

RV Marcus G. Langseth

This is a seismic research vessel
owned by the US National Science Foundation and operated by
Columbia University

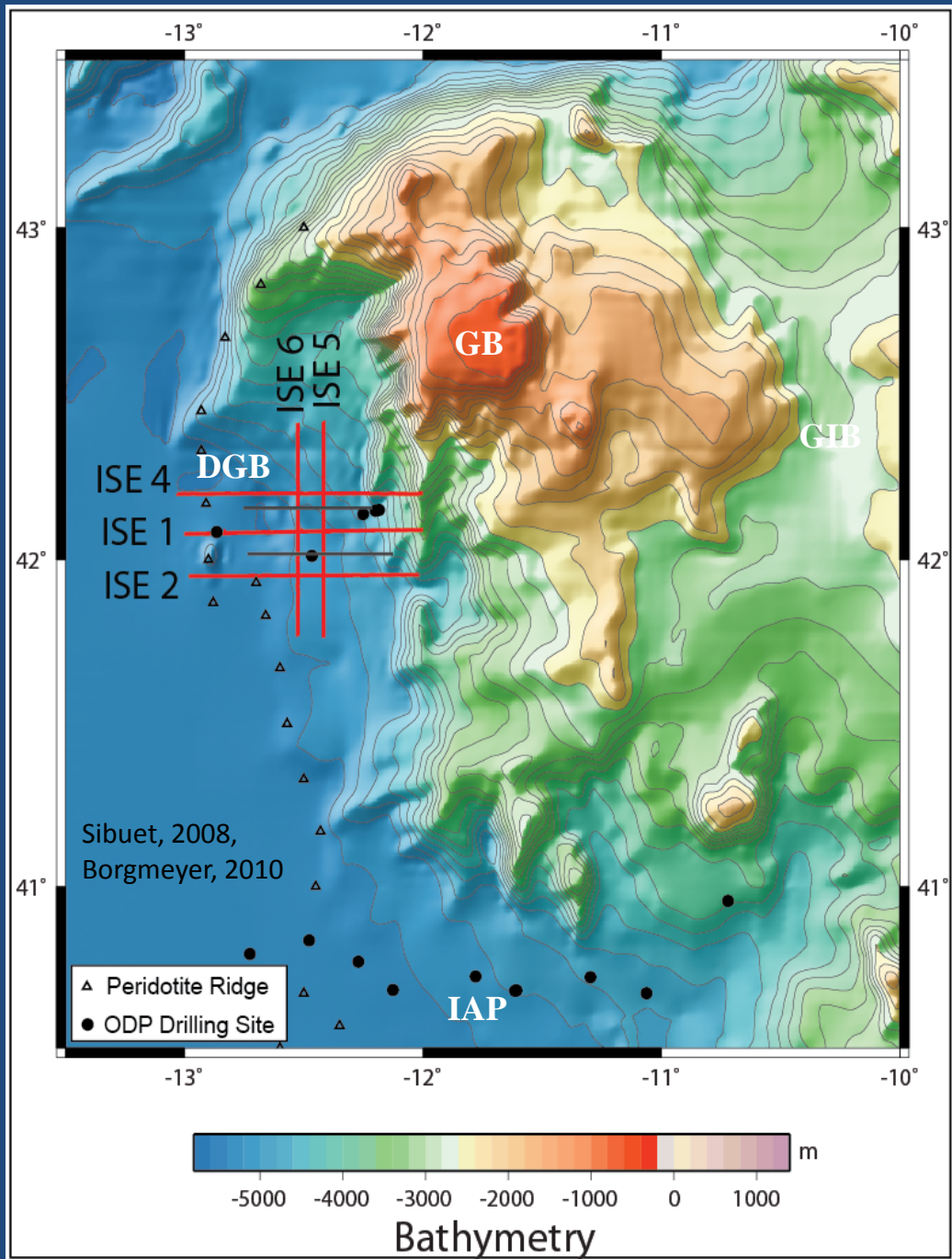
It has now acquired four large-scale 3D seismic experiments: EPR,
Costa Rica, Galicia, and New Jersey.



Science goals and facility needs.

What have been the critical capabilities for past success and what will be needed in the future?

- 2D seismic acquisition
- 2D seismic acquisition long streamer
- 3D seismic acquisition
- Multi Beam
- Seismic sources
- Ocean Bottom Seismometers (active)
- Ocean Drilling Program
- International Partners & funding
- Industrial Partners with funding or in kind



