# Initial Look at 3D Seismic Data Acquired over the Galicia Rifted Margin


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Luke Holroyd, U. Birmingham, UK



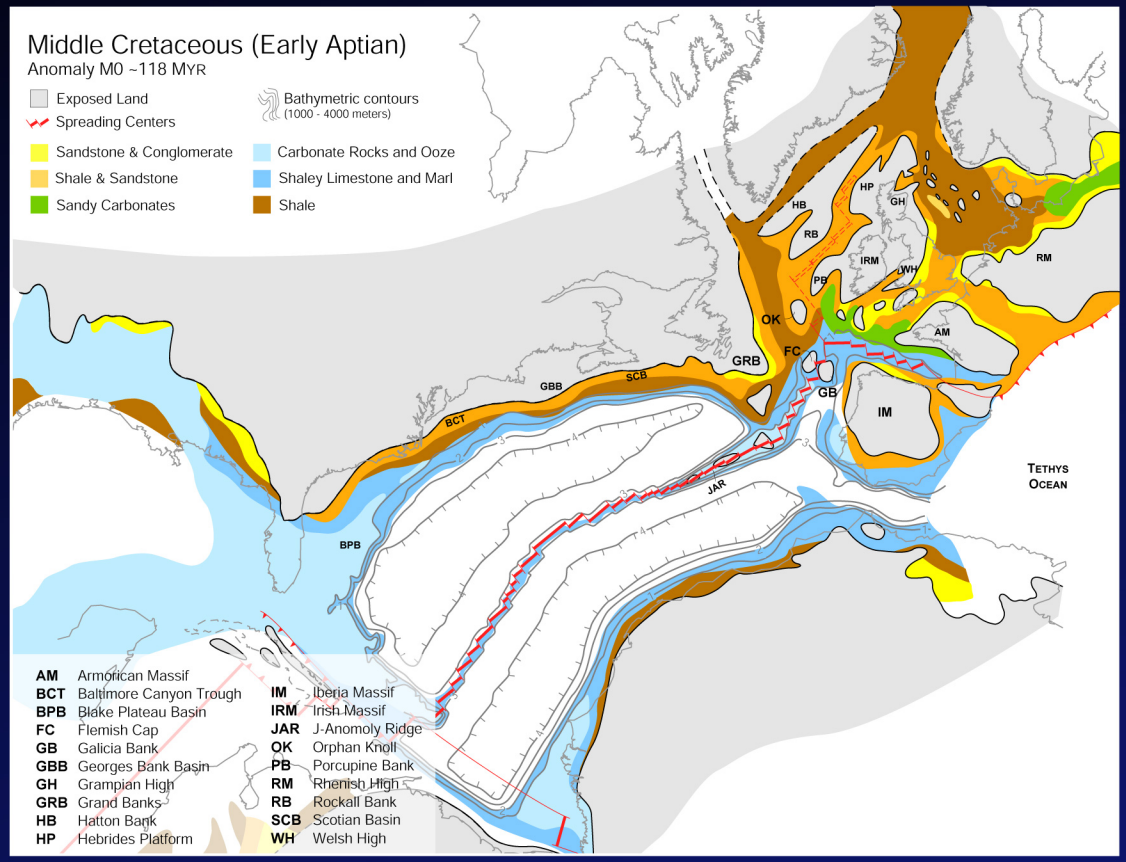
## We Thank

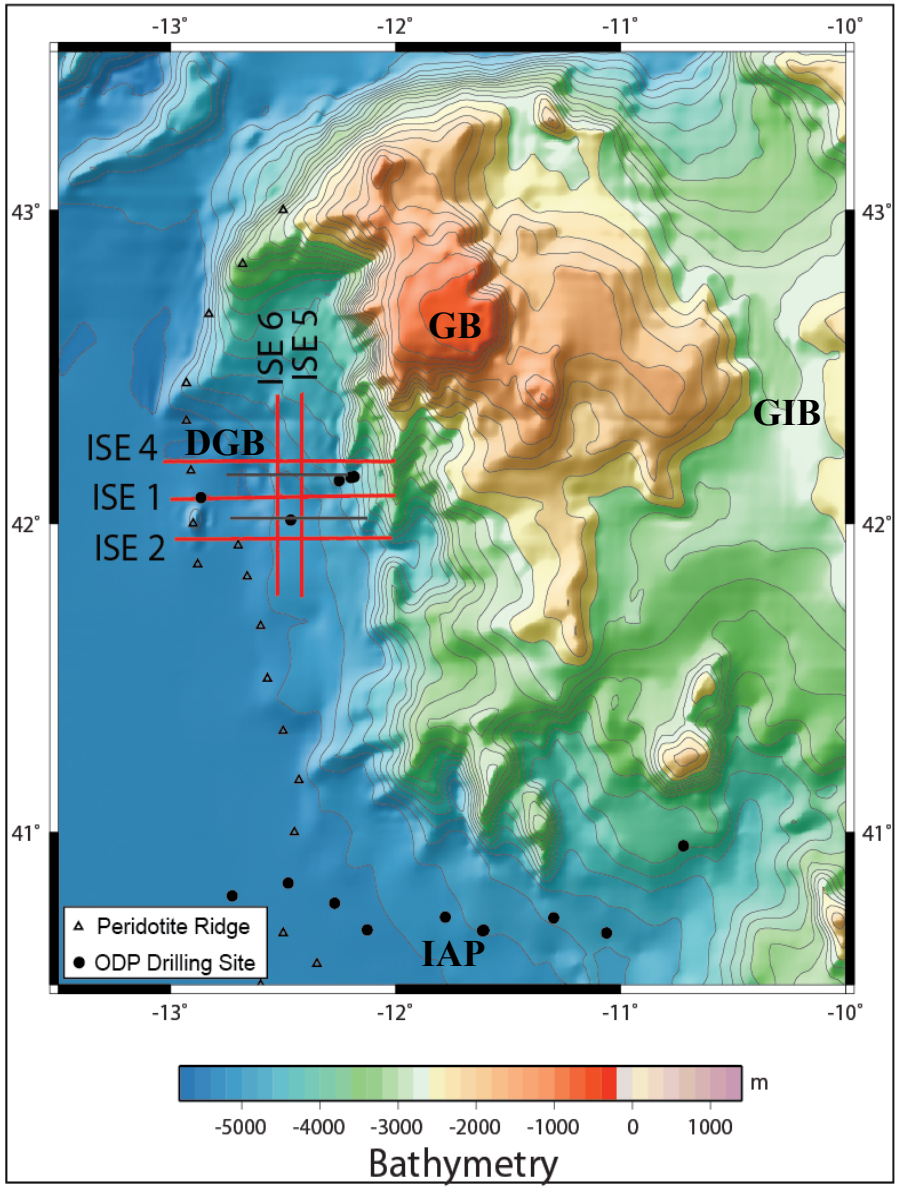
NSF

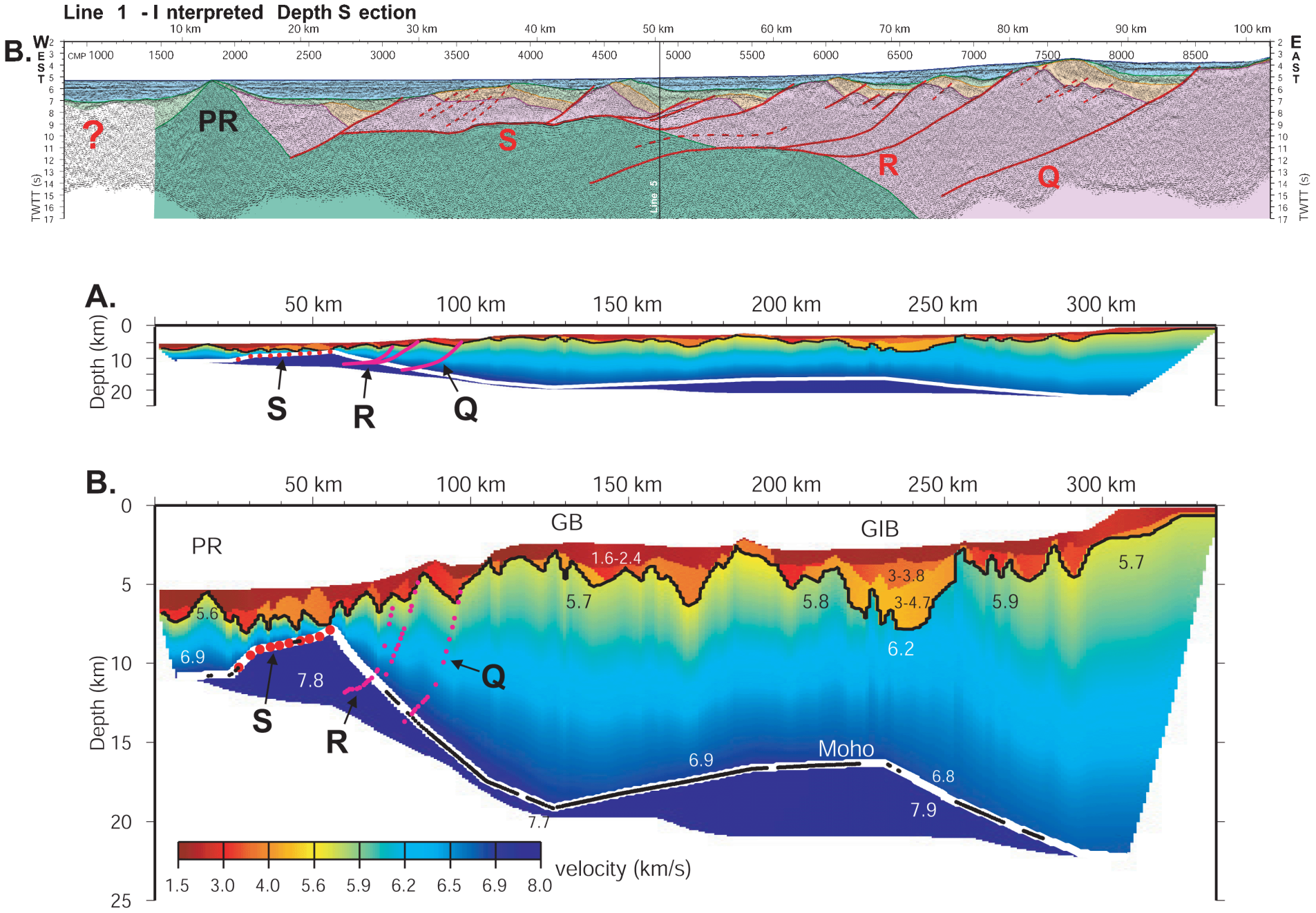
NATURAL ENVIRONMENT RESEARCH COUNCIL

DFG Deutsche Forschungsgemeinschaft

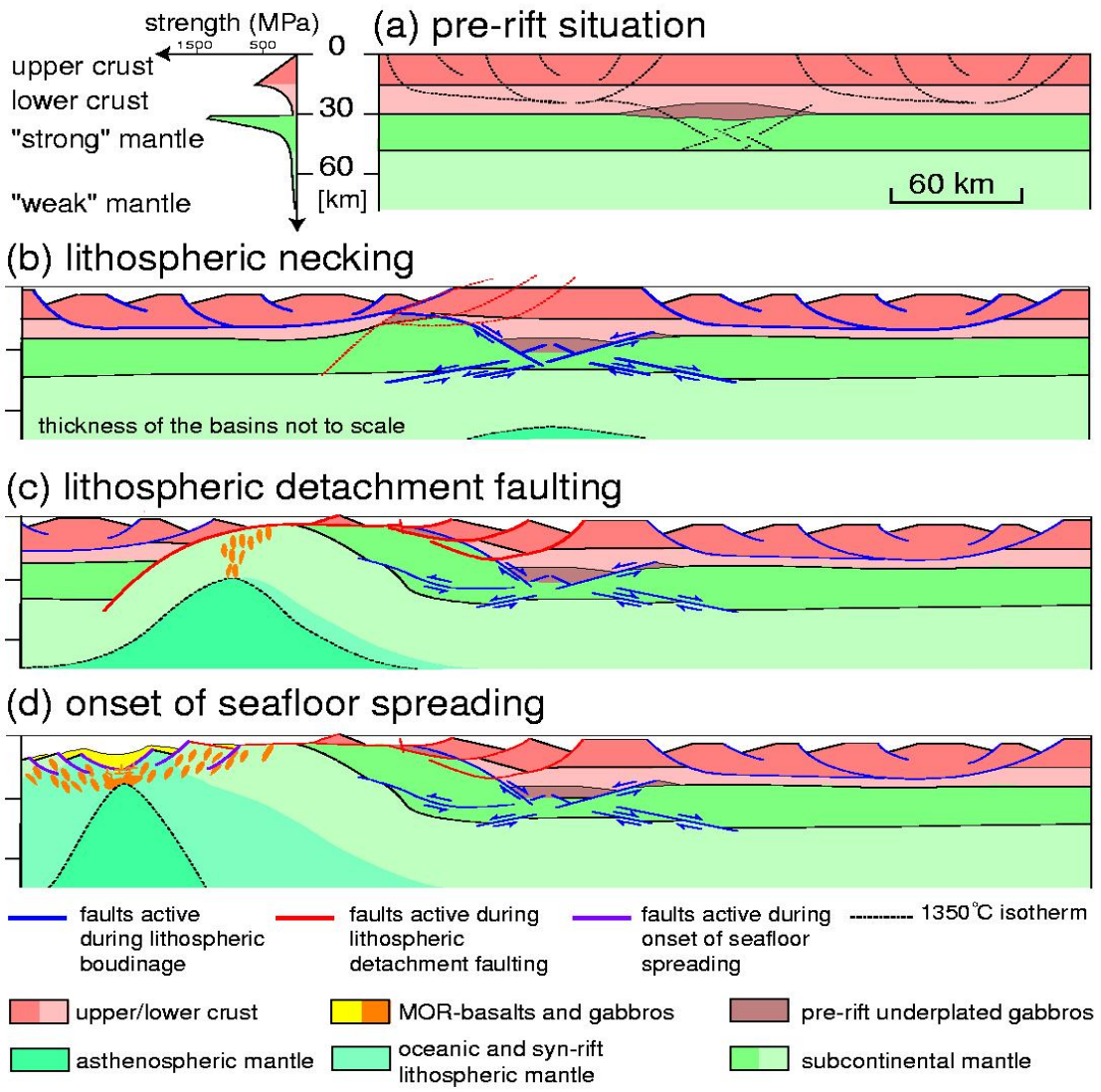
# Tectonic Evolution - Mid Cretaceous




-13°
-12°
-11°
-10°
43°
42°
41°
GB
GIB
DGB
ISE 6
ISE 5
ISE 4
ISE 1
ISE 2
