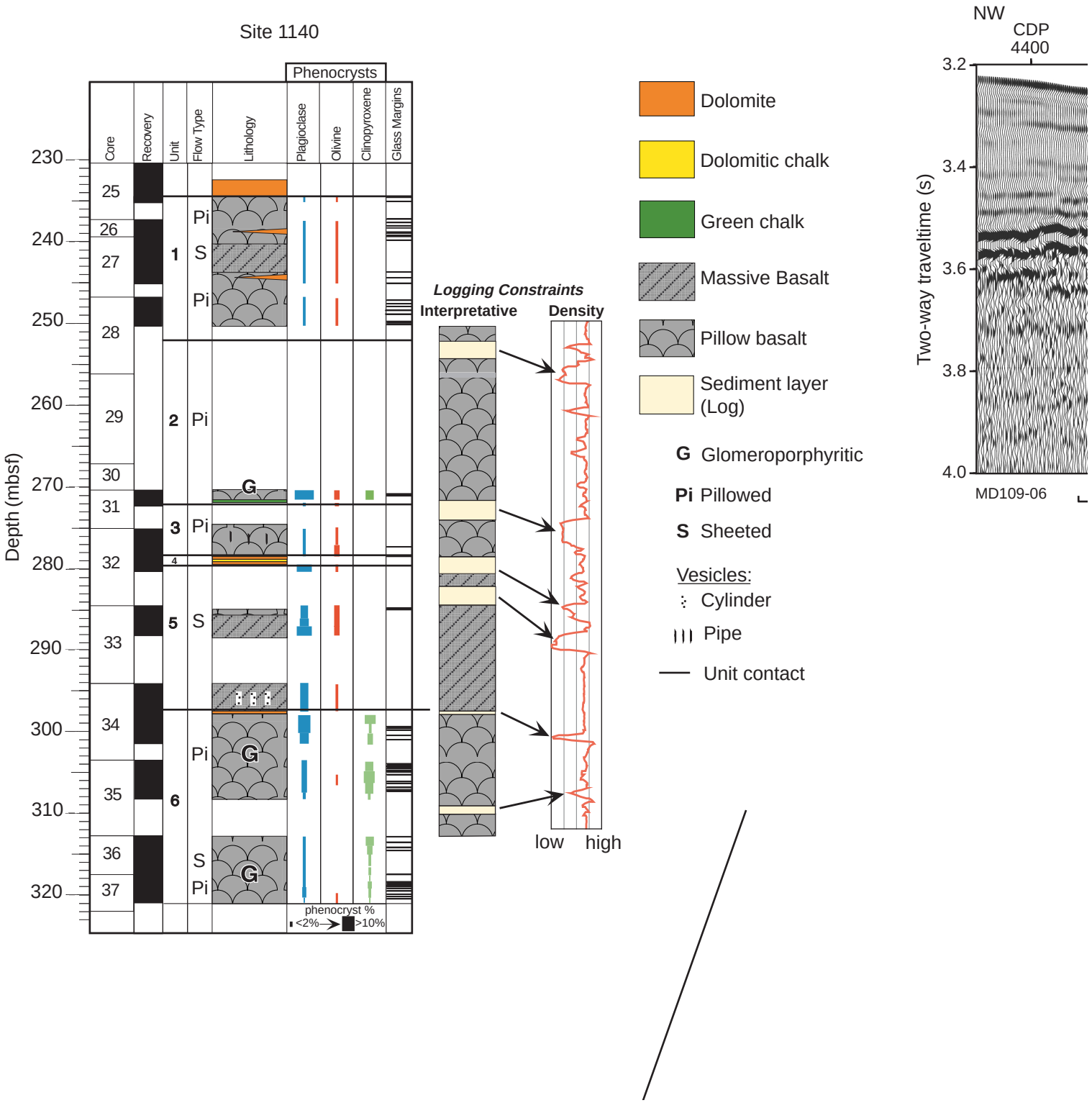


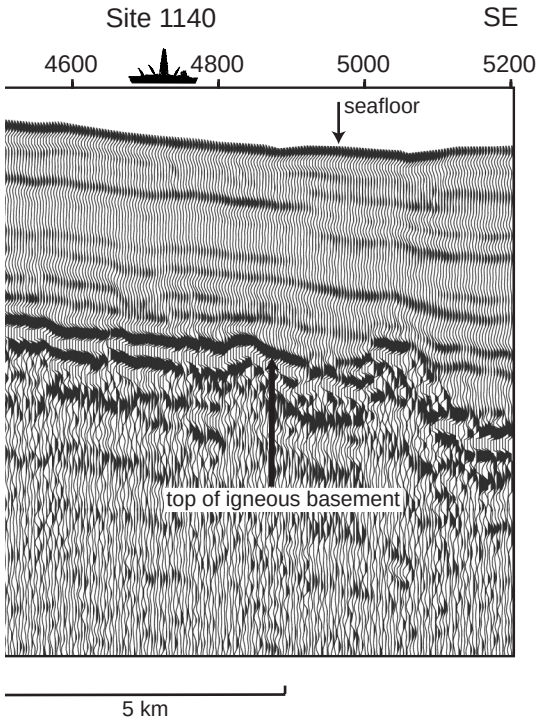


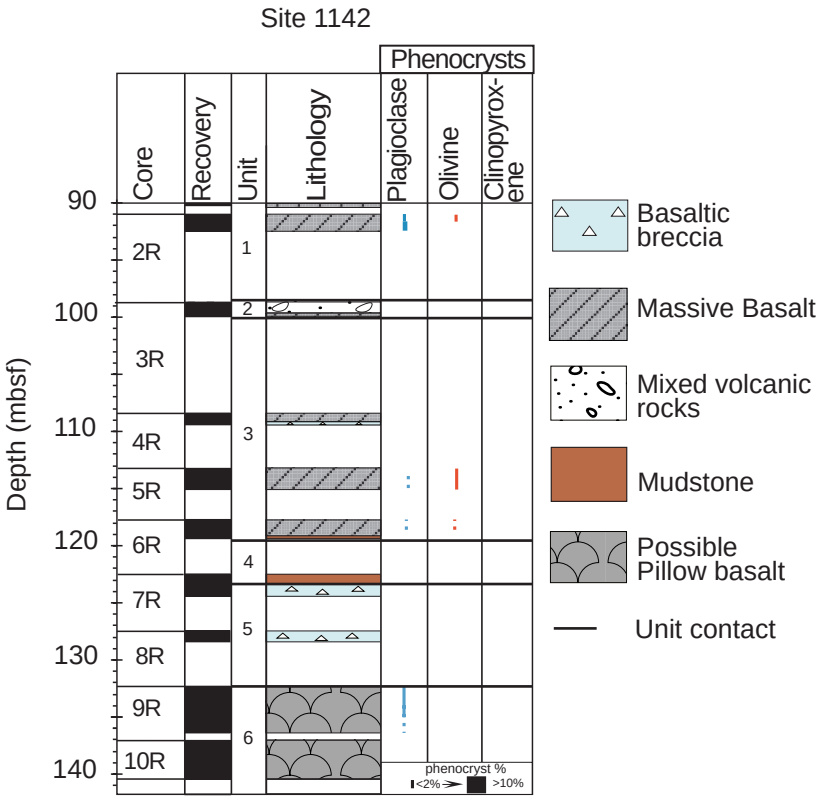


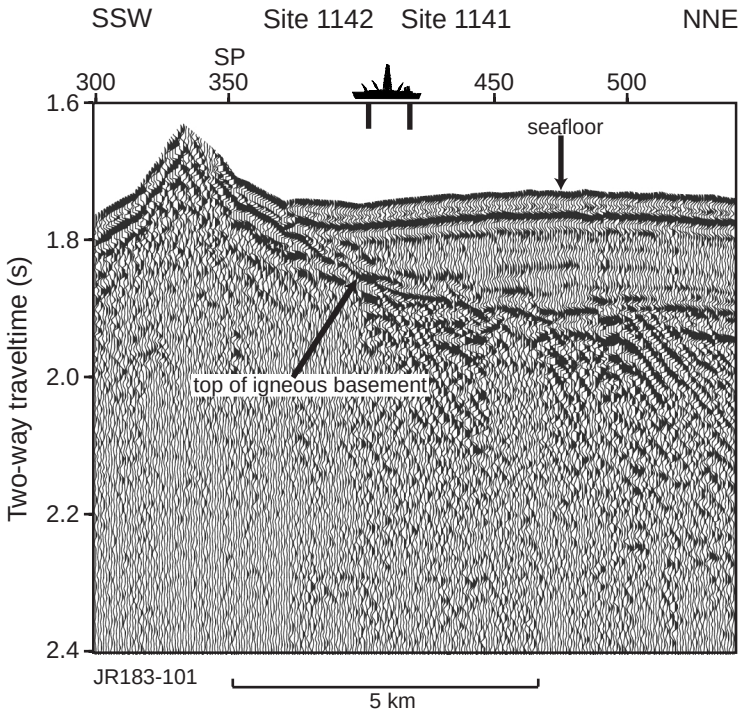
ODP *Proceedings, Initial Reports,* Volume 183: Chapter 1, Figure 4B. Plate reconstruction of the Kerguelen Plateau and Broken Ridge free-air gravity field (Sandwell and Smith, 1997) at C18n.2n$_o$ (40.1 Ma) using rotation poles of Royer and Rollet (1997). Broken Ridge is outlined in red, and Kerguelen Plateau sector boundaries are outlined in black. The axis of breakup between the Australian (Broken Ridge) and Antarctic (Kerguelen Plateau) plates is indicated by a dashed black line. Leg 183 drill sites (stars), Legs 119 and 120 drill sites (circles), and dredge or piston core locations (squares) where igneous basement was recovered are in black; where only sediment was penetrated, the symbols are white. A seismic profile and downhole hardrock lithologic summary diagram is shown for each of the Leg 183 drill sites where basement was recovered. The portion of the northern Kerguelen Plateau that overlaps with Broken Ridge at 40.1 Ma has been eliminated in this reconstruction because drilling results from Site 1140 indicate that the igneous crust postdates breakup of the two features. Similarly, the southernmost portion of Ninetyeast Ridge, which overlaps with the northern Kerguelen Plateau at 40.1 Ma, has been eliminated because drilling results from Site 254 indicate that the igneous crust postdates breakup of the two features. CDP = common depth point, SP = shotpoint, MD = *Marion Dufresne*, JR = *JOIDES Resolution*, RS = *Rig Seismic*.