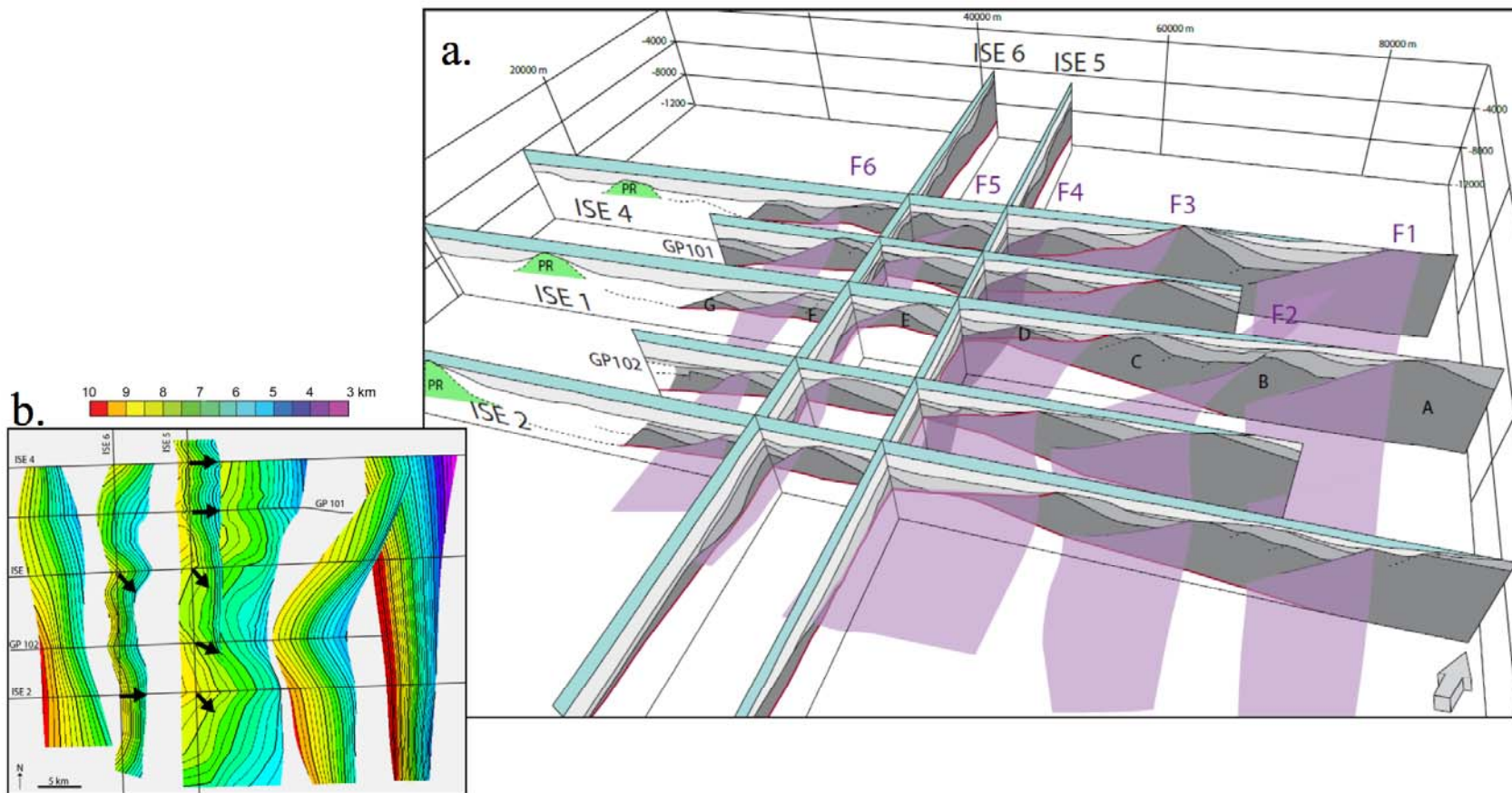
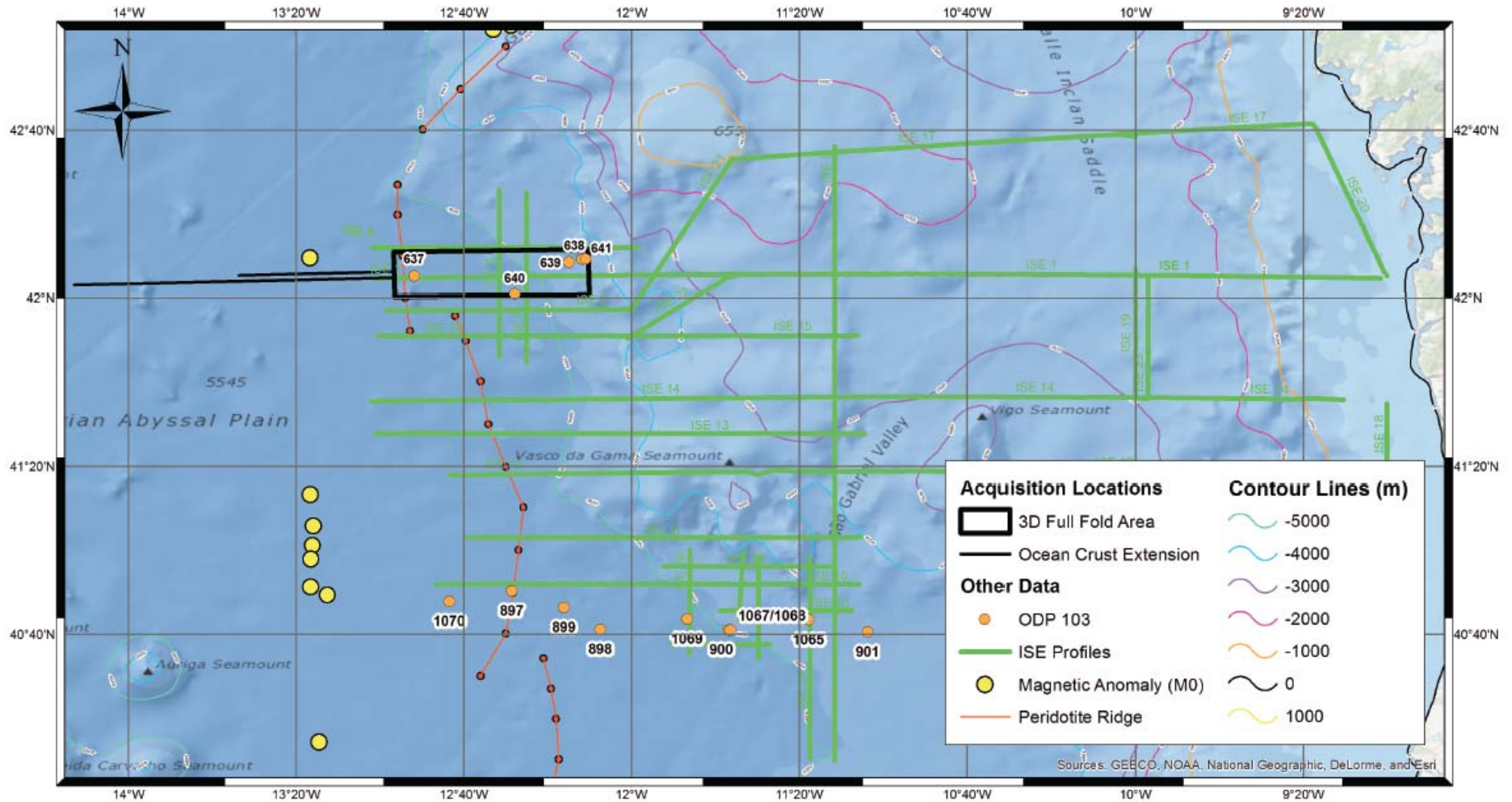