IAP
Peridotite Ridge
ODP Drilling Site
m
-5000
-4000
-3000
-2000
-1000
0
1000
Bathymetry

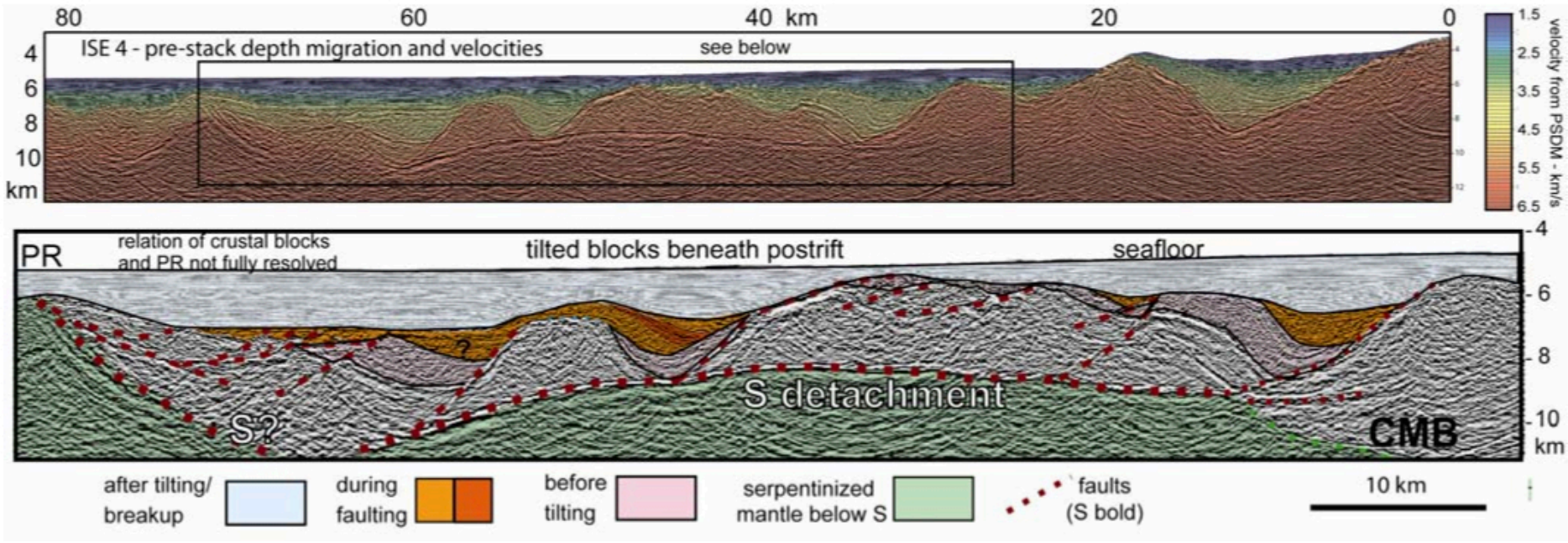

Line 1 - Interpreted Depth Section
B.
WEST
EAST
CMP 1000
10 km
20 km
30 km
40 km
50 km
60 km
70 km
80 km
90 km
100 km
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
8000
8500
TWTT (s)
?
PR
S
R
Q
Line 5
A.
Depth (km)
50 km
100 km
150 km
200 km
250 km
300 km
S
R
Q
B.
PR
GB
GIB
1.6-2.4
5.7
5.6
5.8
3-3.8
3-4.7
5.9
6.2
6.9
7.8
Moho
6.8
7.9
7.7
velocity (km/s)
1.5
3.0
4.0
5.6
5.9
6.2
6.5
6.9
8.0