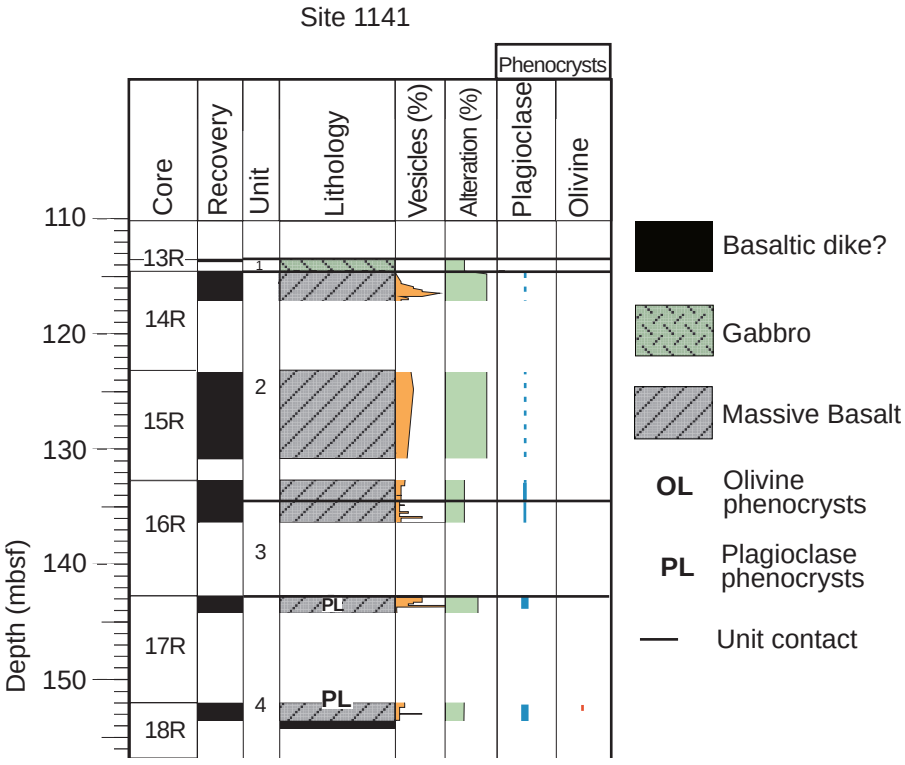


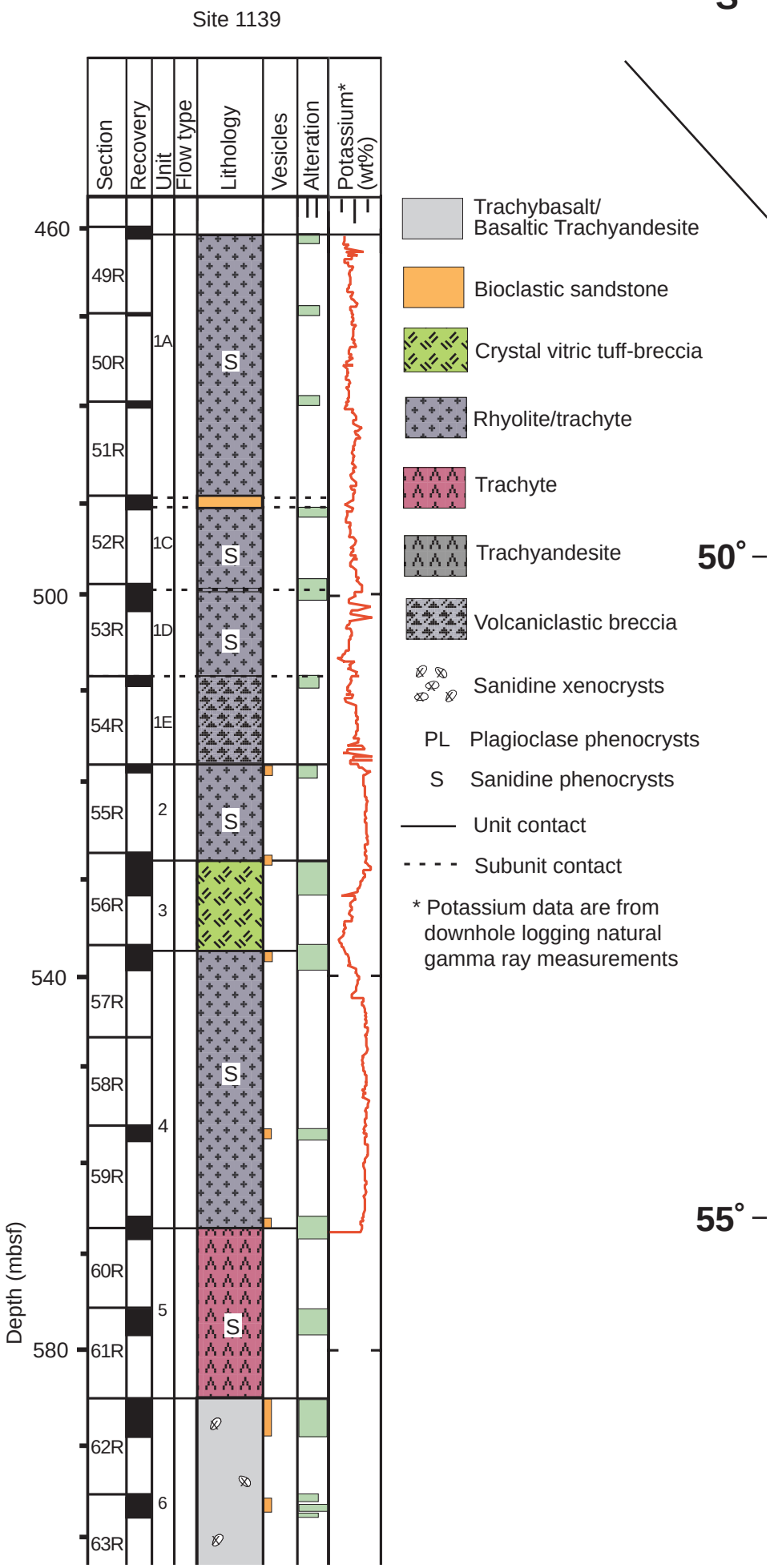

Site 1140
Phenocrysts
Core
Recovery
Unit
Flow Type
Lithology
Plagioclase
Olivine
Clinopyroxene
Glass Margins
Depth (mbsf)
230
240
250
260
270
280
290
300
310
320
25
26
27
28
29
30
31
32
33
34
35
36
37
1
2
3
4
5
6
Pi
S
G
phenocryst %
<2%
>10%
Logging Constraints
Interpretative
Density
low
high
Dolomite
Dolomitic chalk
Green chalk
Massive Basalt
Pillow basalt
Sediment layer (Log)
G Glomeroporphyritic
Pi Pillowed
S Sheeted
Vesicles:
Cylinder
Pipe
Unit contact
NW
CDP 4400
3.2
3.4
3.6
3.8
4.0
Two-way traveltime (s)
MD109-06