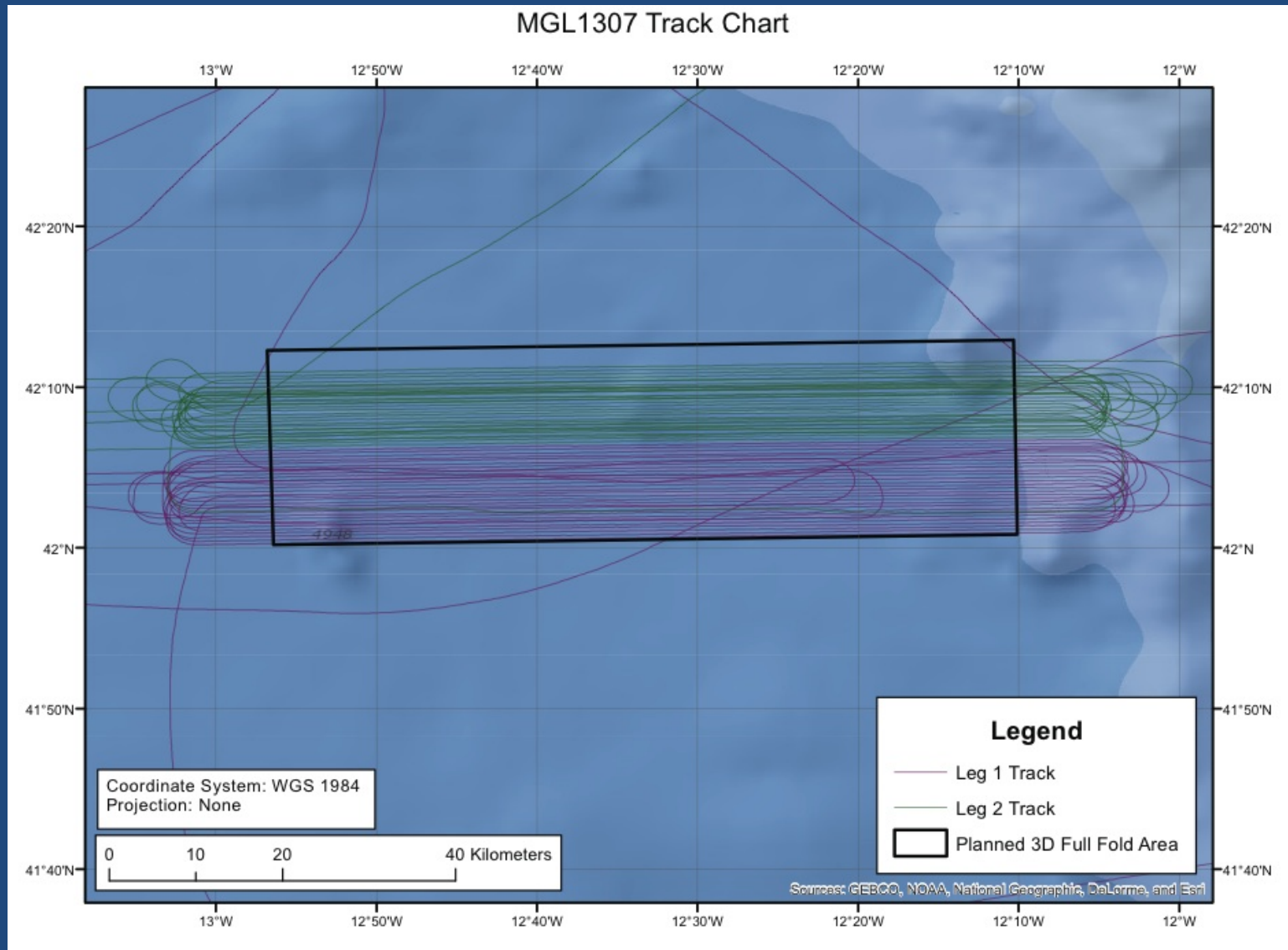
Figure 6. 3D correlations of faults and fault blocks identified on 2D profiles. (a) See Figures 3-4 and 9-13 for stratigraphy. Axes are labeled in meters relative to the NW corner of the study area and as meters below sea level. Faults (purple) are labeled F1-F6. Fault F2 joins with F1 to the north before the ISE 4 profile. Fault F4 joins with fault F3 to the south before the ISE 2 profile. Fault-bounded blocks are labeled A-G. (b) Map view of fault geometry and topography. Topography contoured every 250 m. Warm colors are deep. Cool colors are shallow. Over their interpreted lengths, the mapped faults trend within 10 degrees of north, in agreement with the interpretation of overall east-west oriented extension. The faults surfaces, however, are not planar. On a smaller scale the fault surfaces are irregular and locally strike up to 35 degrees east or west of north. Black arrows indicate the general orientation of hanging wall blocks' true-dip directions based on line intersections.

Galicia 3D Seismic Acquisition



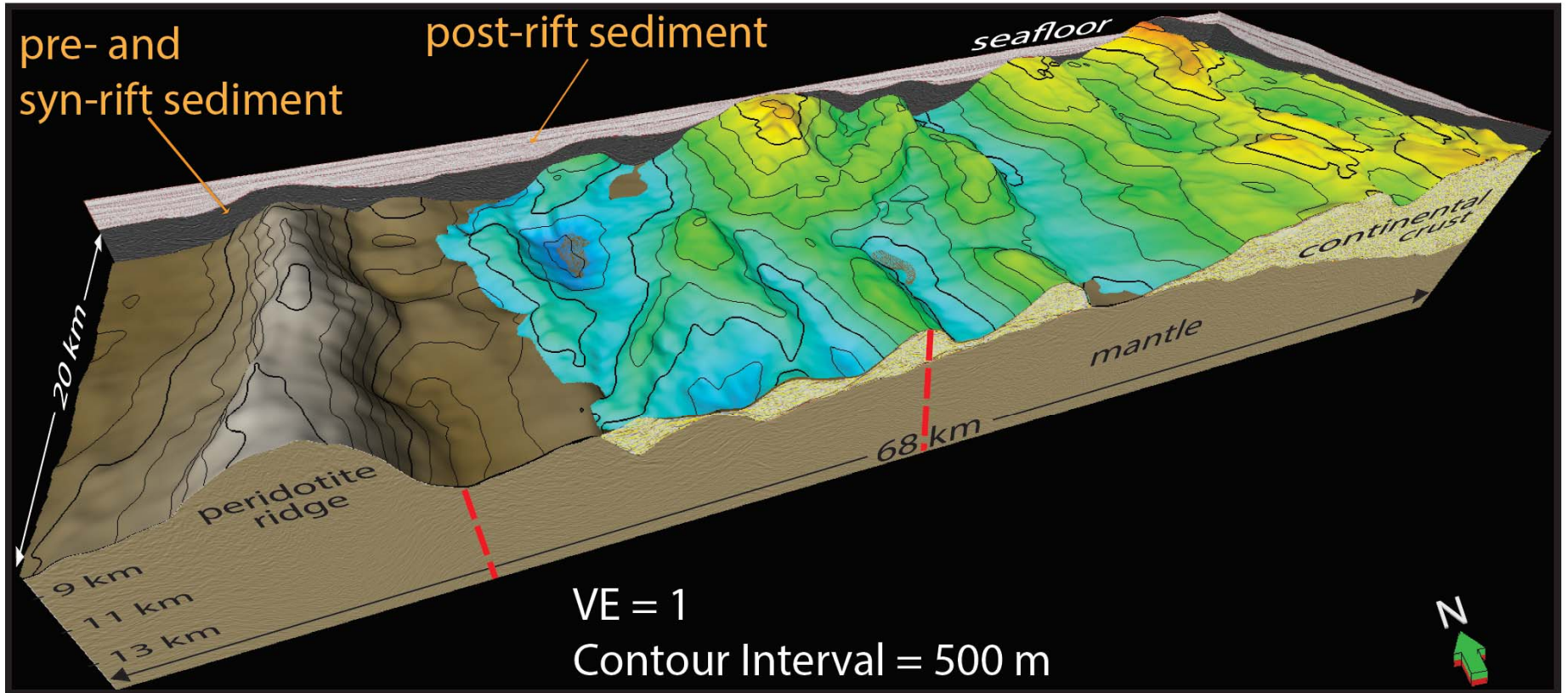
Brian Jordon (2013)