# Models for detachment faulting and mantle exhumation

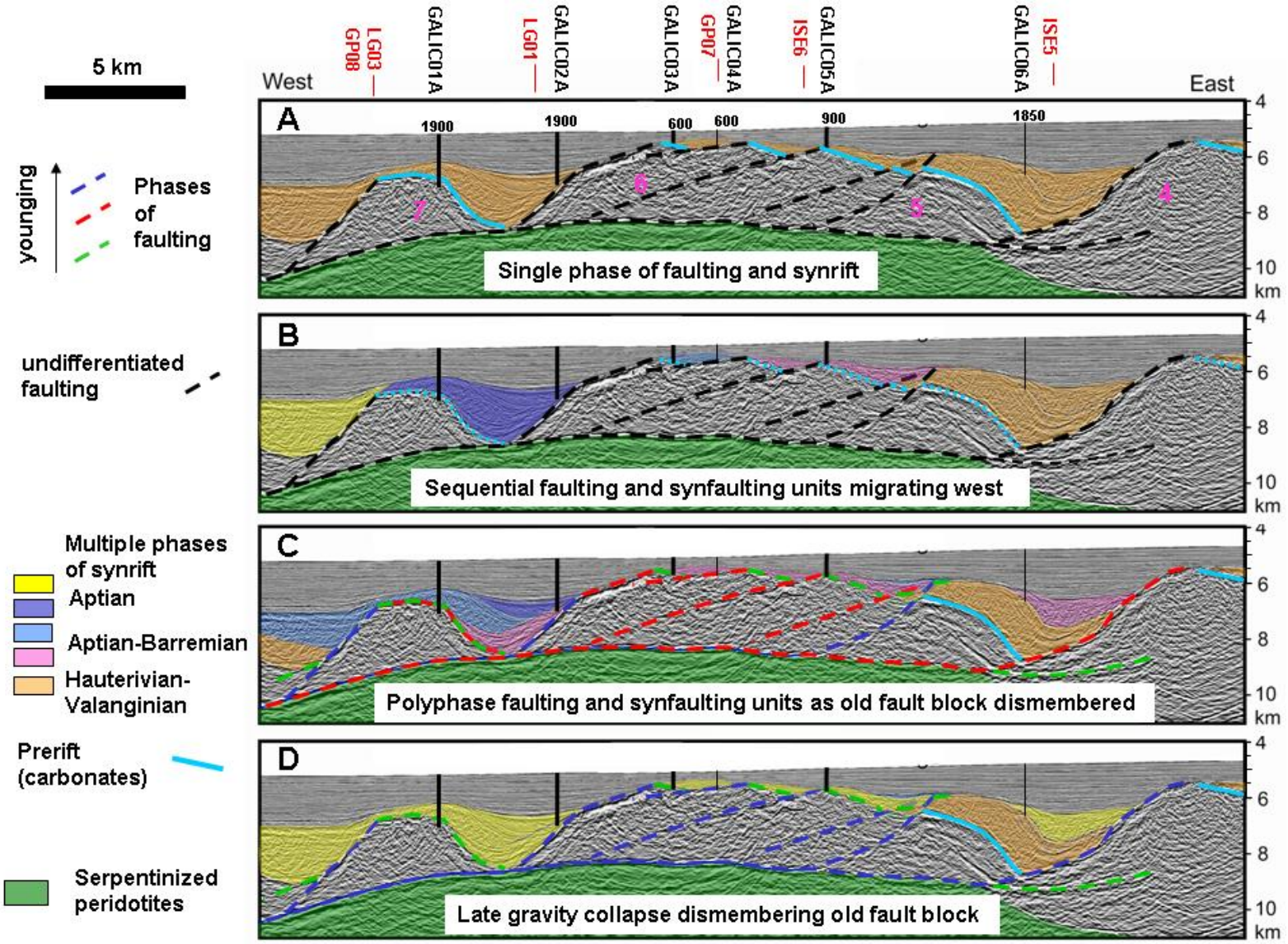



Whitmarsh et al. (2001)

# Focus of this project: the S reflector



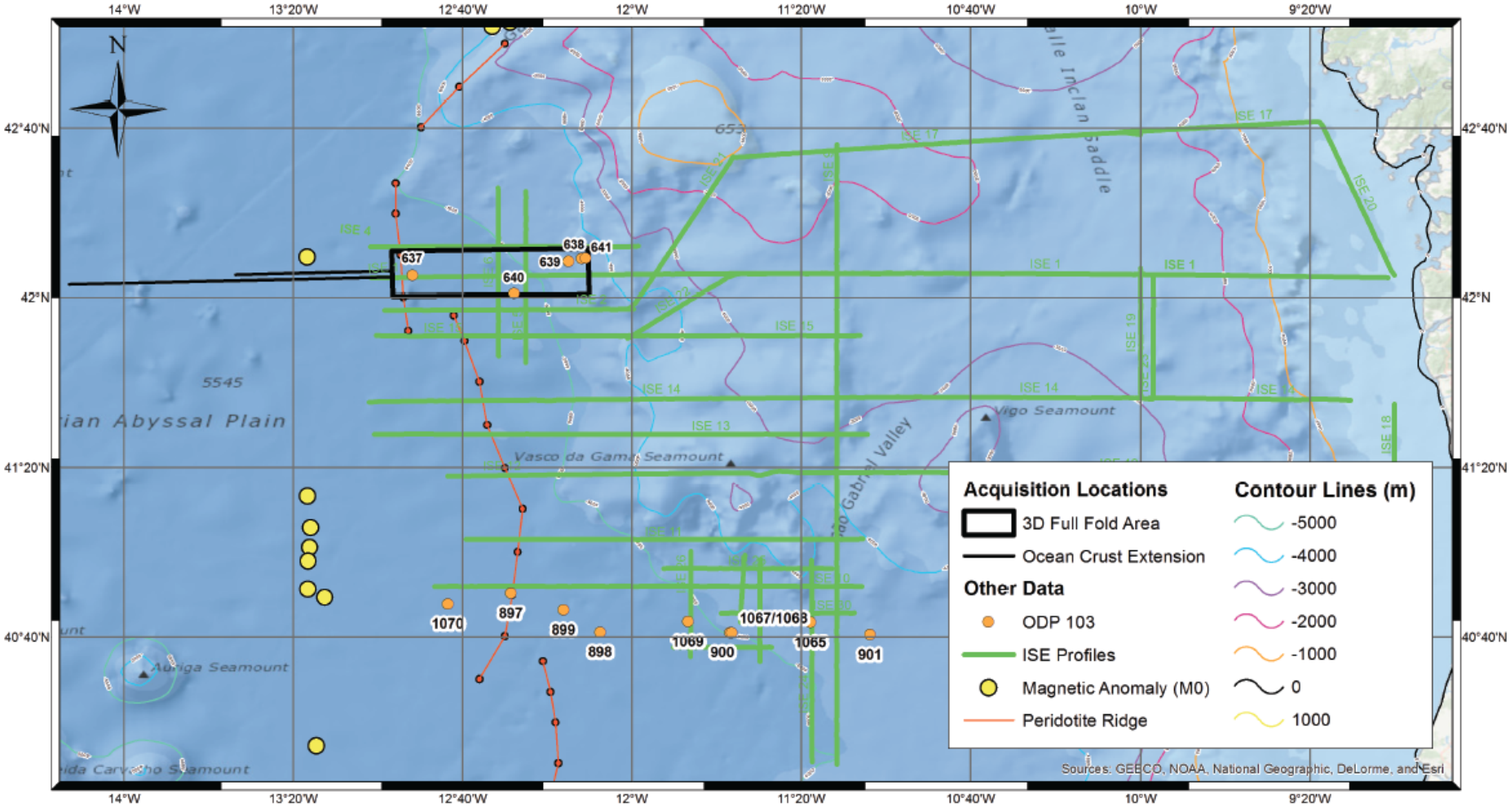
# Tectonic models constrained by proposed IODP drilling