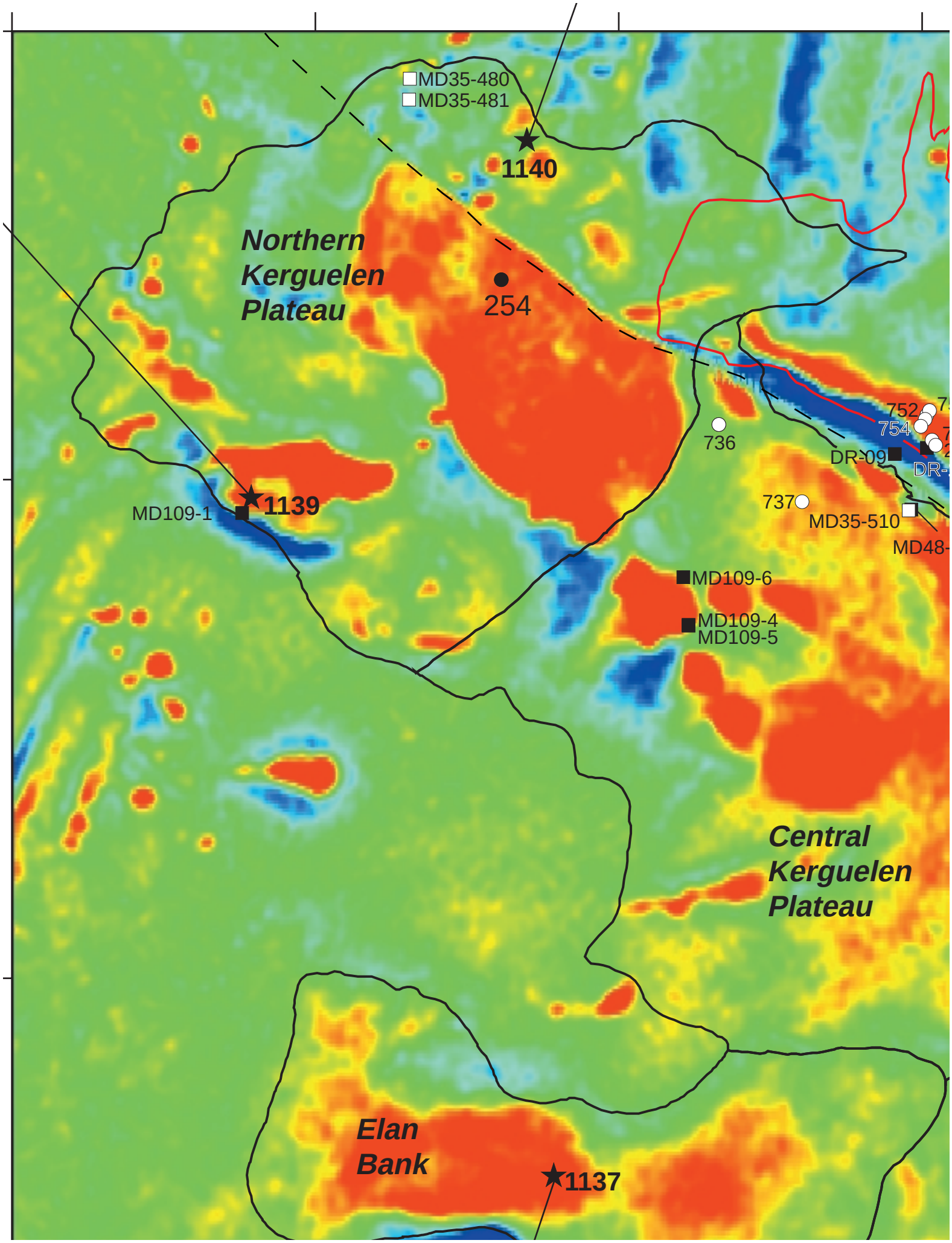

Site 1140
SE
4600
4800
5000
5200
seafloor
top of igneous basement
5 km

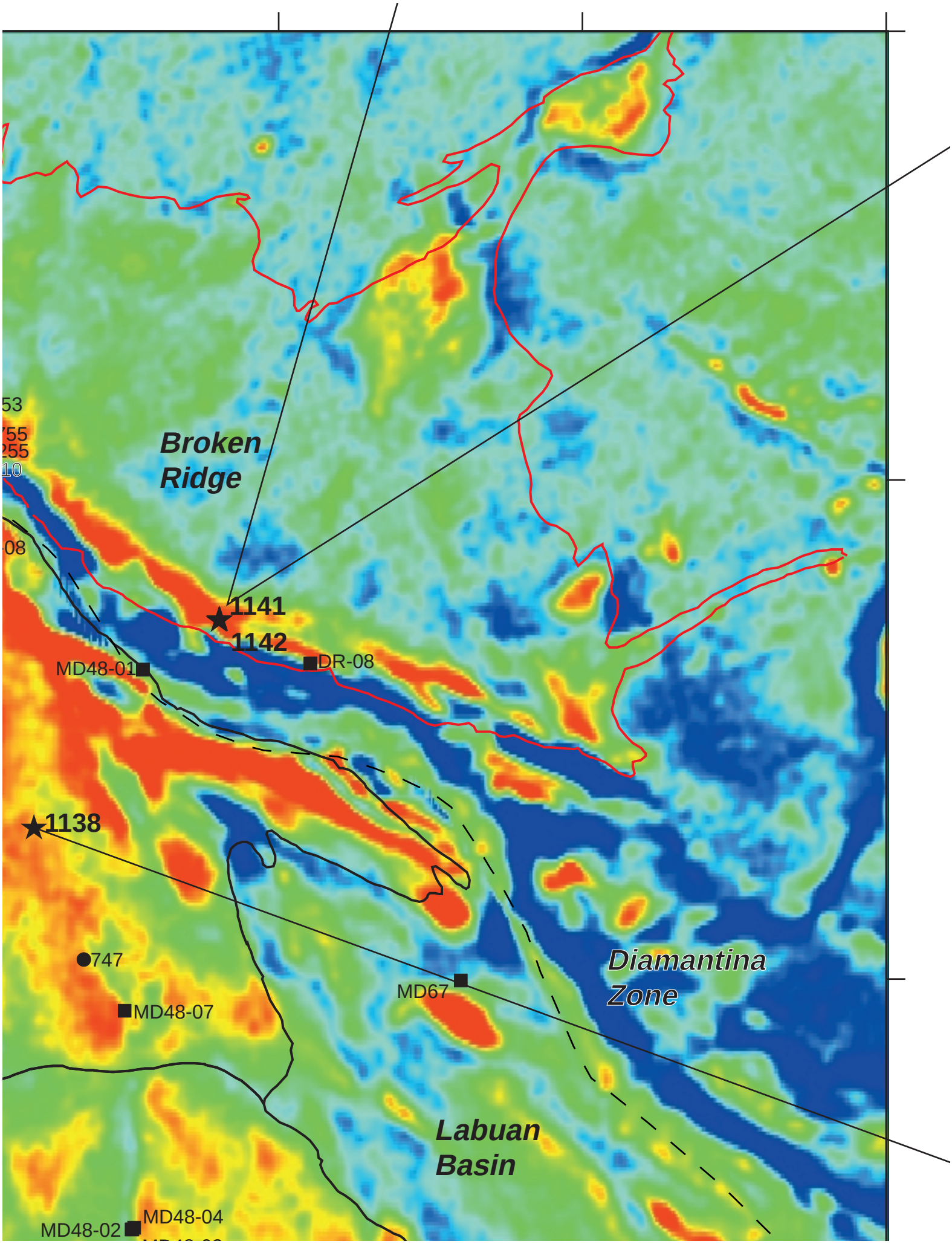

Site 1142
Phenocrysts
Core
Recovery
Unit
Lithology
Plagioclase
Olivine
Clinopyrox-ene
Depth (mbsf)
90
100
110
120
130
140
2R
3R
4R
5R
6R
7R
8R
9R
10R
1
2
3
4
5
6
phenocryst %
<2%
>10%
Basaltic breccia
Massive Basalt
Mixed volcanic rocks
Mudstone
Possible Pillow basalt
Unit contact

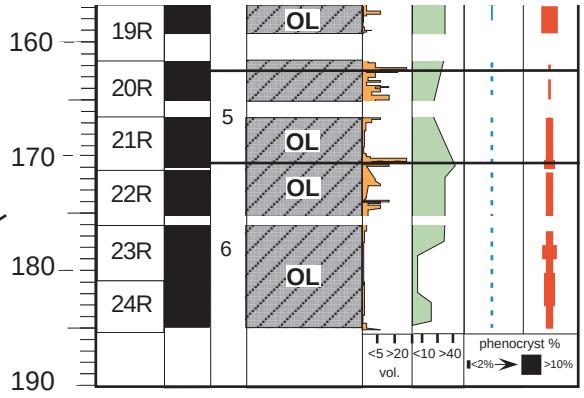

SSW
Site 1142
Site 1141
NNE
SP
300
350
450
500
1.6
1.8
2.0
2.2
2.4
Two-way traveltime (s)
seafloor
top of igneous basement
JR183-101
5 km

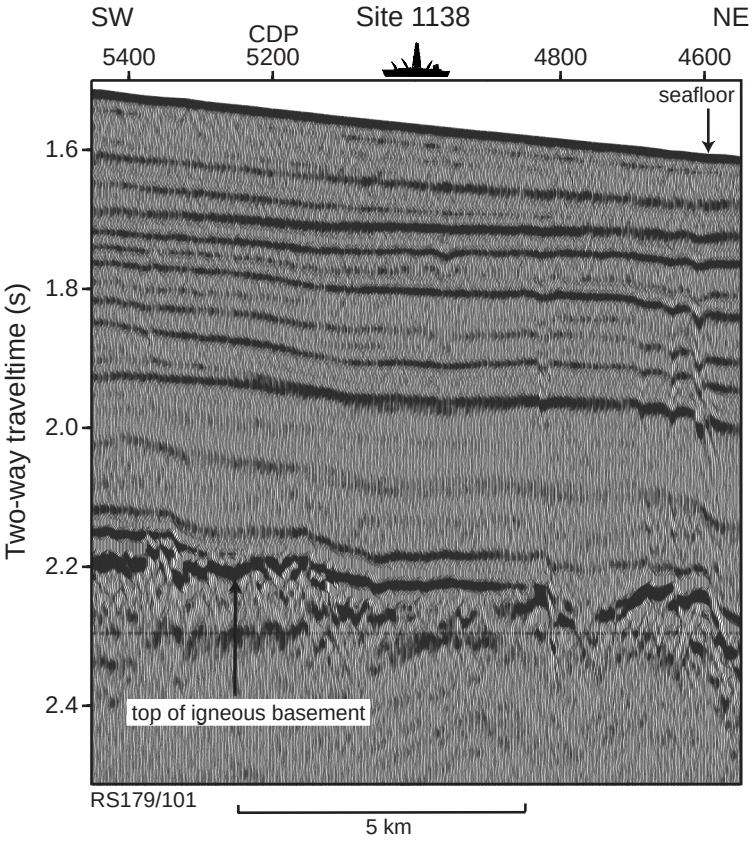

Site 1141
Phenocrysts
Core
Recovery
Unit
Lithology
Vesicles (%)
Alteration (%)
Plagioclase
Olivine
110
120
130
140
150
Depth (mbsf)
13R
14R
15R
16R
17R
18R
1
2
3
4
PL
PL
Basaltic dike?
Gabbro
Massive Basalt
OL
Olivine phenocrysts
PL
Plagioclase phenocrysts
Unit contact


45° S
Site 1139
Section
Recovery
Unit
Flow type
Lithology
Vesicles
Alteration
Potassium* (wt%)
Depth (mbsf)
460
500
540
580
49R
50R
51R
52R
53R
54R
55R
56R
57R
58R
59R
60R
61R
62R
63R
1A
1C
1D
1E
2
3
4
5
6
S
50°
55°
Trachybasalt/ Basaltic Trachyandesite
Bioclastic sandstone
Crystal vitric tuff-breccia
Rhyolite/trachyte
Trachyte
Trachyandesite
Volcaniclastic breccia
Sanidine xenocrysts
PL Plagioclase phenocrysts
S Sanidine phenocrysts
Unit contact
Subunit contact
* Potassium data are from downhole logging natural gamma ray measurements