Survey Completed

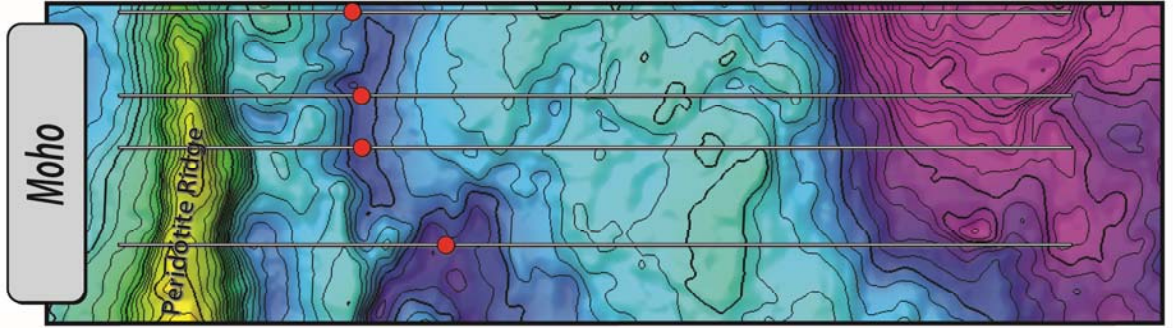
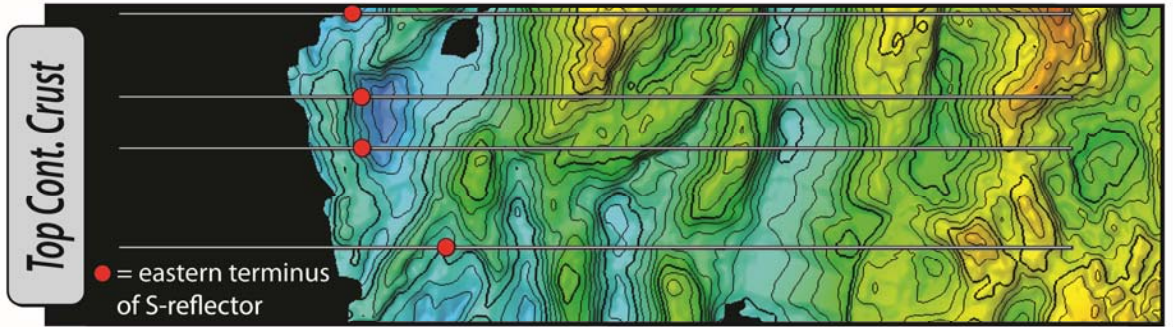
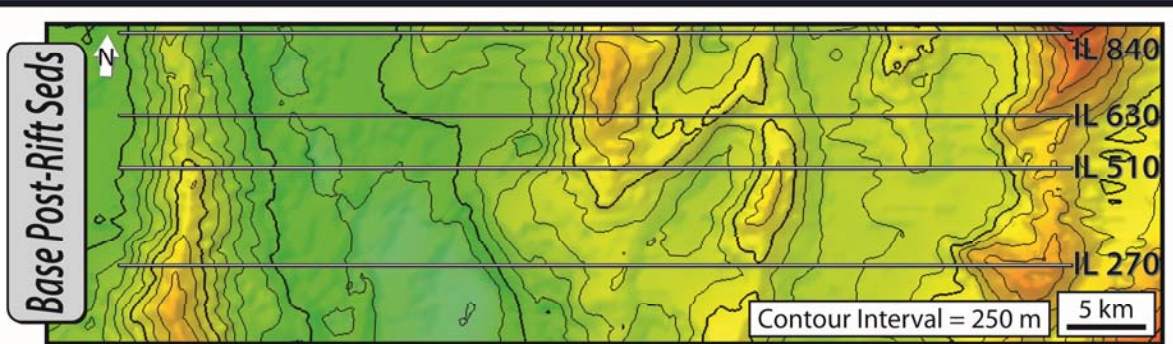


Brian Jordon (2013)

Galicia 3D Seismic Dataset

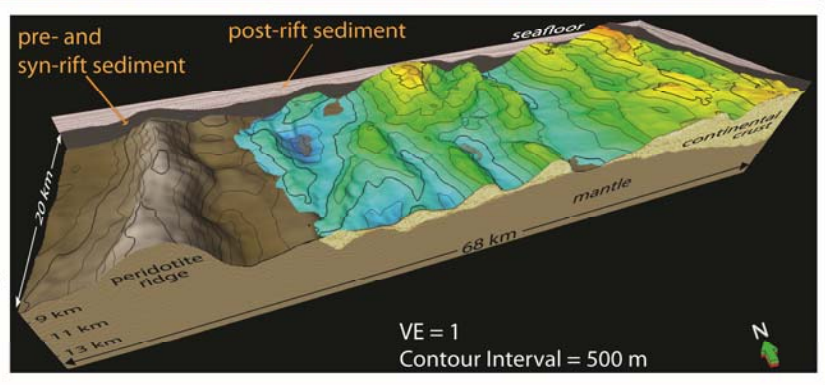


Brian Jordan (2015)