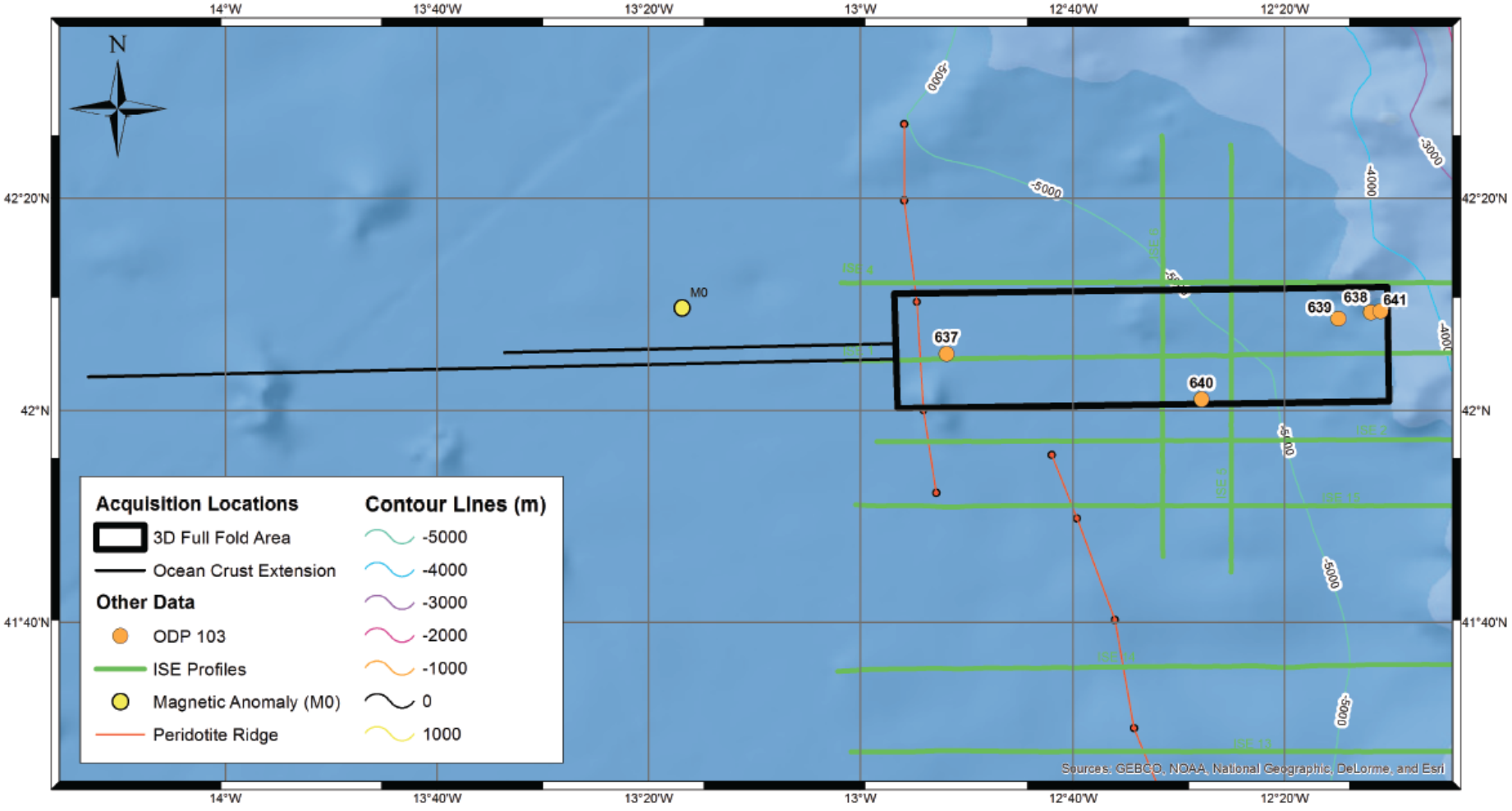
# Project Aims

- Degree, direction and mechanism of brittle extension and its variation in space and time over a 20,000 cubic km volume of lithosphere that may be representative of many such regions on Earth (Brazil, Angola, Norway,…..)
- The physical properties of the fault zone defined by S and those of the underlying mantle, and how variations in these properties relate to the behavior of the fault over time
- The relationship between the intensity of faulting of the crust overlying S and the degree of serpentinisation of the mantle beneath S
- Where to locate future deep drilling to provide detailed timing constraints on margin evolution and hence rates of the processes involved