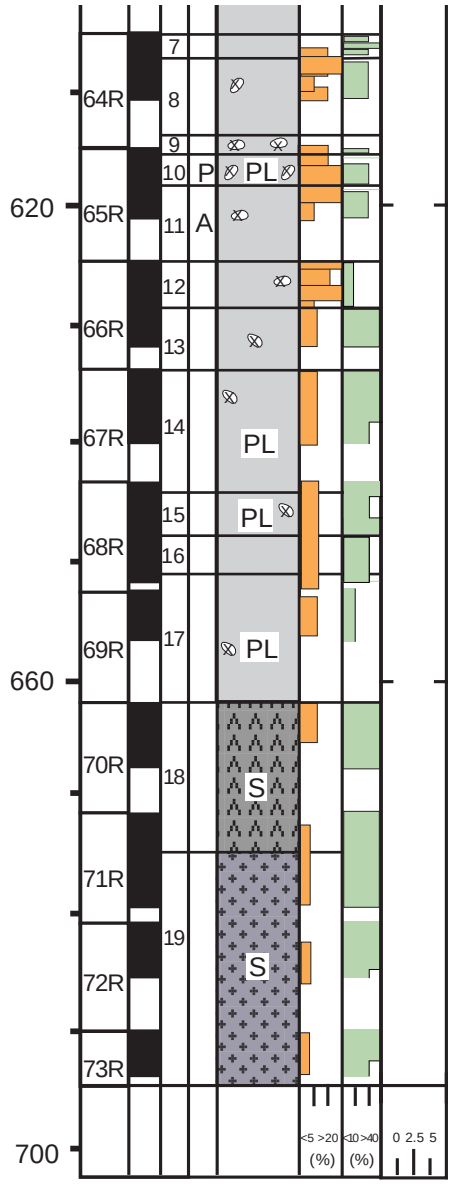

MD35-480
MD35-481
1140
Northern
Kerguelen
Plateau
254
736
752
754
DR-09
737
MD35-510
MD109-1
1139
MD109-6
MD109-4
MD109-5
Central
Kerguelen
Plateau
Elan
Bank
1137


Broken
Ridge
1141
1142
MD48-01
DR-08
1138
747
MD48-07
MD67
Diamantina
Zone
Labuan
Basin
MD48-02
MD48-04


160
170
180
190
19R
20R
21R
22R
23R
24R
5
6
OL
OL
OL
OL
<5 >20
<10 >40
vol.
phenocryst %
<2%
>10%

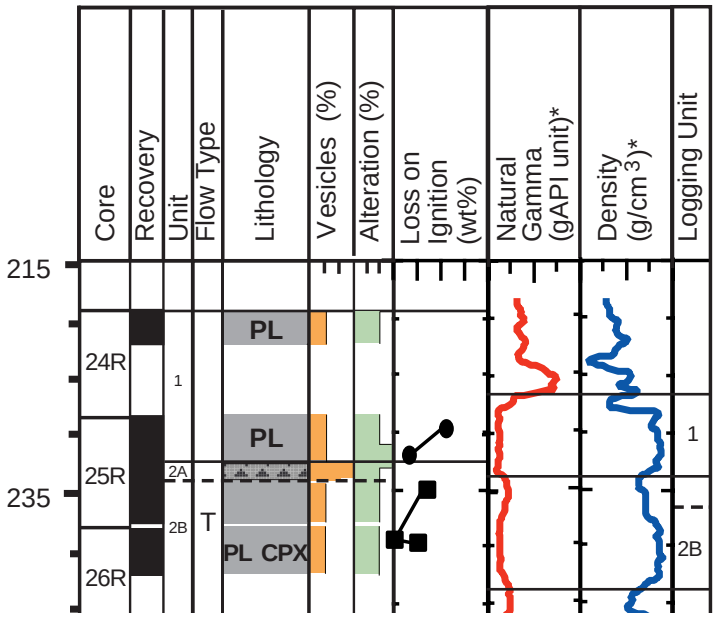

SW
Site 1138
NE
CDP
5400
5200
4800
4600
seafloor
1.6
1.8
2.0
2.2
2.4
Two-way traveltime (s)
top of igneous basement
RS179/101
5 km