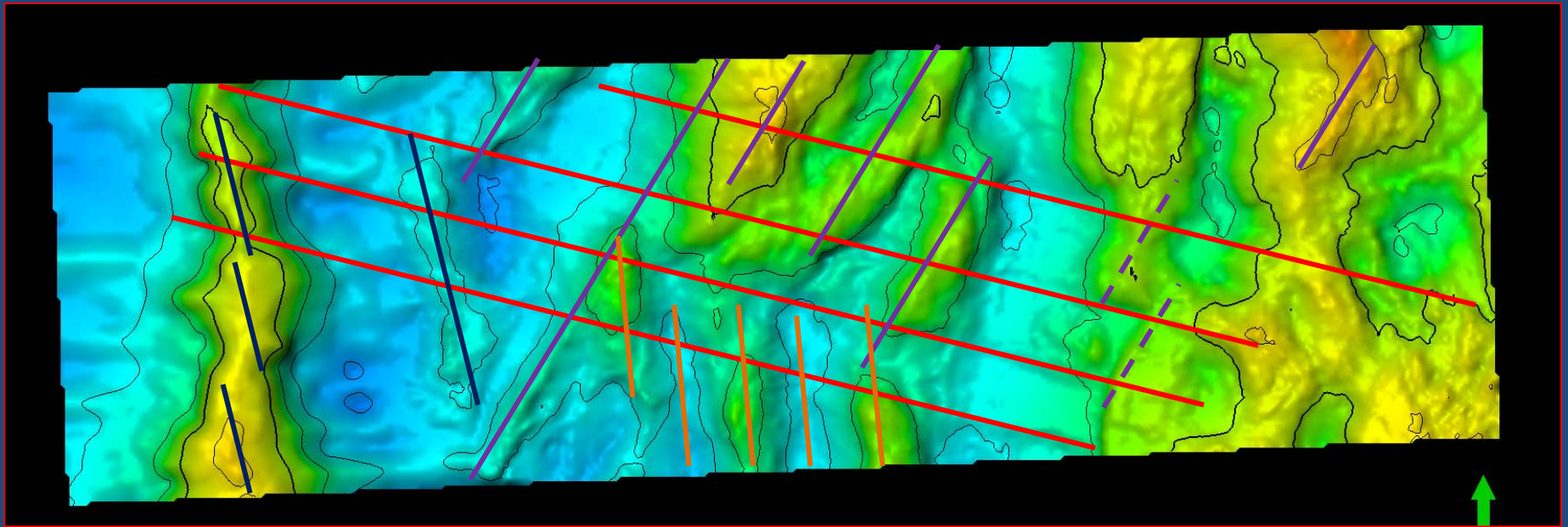


Above: Contour maps of the yellow (upper), blue (middle), and purple (lower) interpreted lines from the figures to the left

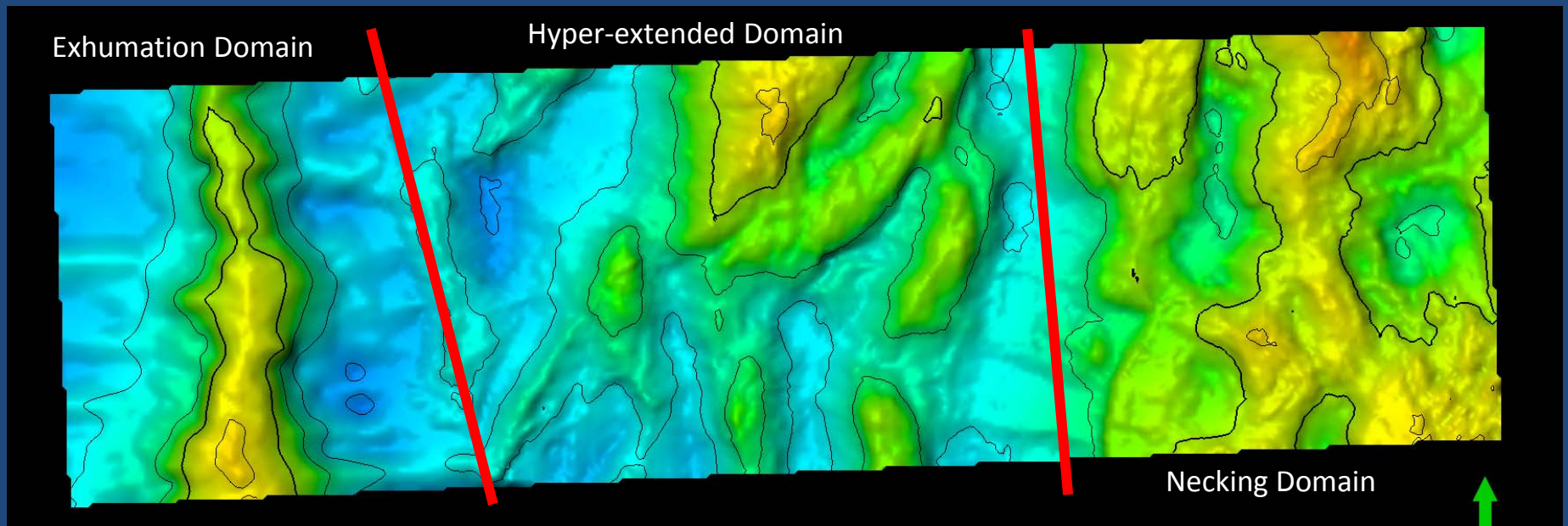
Right: 3D interpretations of the continental crust and mantle



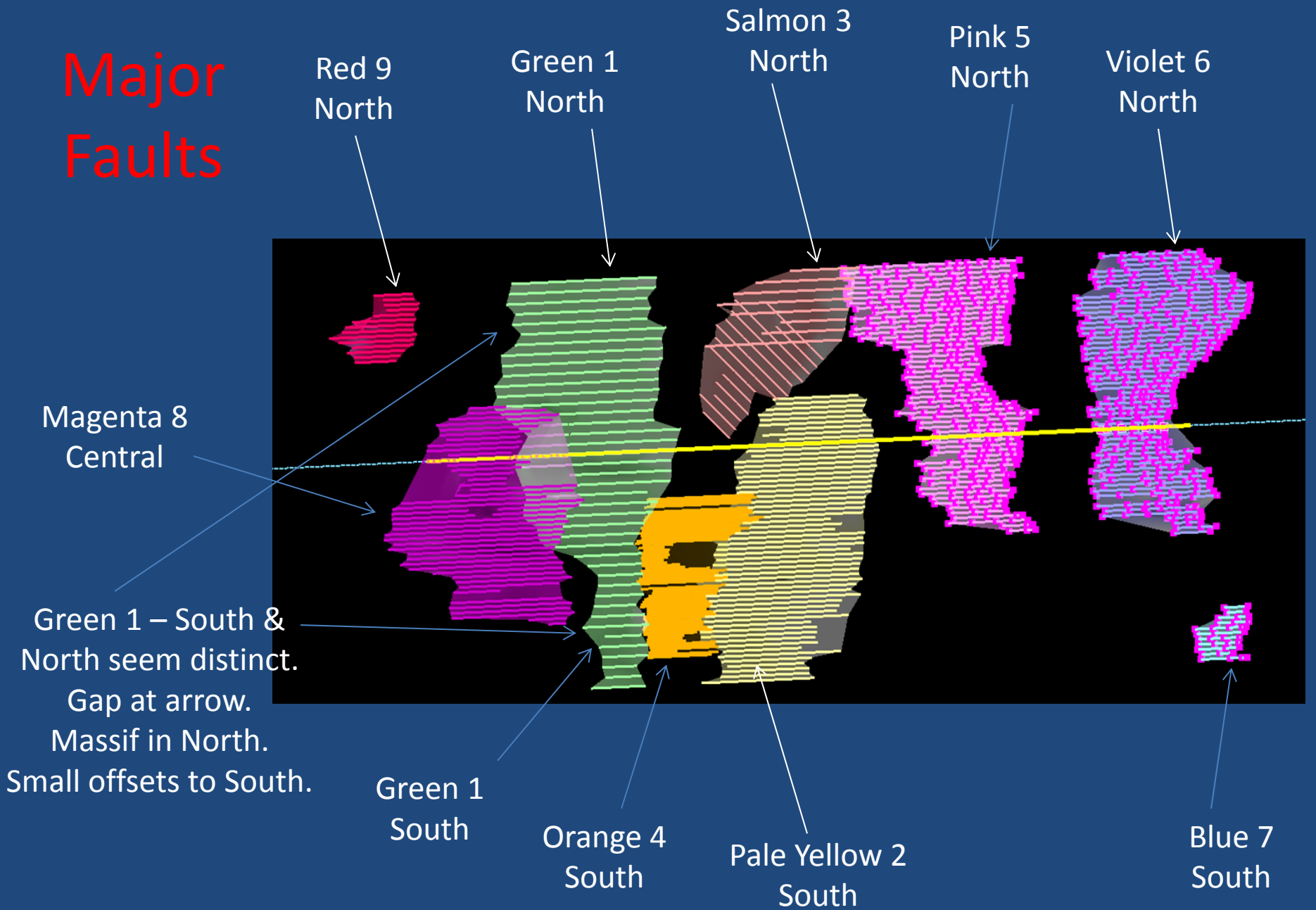
Brian Jordan
(2015)