# Galicia 3D Seismic Acquisition

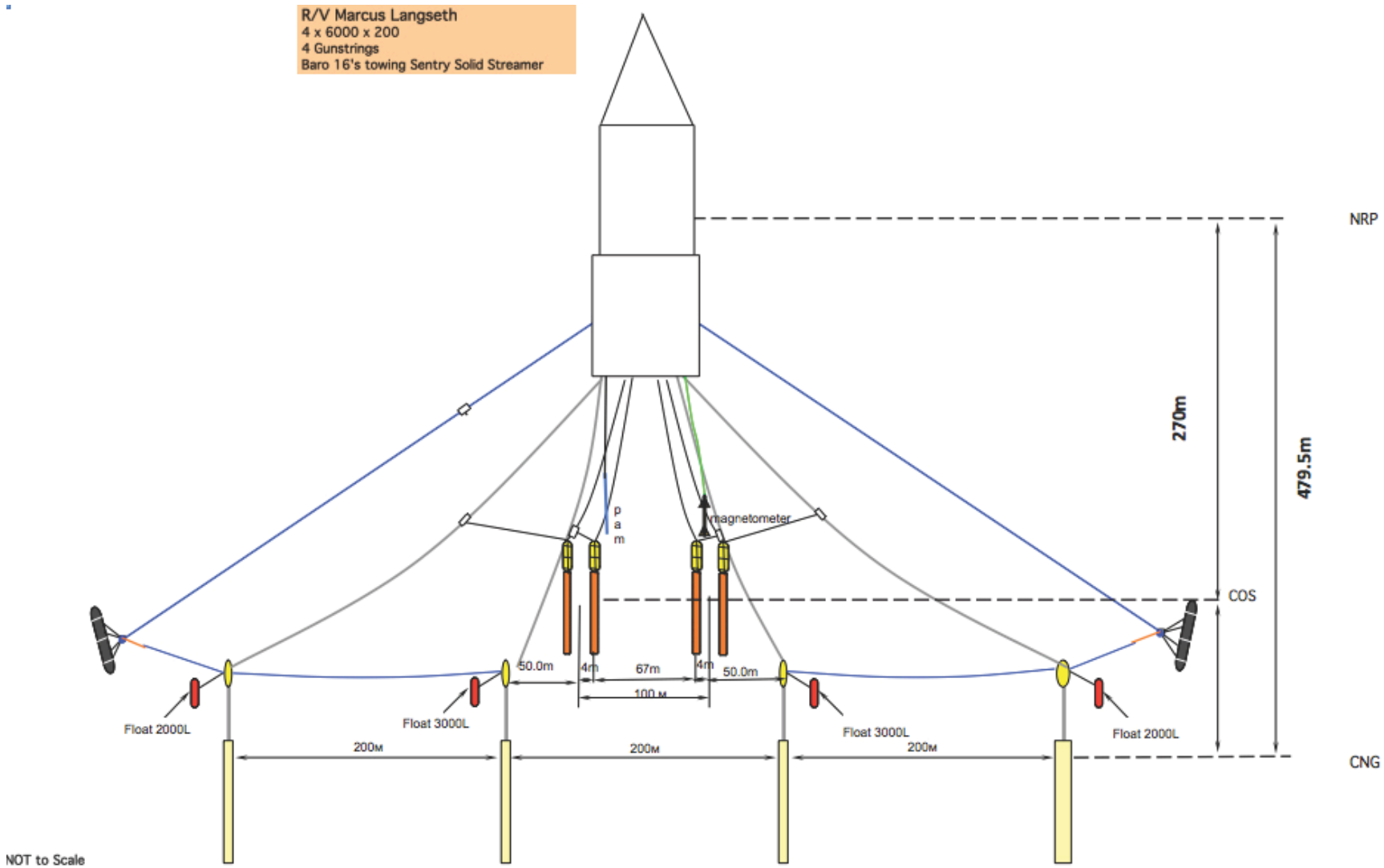


# Galicia 3D Seismic Acquisition

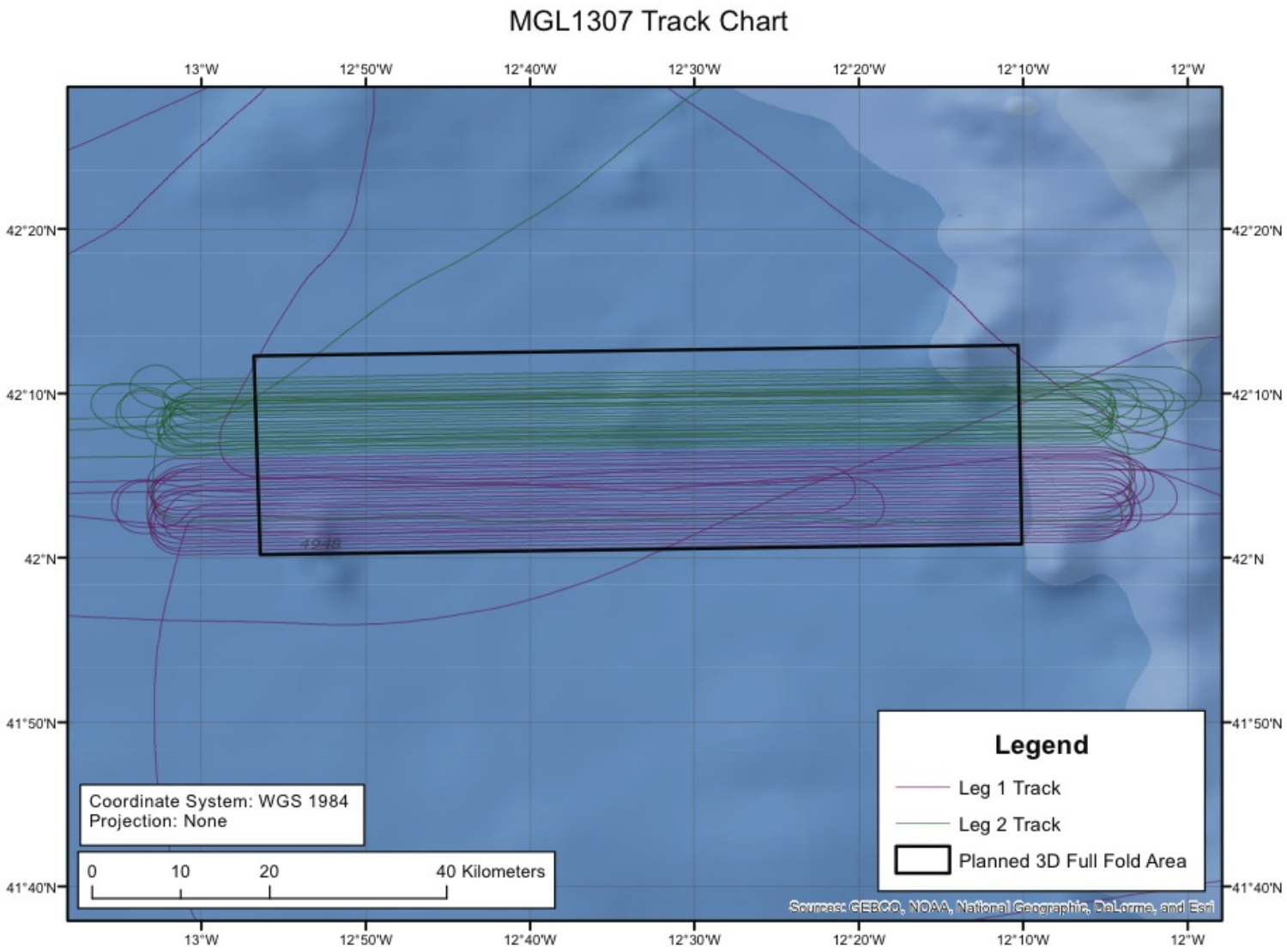


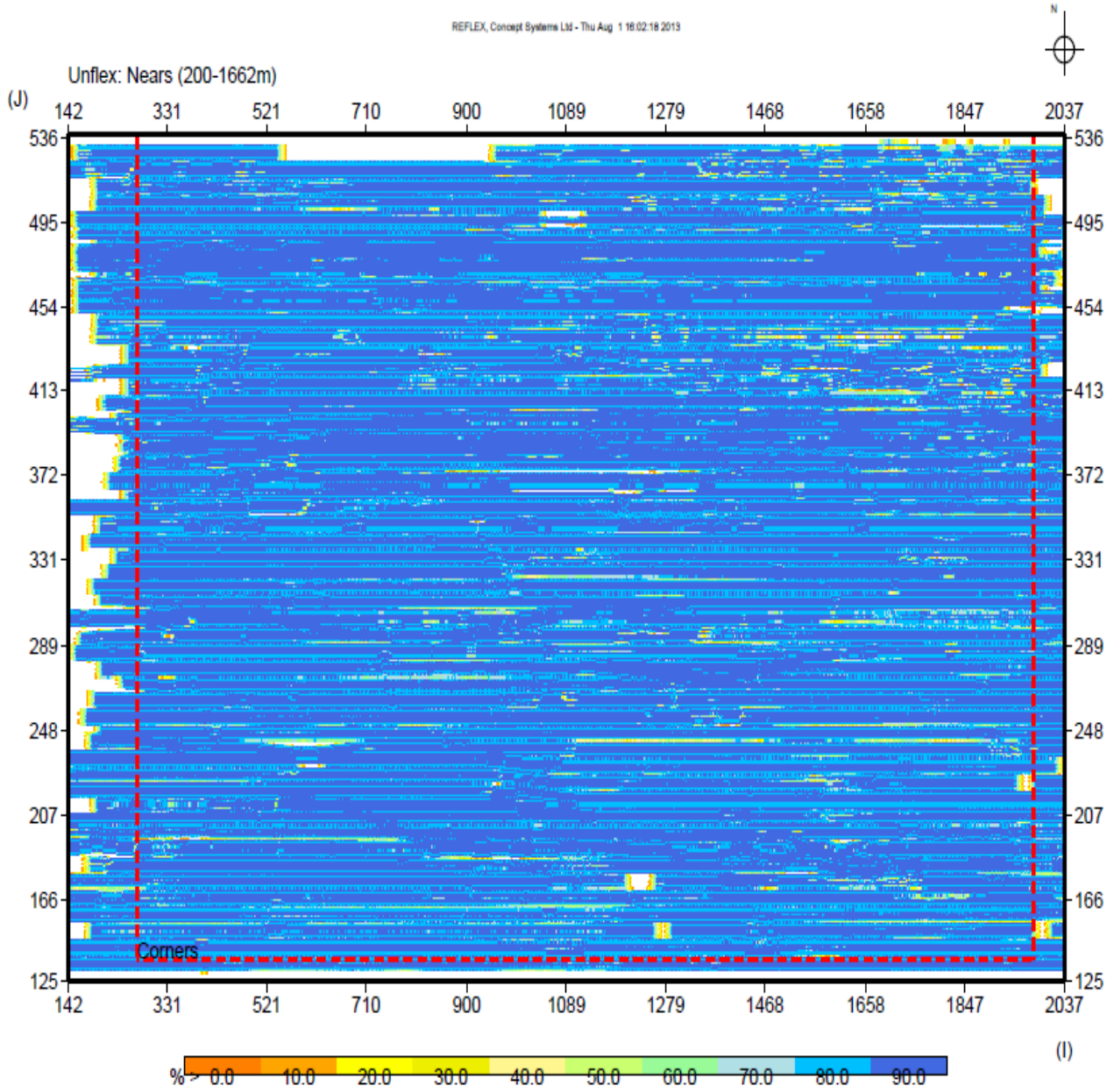
# 3D Acquisition Configuration

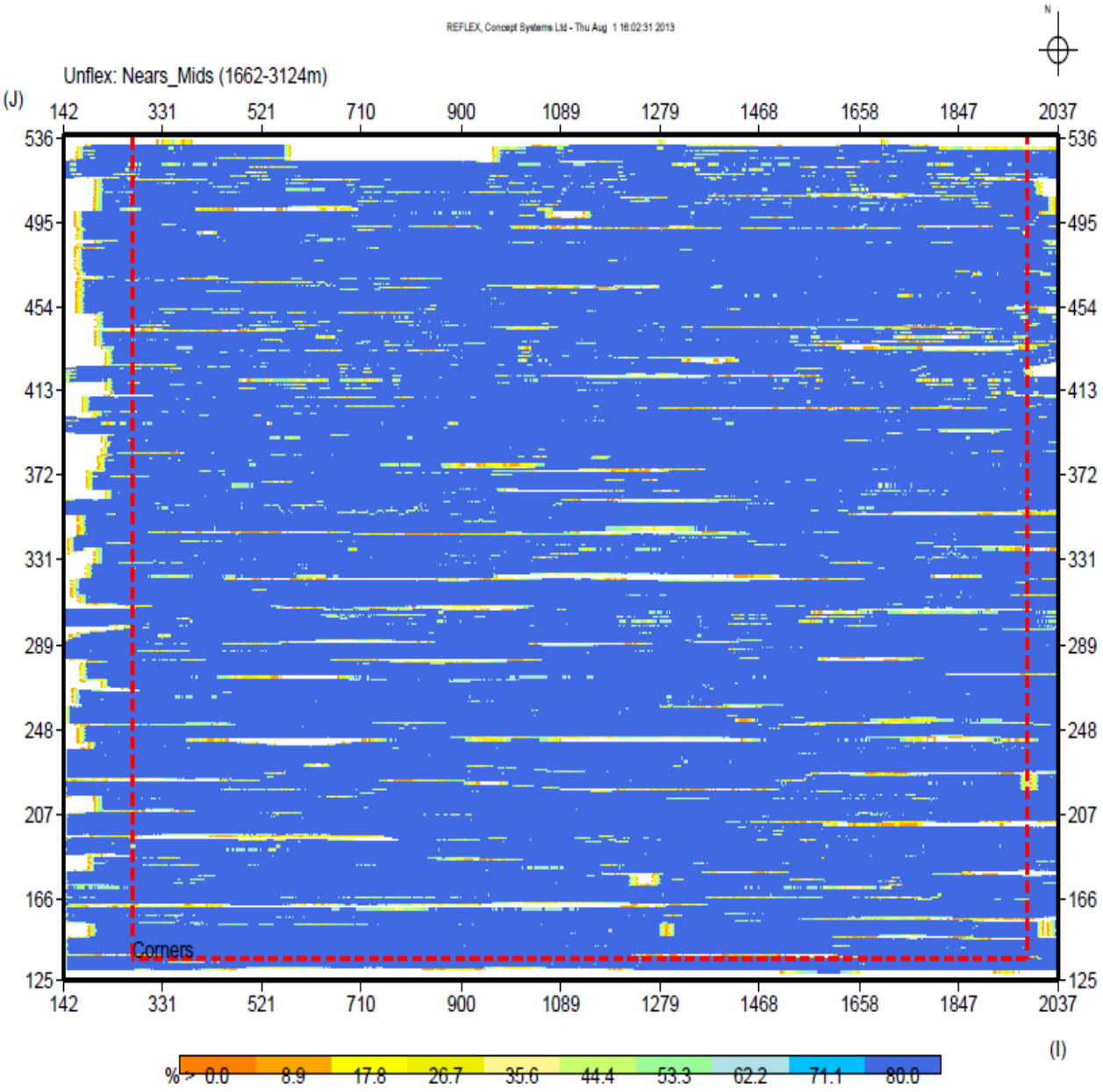
- We acquired 50 sail lines, each 400 m wide
- We include about 20 more “infill” sail lines
- The full fold box is 64 km by 20 km (1,280 $km^2$)
- Four 6 km streamers
  - Streamers 200m apart, each with 468 channels (12.5 m)
  - Total channels 1,872 per shot
- Two source arrays, each 3300 cu. in.
  - Arrays towed 100 m apart
  - 37.5 m between shots, alternate firing
  - Approximately 140,000 shots in the full fold box
- Approximately 260 million seismic traces
- Approximately 7 Tb of reflection data
- 400 Inline bins (50 m) and 10,240 Crossline bins (6.25 m)
- Nominal 40 fold