Site 1138



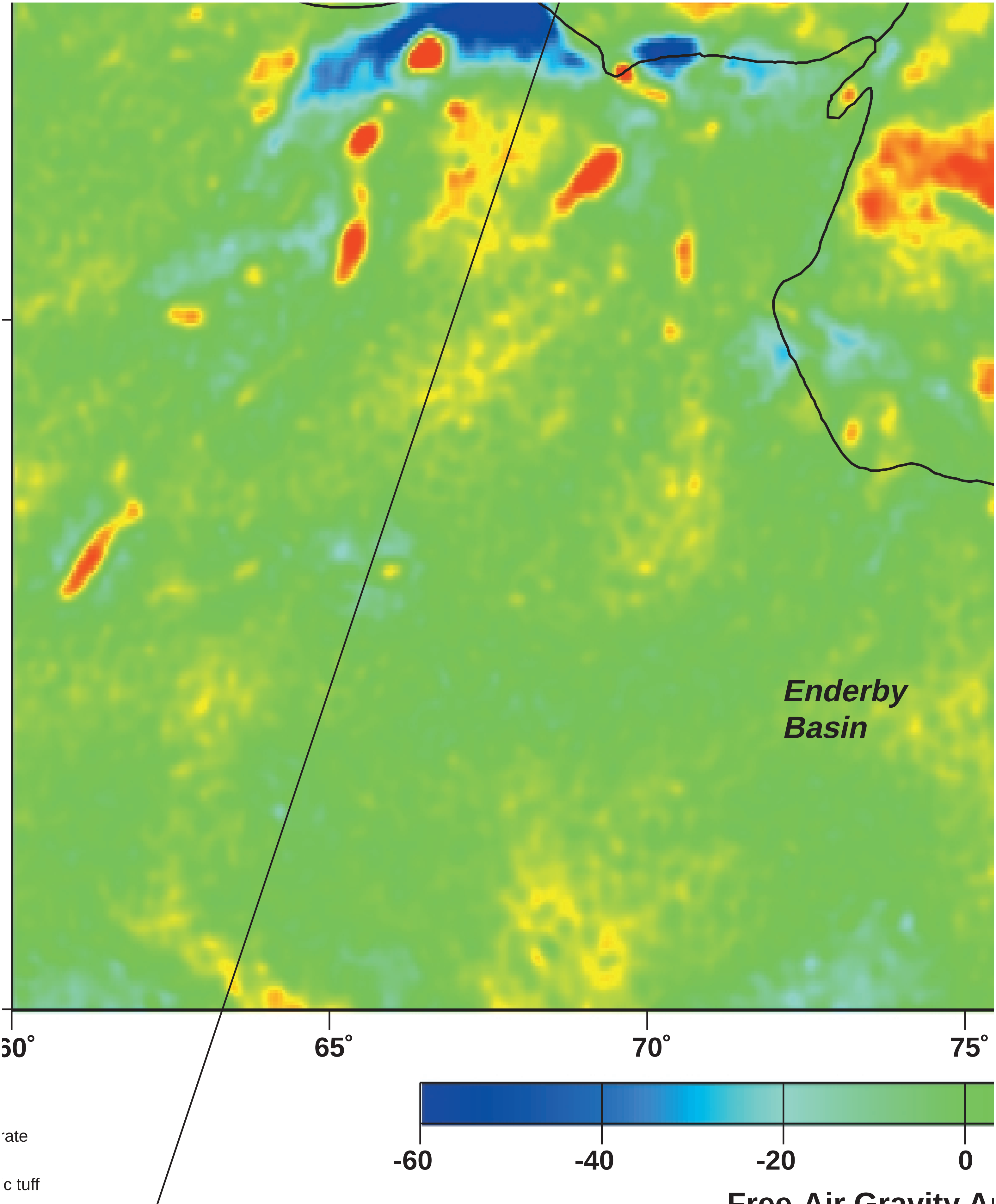
60°

Site 1137



65°

E

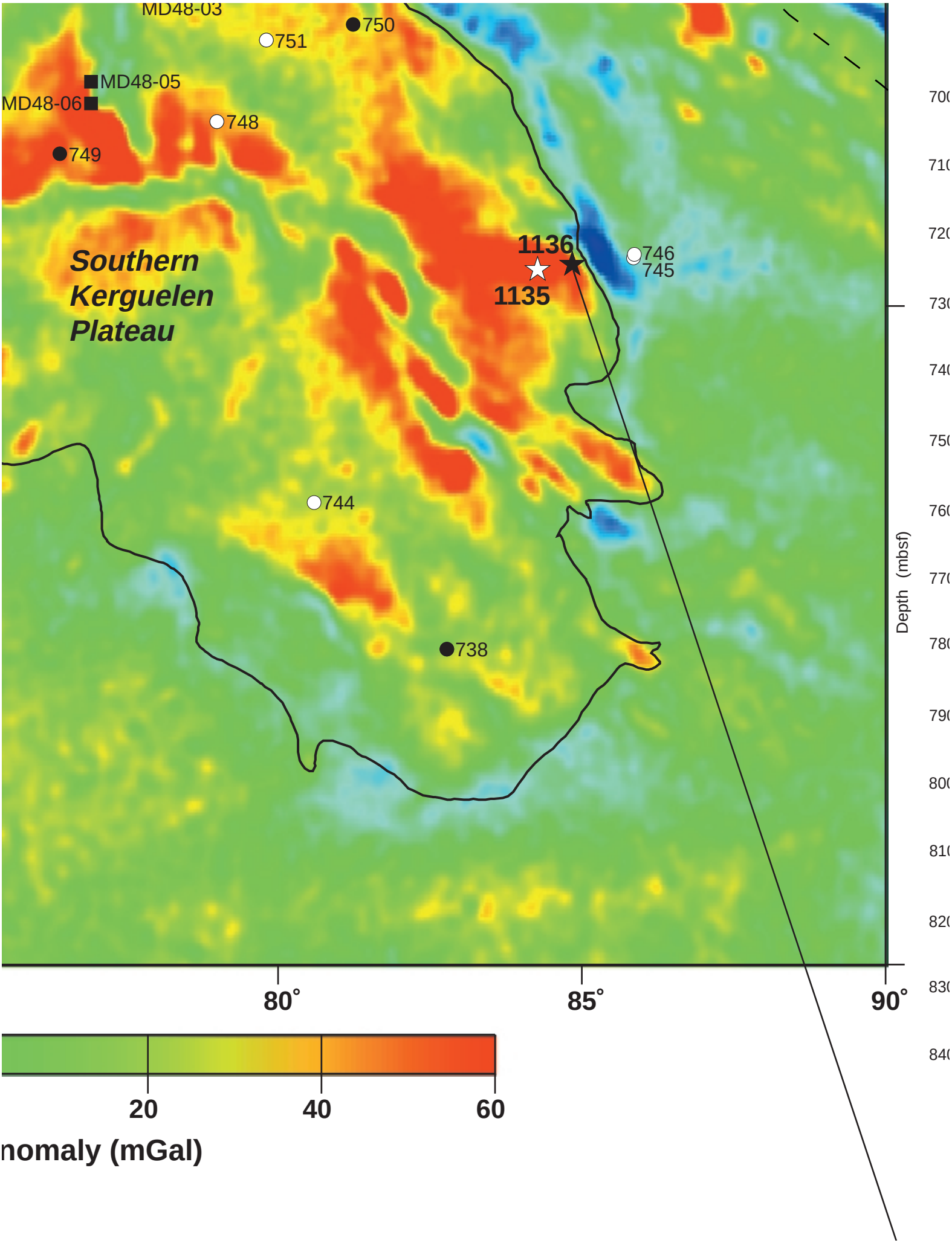


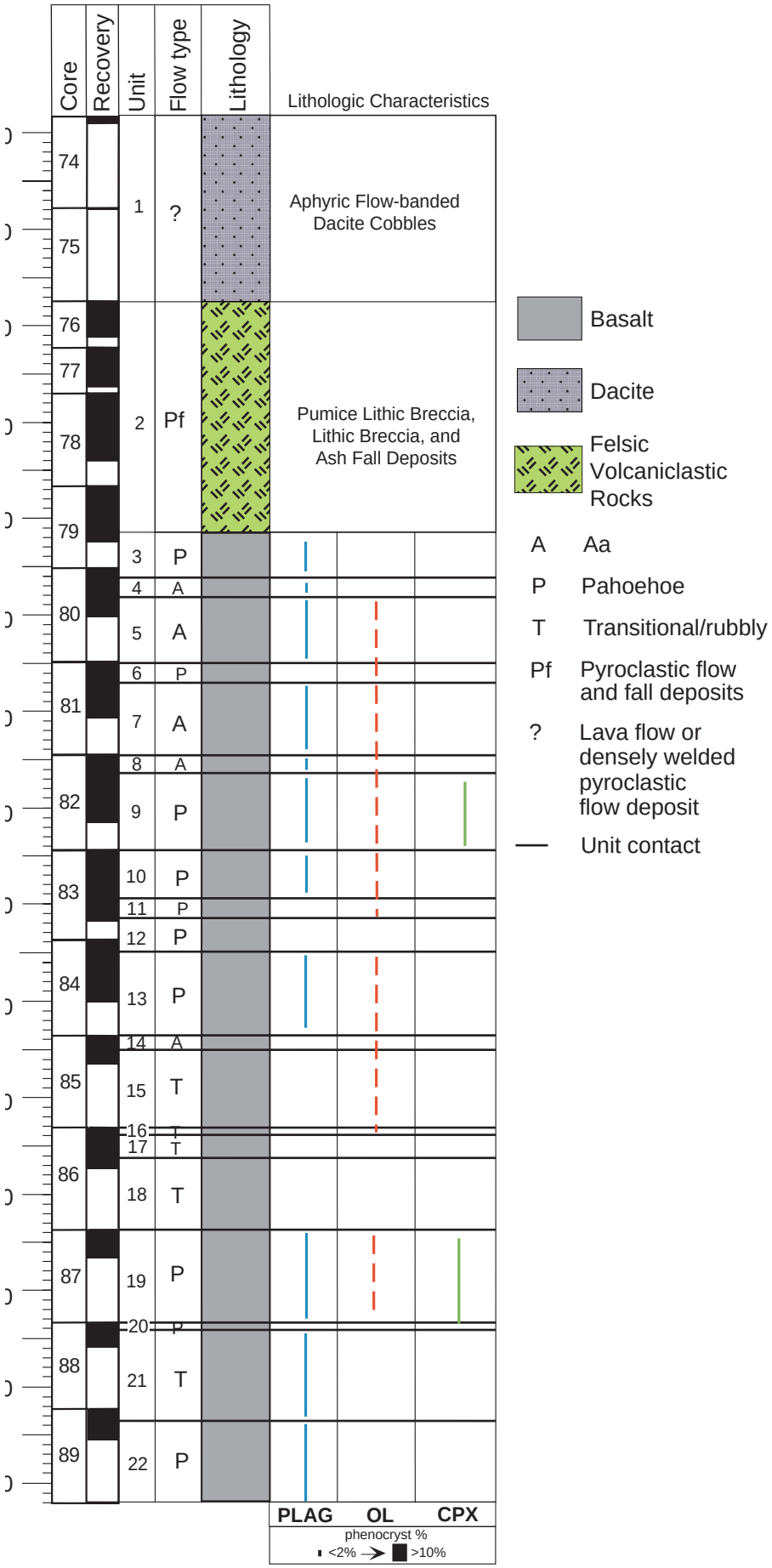
rate

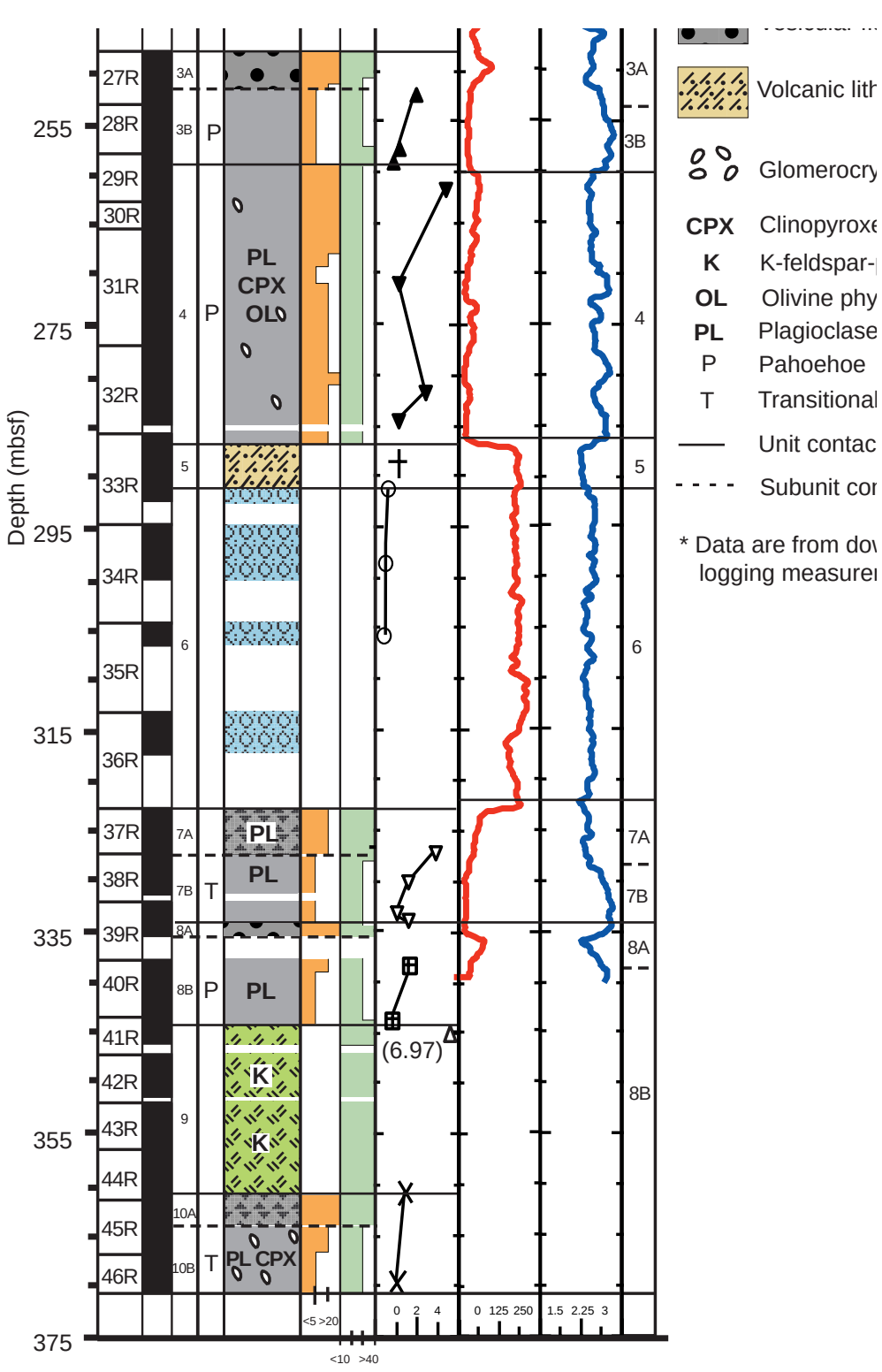
c tuff

eccia

owtop


MD48-03
750
751
MD48-05
MD48-06
748
749
Southern
Kerguelen
Plateau
1136
1135
746
745
744
738
80°
85°
90°
Depth (mbsf)
700
710
720
730
740
750
760
770
780
790
800
810
820
830
840
20
40
60
nomaly (mGal)


Core
Recovery
Unit
Flow type
Lithology
Lithologic Characteristics
74
75
1
?
Aphyric Flow-banded Dacite Cobbles
76
77
78
79
2
Pf
Pumice Lithic Breccia, Lithic Breccia, and Ash Fall Deposits
80
81
82
83
84
85
86
87
88
89
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
P
A
A
P
A
A
P
P
P
P
A
T
T
T
P
P
T
P
PLAG
OL
CPX
phenocryst %
<2%
>10%
Basalt
Dacite
Felsic Volcaniclastic Rocks
A Aa
P Pahoehoe
T Transitional/rubbly
Pf Pyroclastic flow and fall deposits
? Lava flow or densely welded pyroclastic flow deposit
Unit contact


Depth (mbsf)
255
275
295
315
335
355
375
27R
28R
29R
30R
31R
32R
33R
34R
35R
36R
37R
38R
39R
40R
41R
42R
43R
44R
45R
46R
3A
3B
4
5
6
7A
7B
8A
8B
9
10A
10B
P
T
PL
CPX
OL
K
(6.97)
<5 >20
<10 >40
0 2 4
0 125 250
1.5 2.25 3
Volcanic lith
Glomerocry
CPX Clinopyroxe
K K-feldspar-
OL Olivine phy
PL Plagioclase
P Pahoehoe
T Transitional
Unit contac
Subunit cor
* Data are from dov
logging measurer