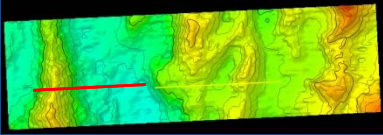
Depth converted surface is between sediments above & hard rocks below. Annotated above are likely structural fabrics.



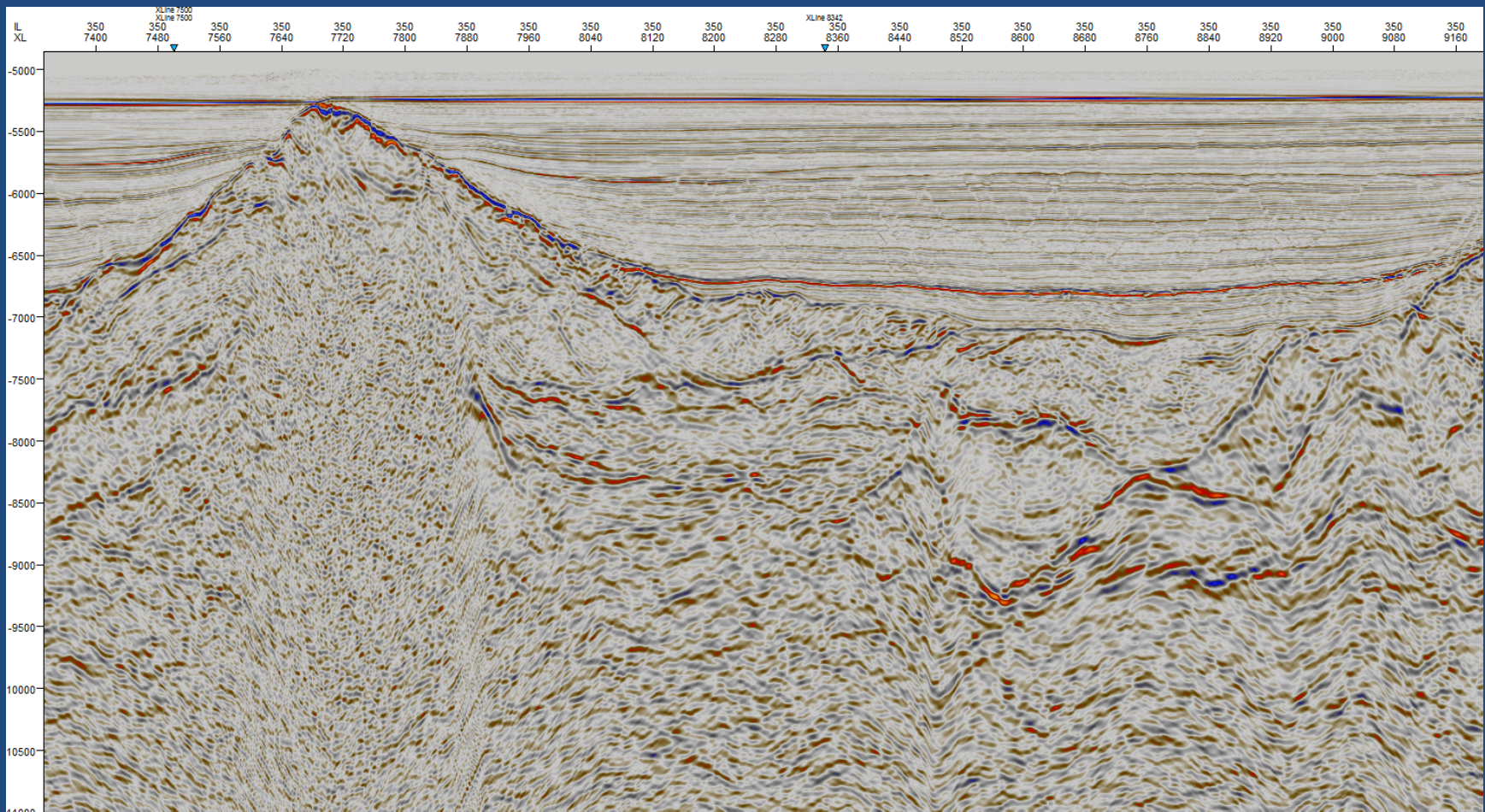
Major Faults



PSTM Repsol - Depth