R/V Marcus Langseth
4 x 6000 x 200
4 Gunstrings
Baro 16's towing Sentry Solid Streamer
NRP
270m
479.5m
COS
CNG
p
a
m
magnetometer
50.0m
4m
67m
4m
50.0m
100 м
Float 2000L
Float 3000L
Float 3000L
Float 2000L
200м
200м
200м
NOT to Scale

# Survey Completed




REFLEX, Concept Systems Ltd - Thu Aug 1 16:02:18 2013
N
Unflex: Nears (200-1662m)
(J)
142
331
521
710
900
1089
1279
1468
1658
1847
2037
536
495
454
413
372
331
289
248
207
166
125
Corners
(I)
% > 0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0


REFLEX, Concept Systems Ltd - Thu Aug 1 16:02:31 2013
N
Unflex: Nears_Mids (1662-3124m)
(J)
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1279
1468
1658
1847
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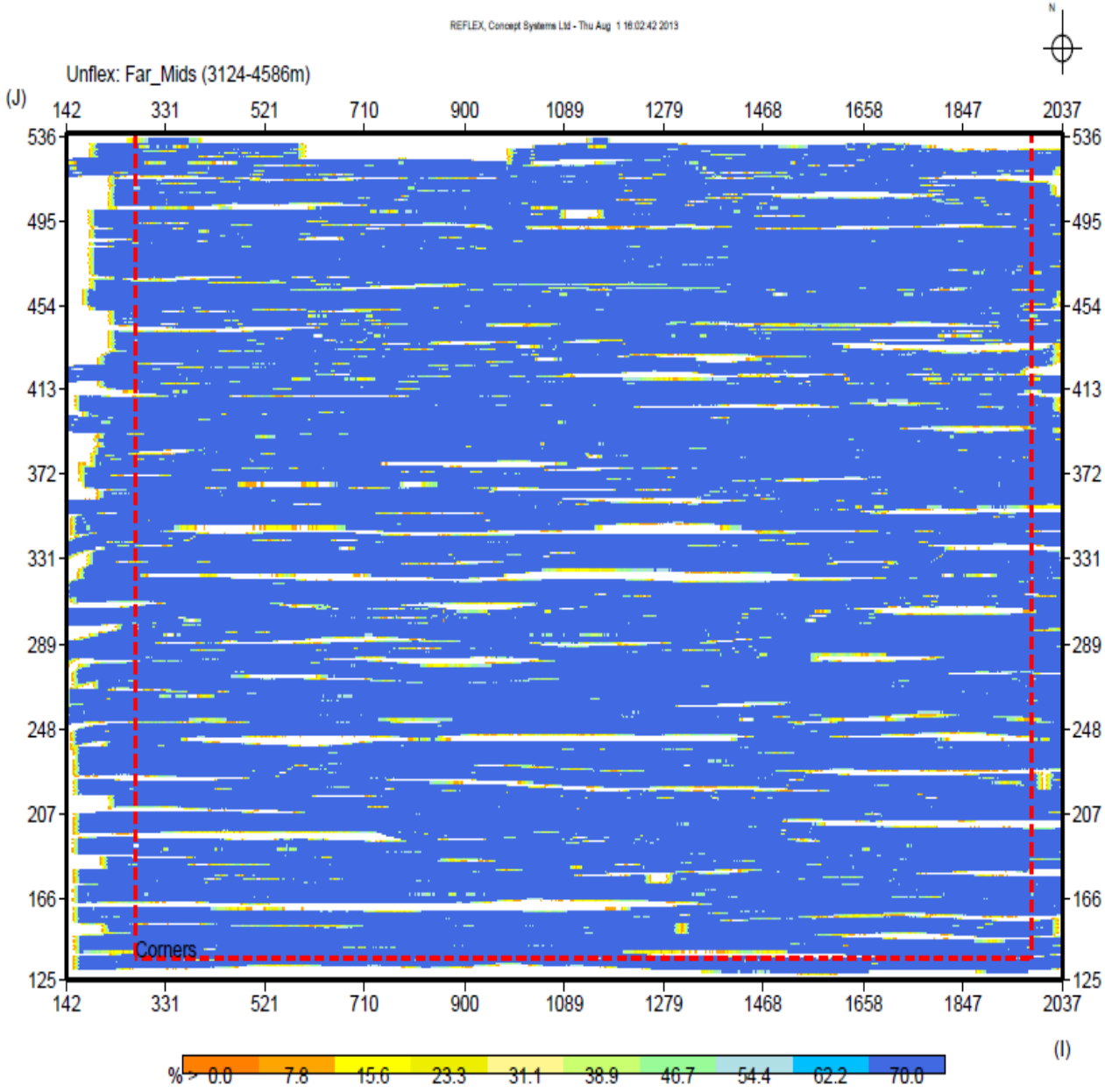
454
413
372
331
289
248
207
166
125
Corners
(I)
%> 0.0
8.9
17.8
26.7
35.6
44.4
53.3
62.2
71.1
80.0


REFLEX, Concept Systems Ltd - Thu Aug 1 16:02:42 2013
N
Unflex: Far_Mids (3124-4586m)
(J)
142
331
521
710
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1089
1279
1468
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2037
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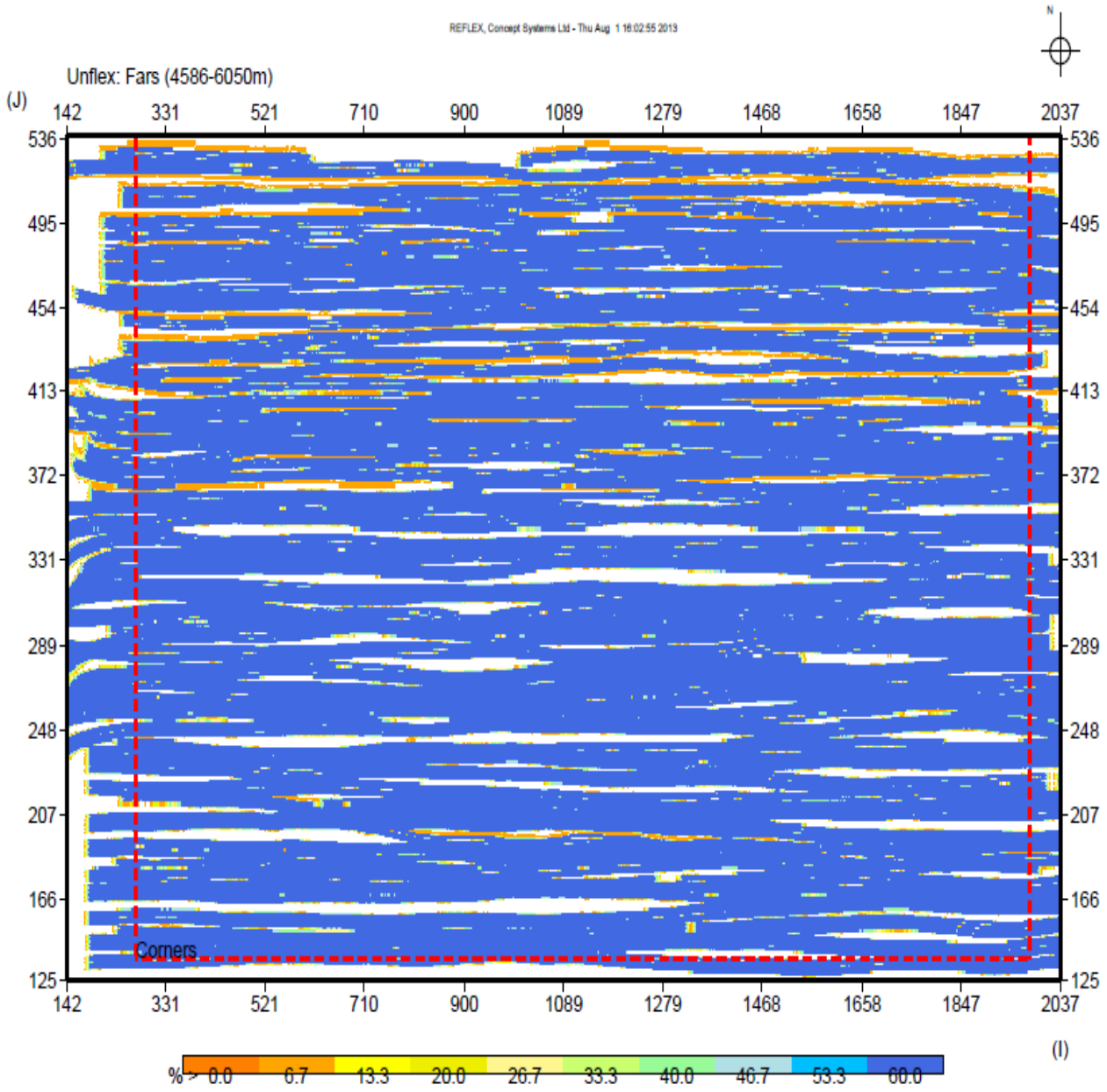
495
454
413
372
331
289
248
207
166
125
Corners
(I)
% > 0.0
7.8
15.6
23.3
31.1
38.9
46.7
54.4
62.2
70.0