ıic sandstone

ʏsts

ɛne-phyric

phyric

ʏic

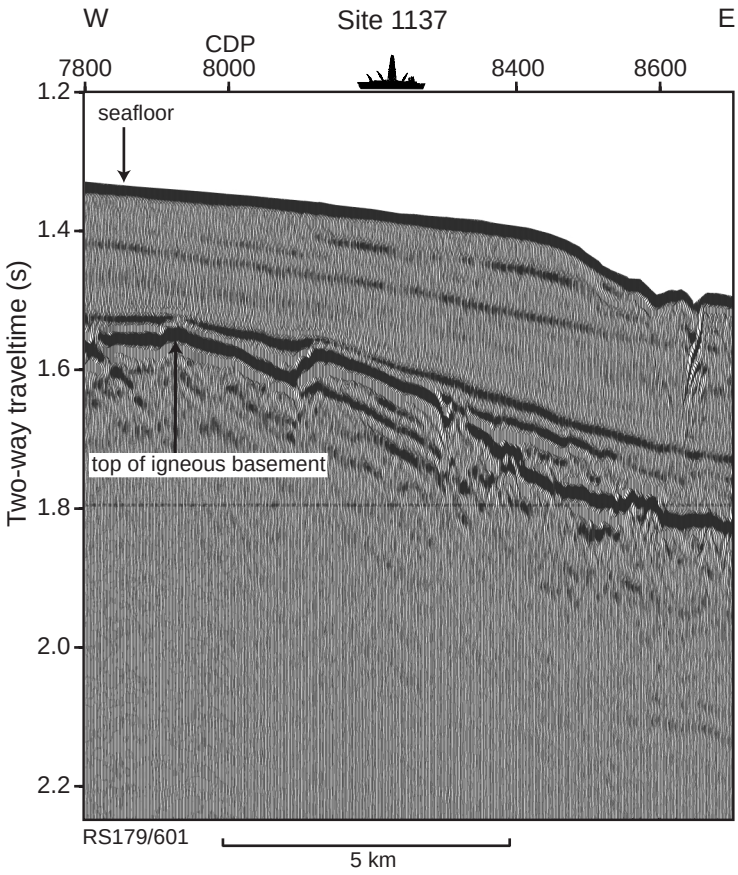
ɛ-phyric

l/rubbly

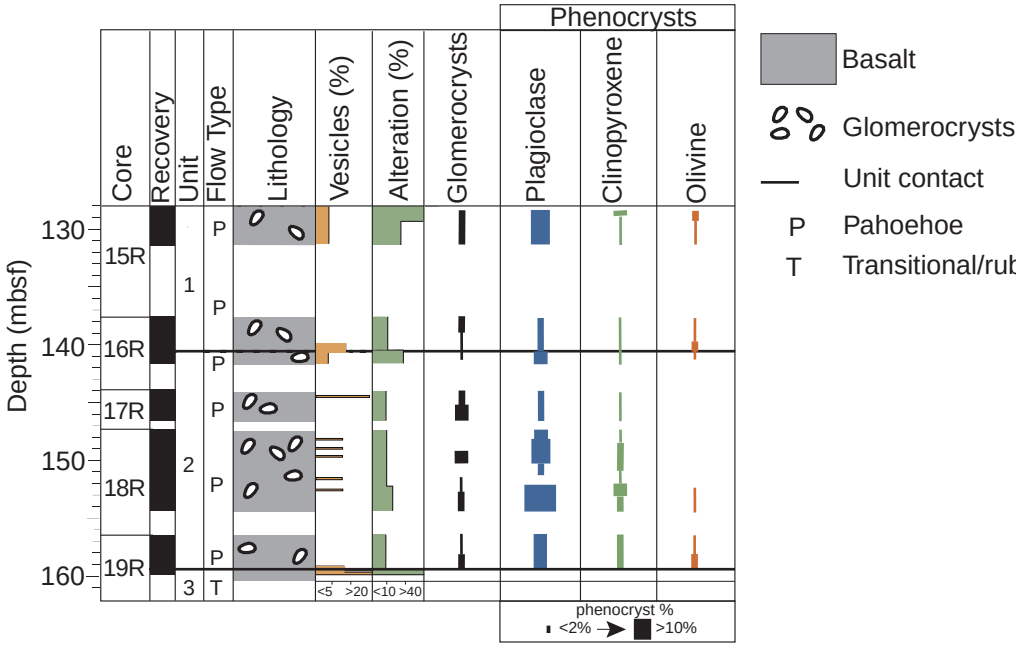
t

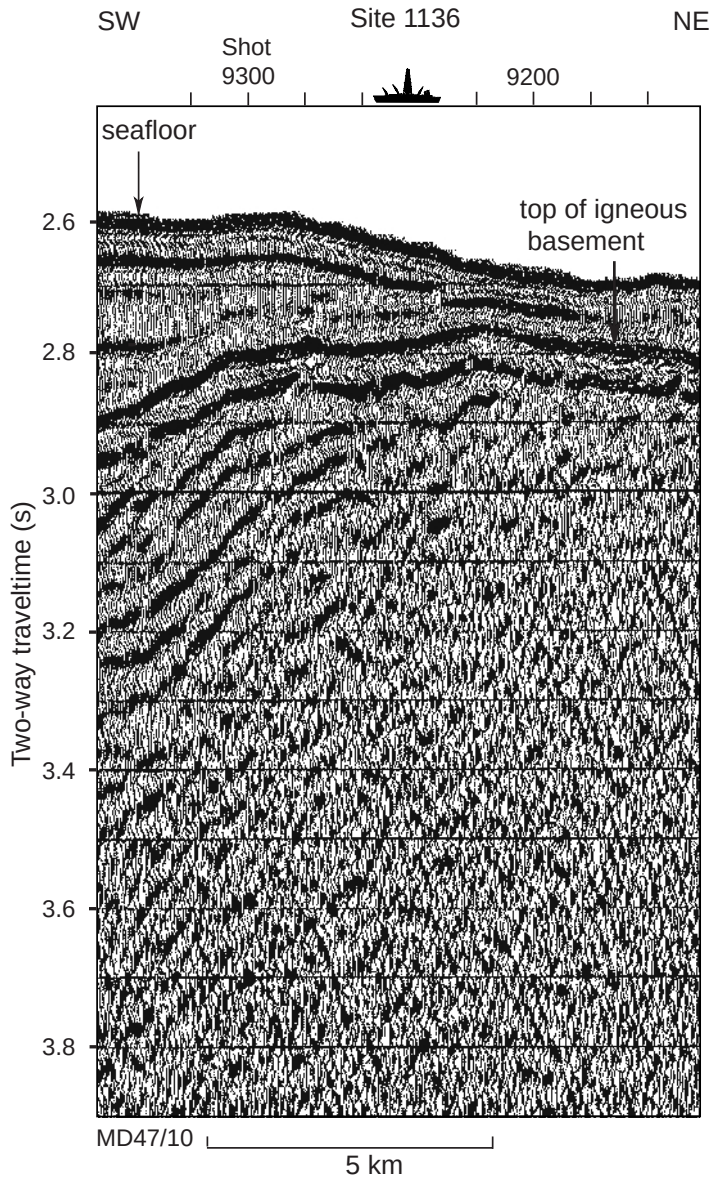
ıtact

ʍnhole
ments



Site 1136


Phenocrysts
Core
Recovery
Unit
Flow Type
Lithology
Vesicles (%)
Alteration (%)
Glomerocrysts
Plagioclase
Clinopyroxene
Olivine
Depth (mbsf)
130
140
150
160
15R
16R
17R
18R
19R
1
2
3
P
P
P
P
P
P
T
<5
>20
<10
>40
phenocryst %
<2%
>10%
Basalt
Glomerocrysts
Unit contact
P Pahoehoe
T Transitional/rub


SW
Site 1136
NE
Shot
9300
9200
seafloor
top of igneous
basement
2.6
2.8
3.0
3.2
3.4
3.6
3.8
Two-way traveltime (s)
MD47/10
5 km