IL 350



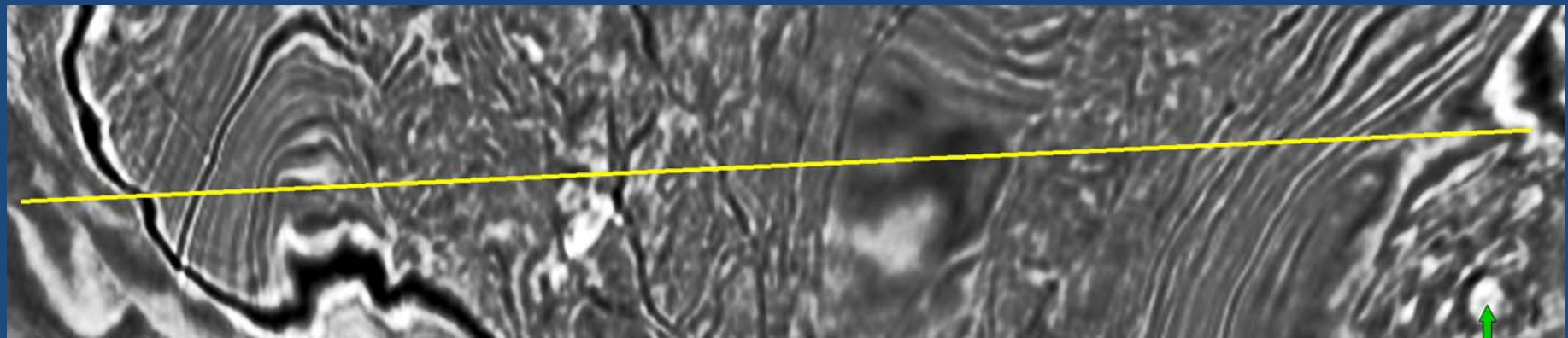
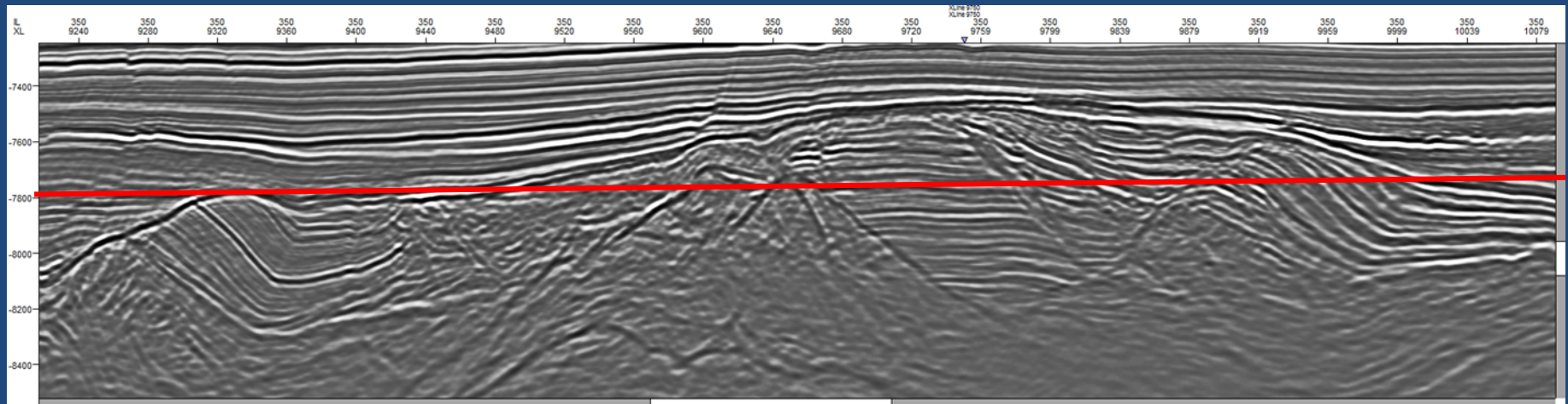
VE=2 Depth

W

East-West extent of 11 km

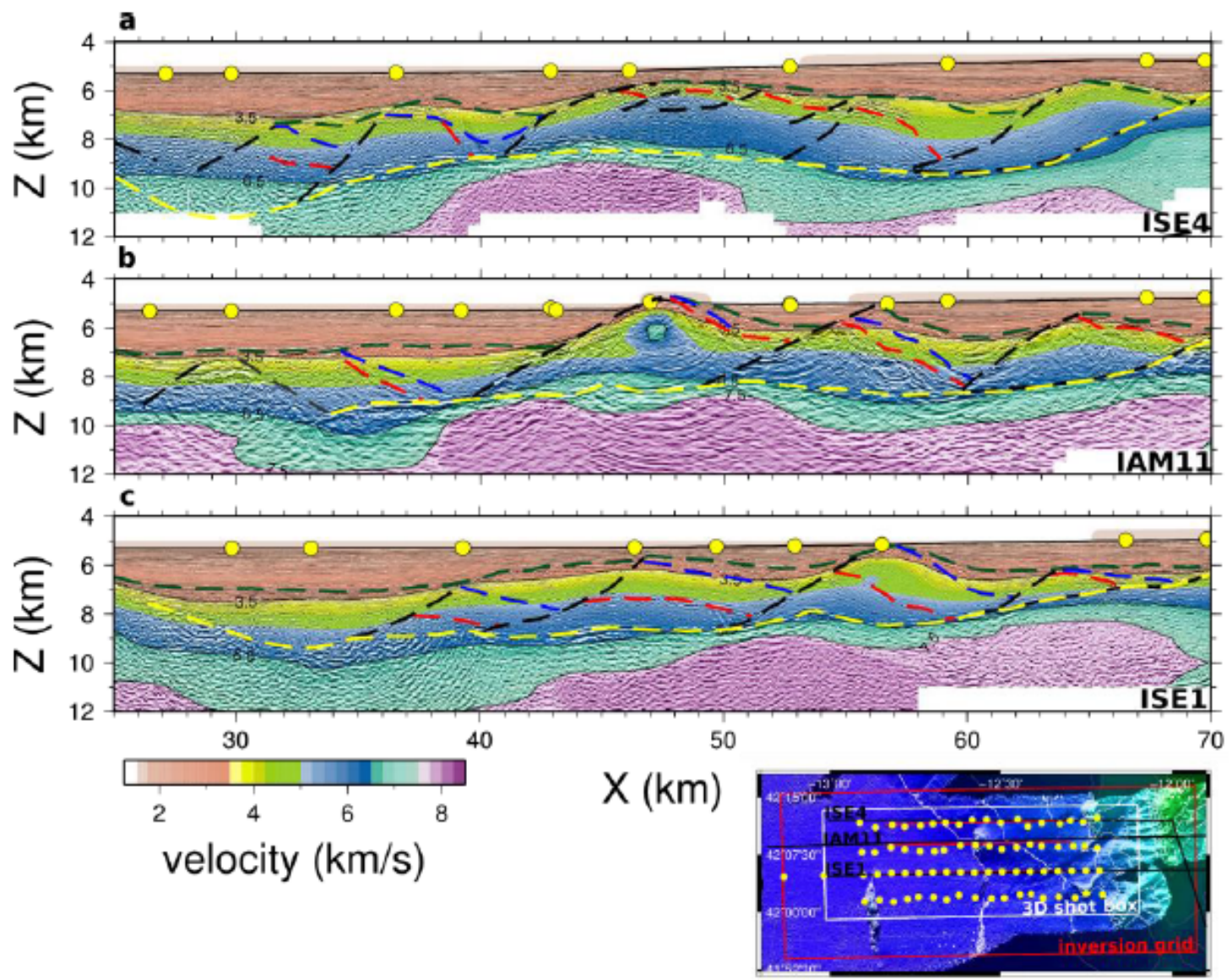
E

Inline #350 – Red line is the 7884 TWT (ms).