REFLEX, Concept Systems Ltd - Thu Aug 1 16:02:55 2013
N
Unflex: Fars (4586-6050m)
(J)
142
331
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1279
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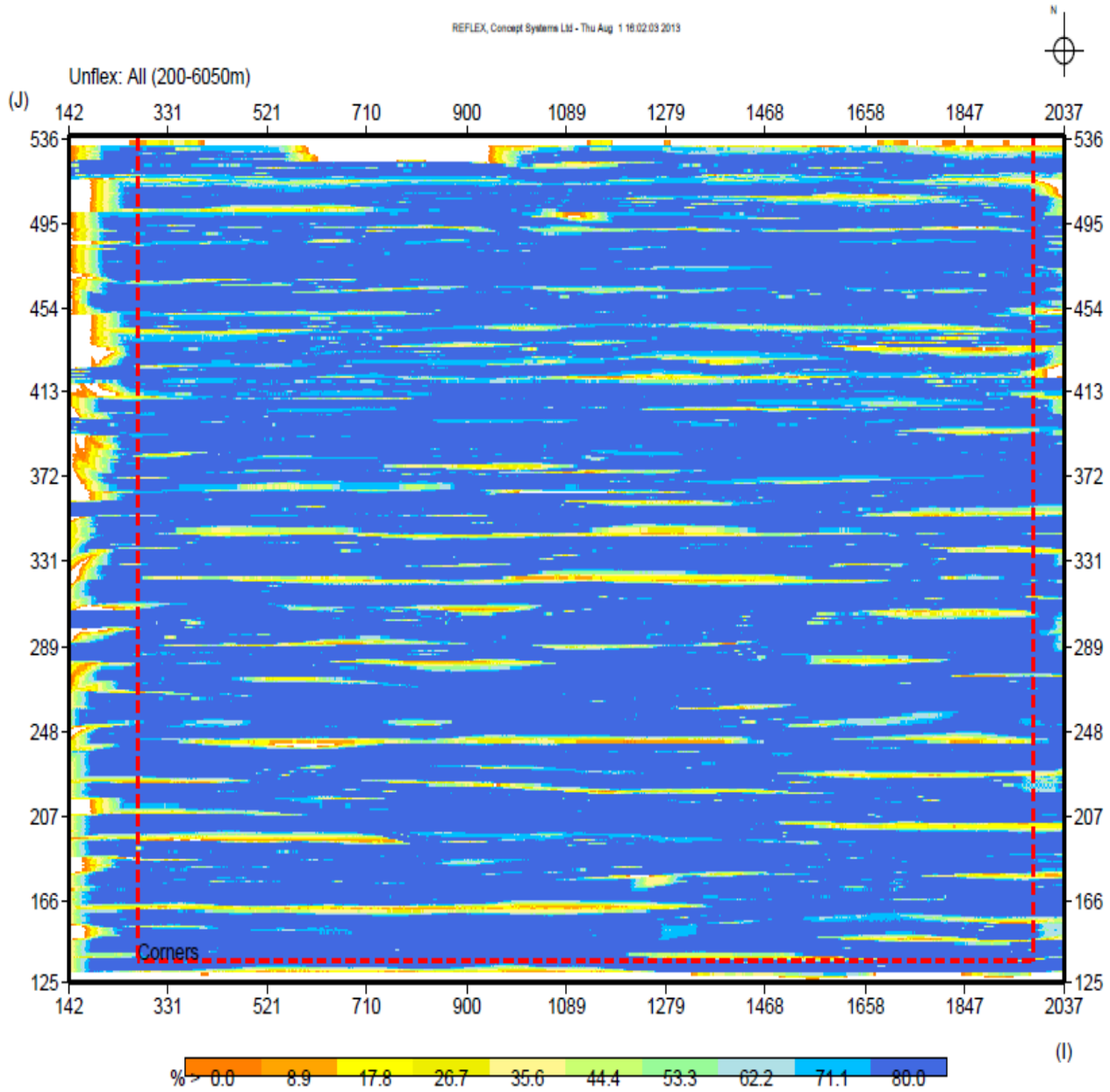
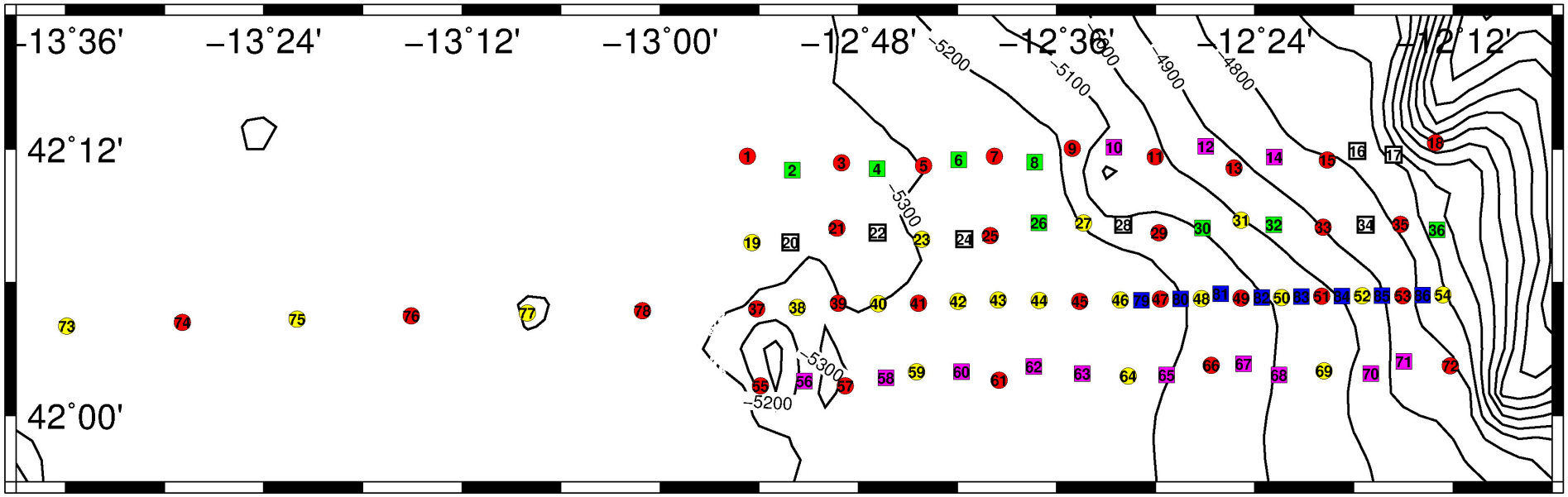
1847
2037
536
495
454
413
372
331
289
248
207
166
125
Corners
(I)
% > 0.0
6.7
13.3
20.0
26.7
33.3
40.0
46.7
53.3
60.0


REFLEX, Concept Systems Ltd - Thu Aug 1 16:02:03 2013
N
Unflex: All (200-6050m)
(J)
142
331
521
710
900
1089
1279
1468
1658
1847
2037
536
495
454
413
372
331
289
248
207
166
125
Corners
(I)
% > 0.0
8.9
17.8
26.7
35.6
44.4
53.3
62.2
71.1
80.0

# OBS Deployment
# Geomar instruments

High resolution line OBHs (in blue) were recovered after the shooting of the E-W regional profile
Redeployed on the 3D box (in green)

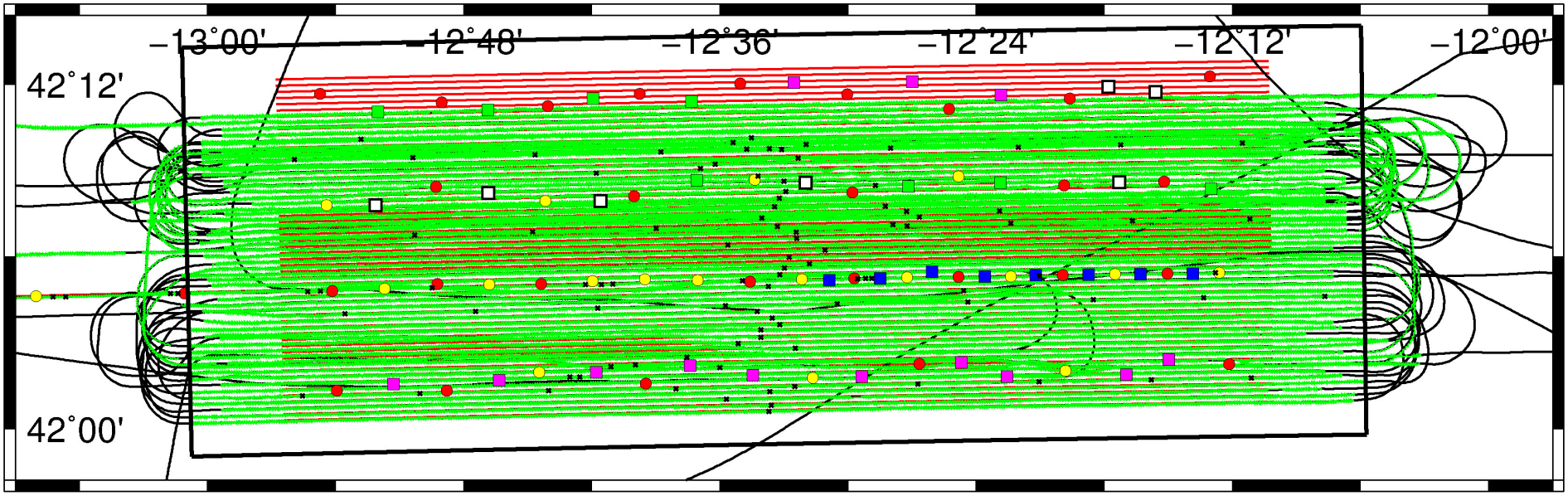



Circles => UK instruments
Red: LC4x4
Yellow LC2000

Squares => German instruments
Pink: OBH
White: OBS
Blue: HiRes
Green: redeployed

# Shot profiles

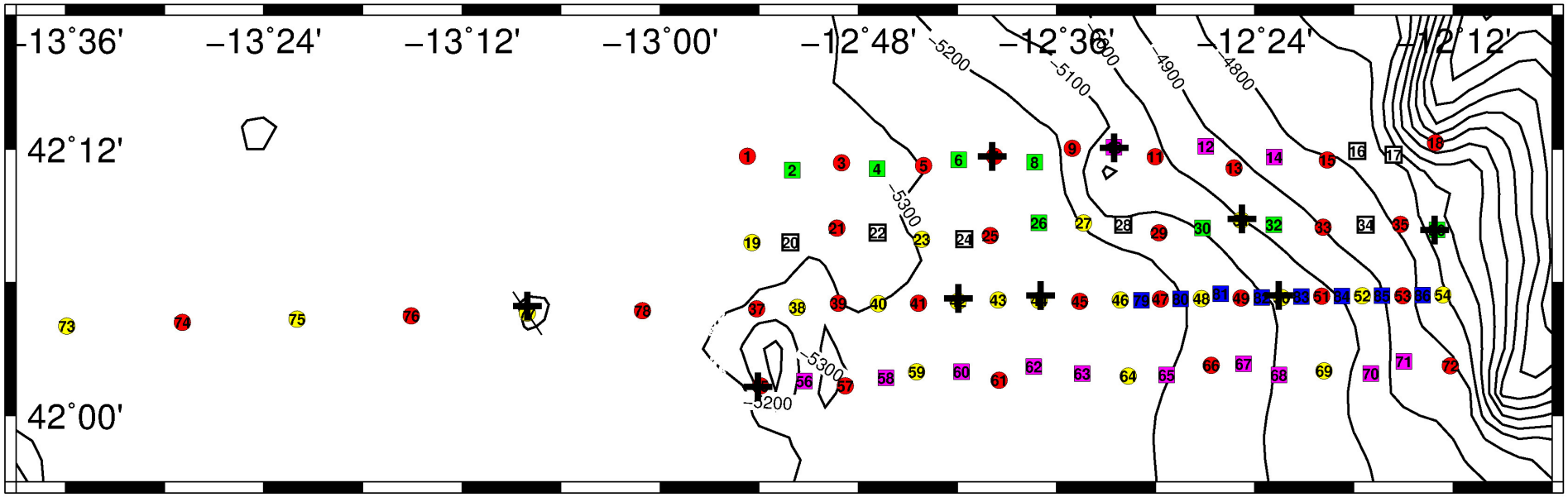
| W ext | MCS lines | Rec turns | Unrec turns |
|---|---|---|---|
| Ship nav | Ship nav | Ship nav | Ship nav |
| Obsip | Obsip | Obsip | - |
| P2/90 | P2/90 | P2/90 | - |
| Unproc P1/90 | Unproc P1/90 | Unproc P1/90 | - |
| - | P1/90 | - | - |



# OBS Recovery

All shots are recorded on 64 instruments
+ HiRes instruments for western extension

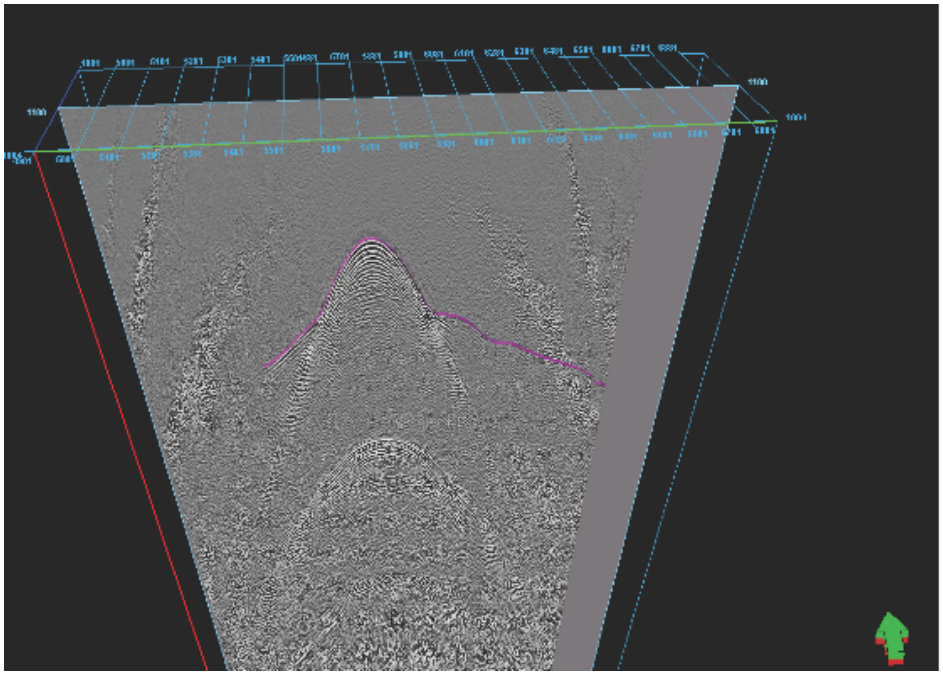
| | OBIC | Geomar |
|---|---|---|
| Loss | 31/44/50/55 | 10/36 |
| Logger problem | 7/77/42 | ? |

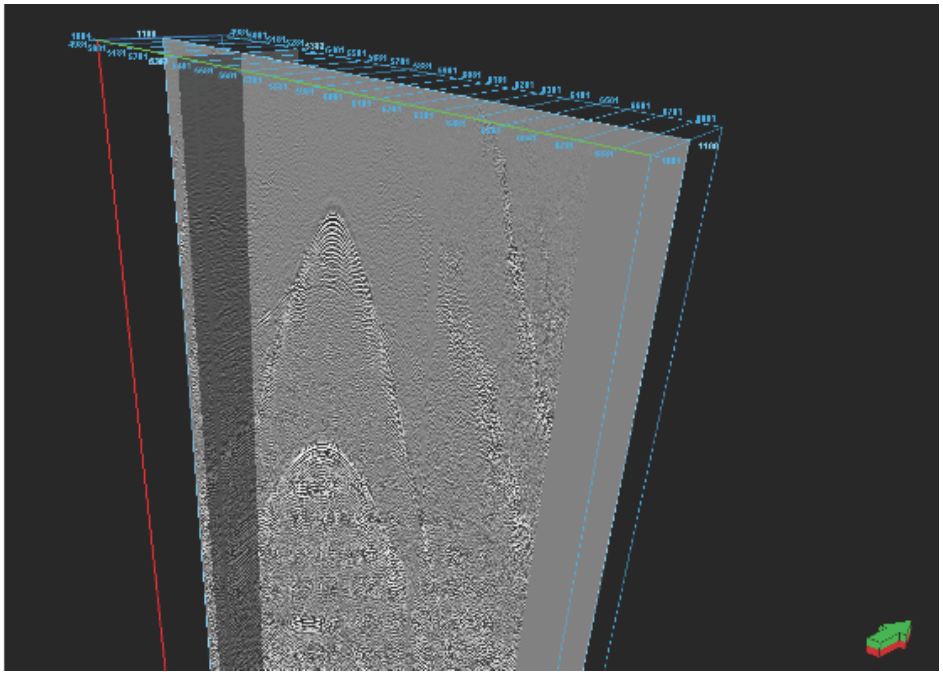



Circles => UK instruments
Red: LC4x4
Yellow LC2000

Squares => German instruments
Pink: OBH
White: OBS
Blue: HiRes
Green: redeployed

# 3D OBS arrivals displayed in Petrel





OBS Instruments recorded approximately
15,000,000 seismic traces.

Please visit our Poster on Tuesday Morning.

It is Poster T21B – 2541.

I plan to have my Petrel computer at the poster session and am happy to show off the Galicia 3D dataset.

Thank You!