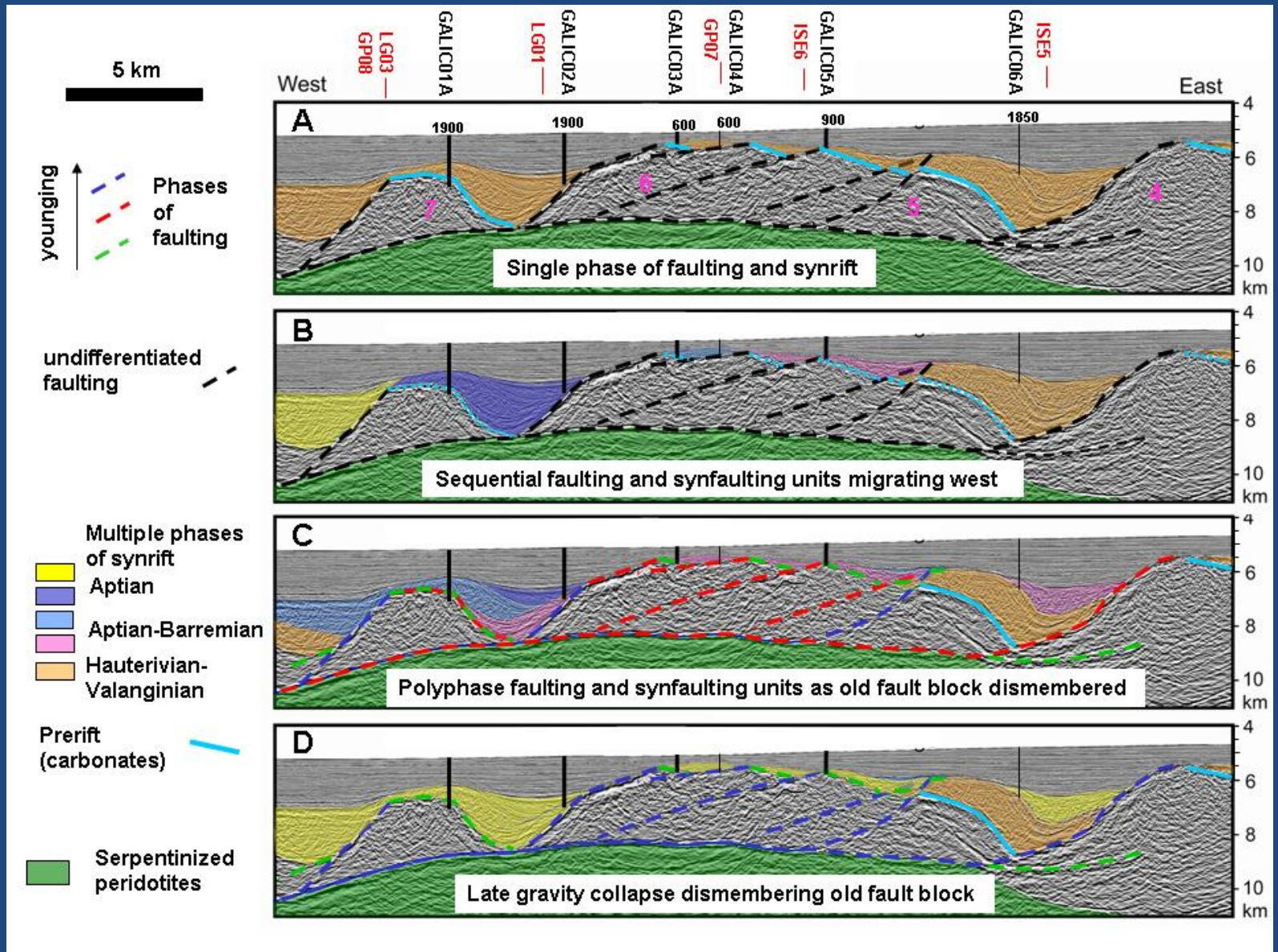
Time Slice #7884 – Yellow line is the Inline 350 location.

Repsol – PSTM – May2015



Gaye Bayrakci et al. (AGU 2014) – OBS Tomography

Tectonic models constrained by proposed IODP drilling



Reston, Sawyer, et al. (2008)

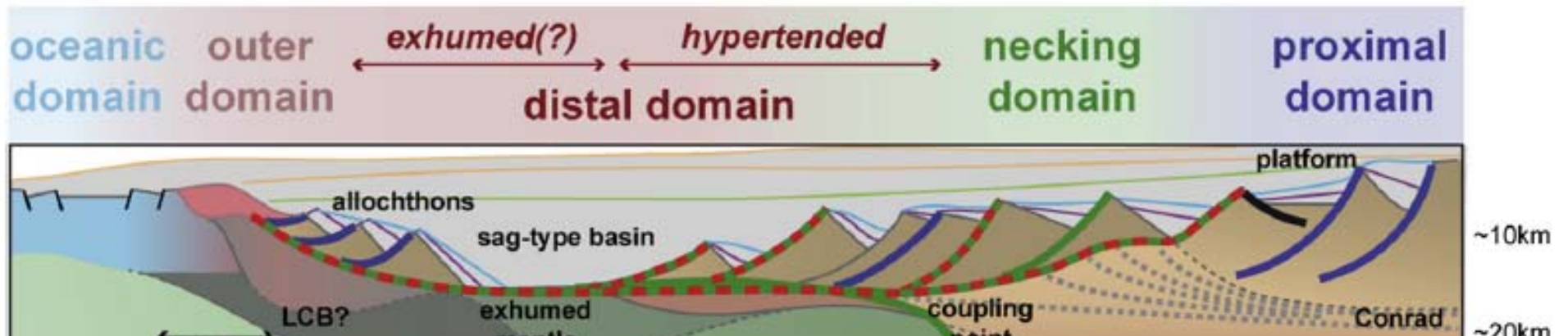
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Observations and Objectives for a Magma-Poor Rifted Margin

- Mechanisms of brittle extension of the crust
- The physical properties of the fault zone defined by S and those of the underlying mantle
- The relationship of faulting of the crust overlying S and the degree of serpentinization of S
- Where to locate future drilling to provide detailed timing constraints



BASEMENT

continental crust

- upper
- middle - lower
- lower - mafic

- outer high
- extrusive magmatic material
- oceanic crust

basement features

shear zones

time evolution
 poly-phase deformation structures

'pre-rift' / stretching / thinning / hyperextension-exhumation

mantle

- inherited upper subcontinental
- lower subcontinental
- asthenospheric 'oceanic'

higher degrees of alteration



'attenuated' mantle
 (deformed / serpentinized infiltrated / intruded)

SEDIMENTS

'pre-rift' sediments are included in the basement

- sediments
- syn-stretching
- syn-thinning
- syn-hyperextension / exhumation
- syn-magmatic phase
- post-breakup
- post-rift

~100km
 schematic
 not at scale
 VE ~ 3