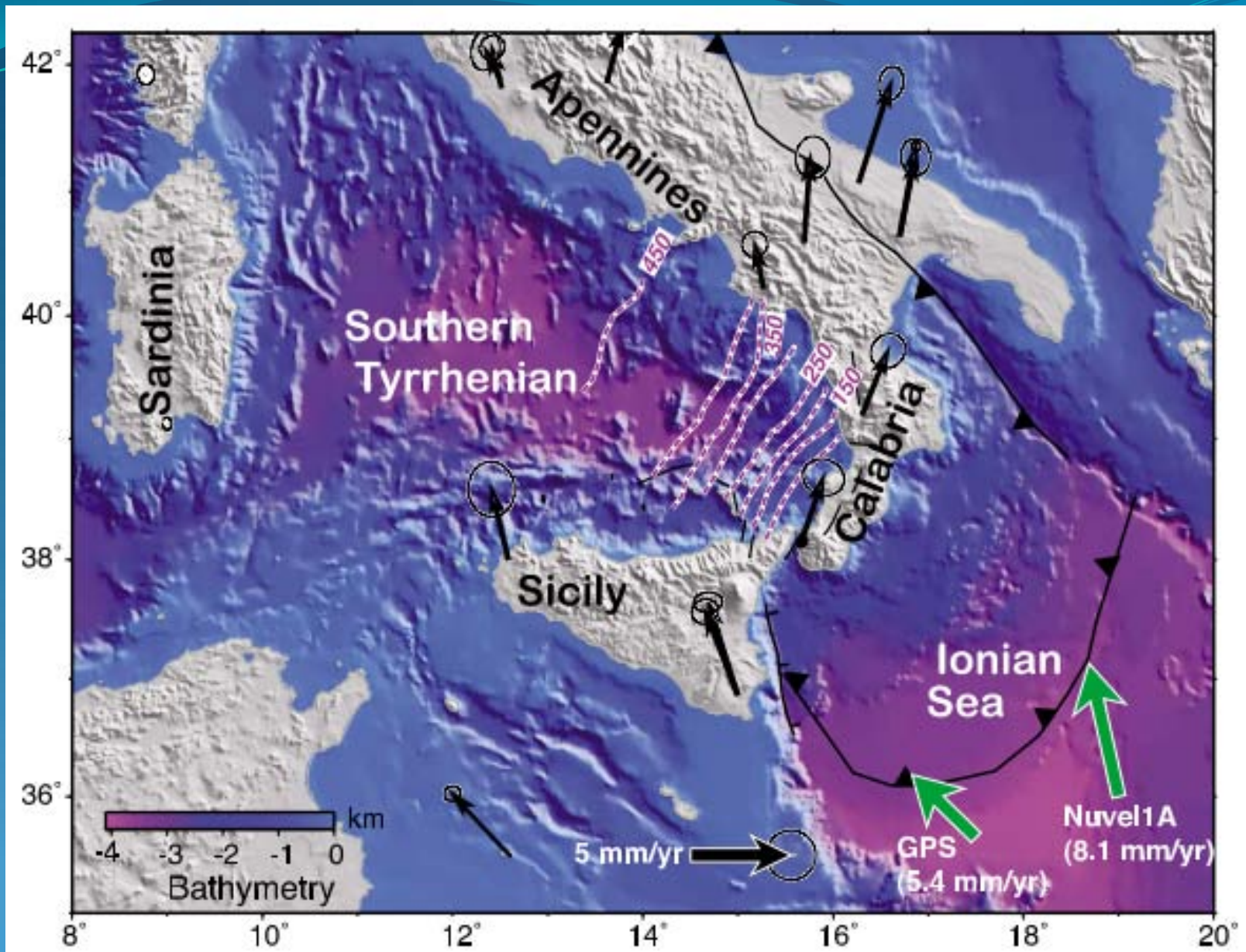




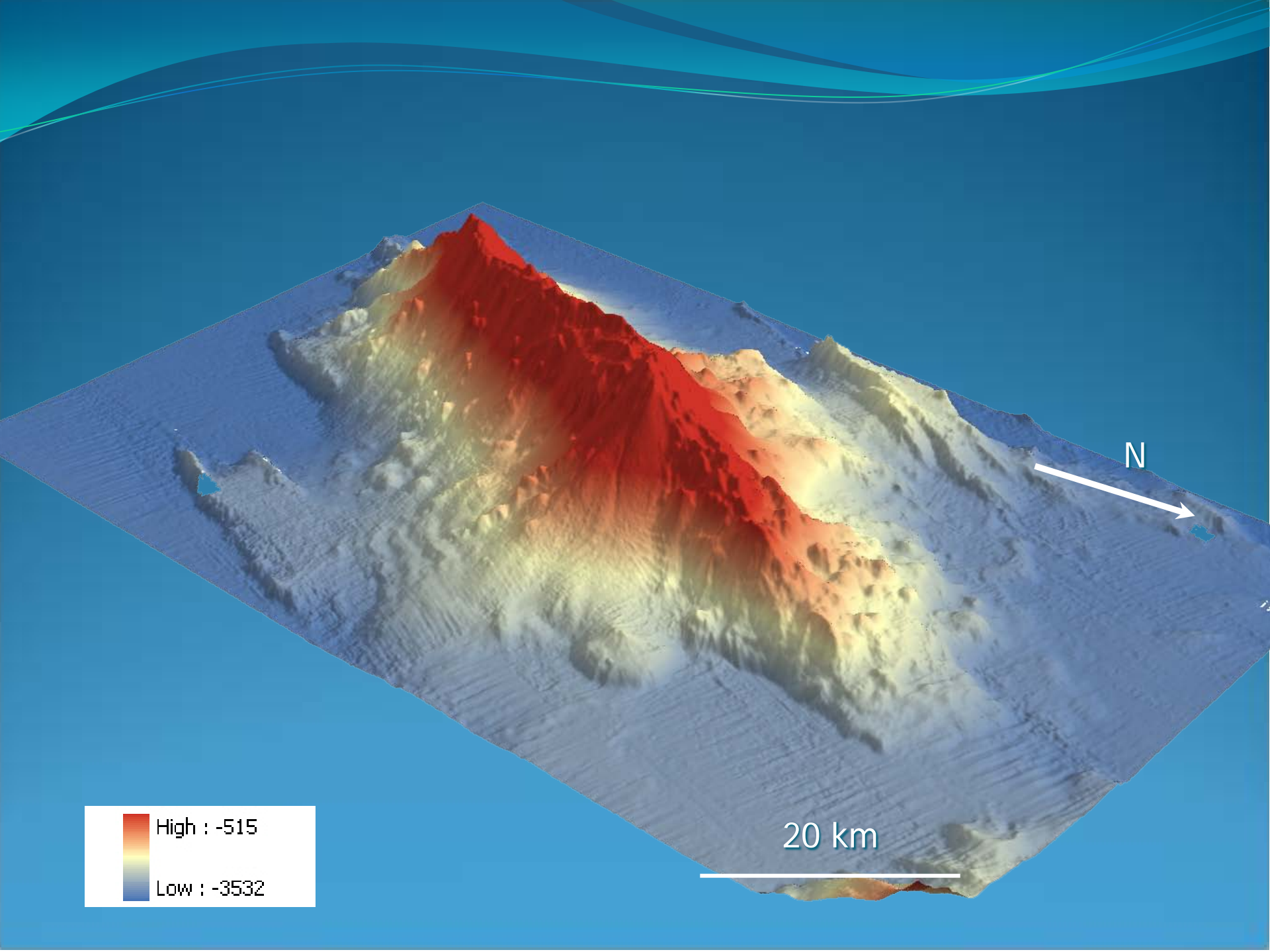
GEBCO Science Day 2012 – Monaco October 2nd, 2012

Multibeam backscatter-driven investigations reveal previously unknown cold seeps in the southeastern Tyrrhenian Sea

**Marzia Rovere, Fabiano Gamberi, Alessandra Mercorella, Michael Marani, Andrea
Gallerani, Elisa Leidi, Federica Foglini**



Faccenna et al., Tectonics, 2011

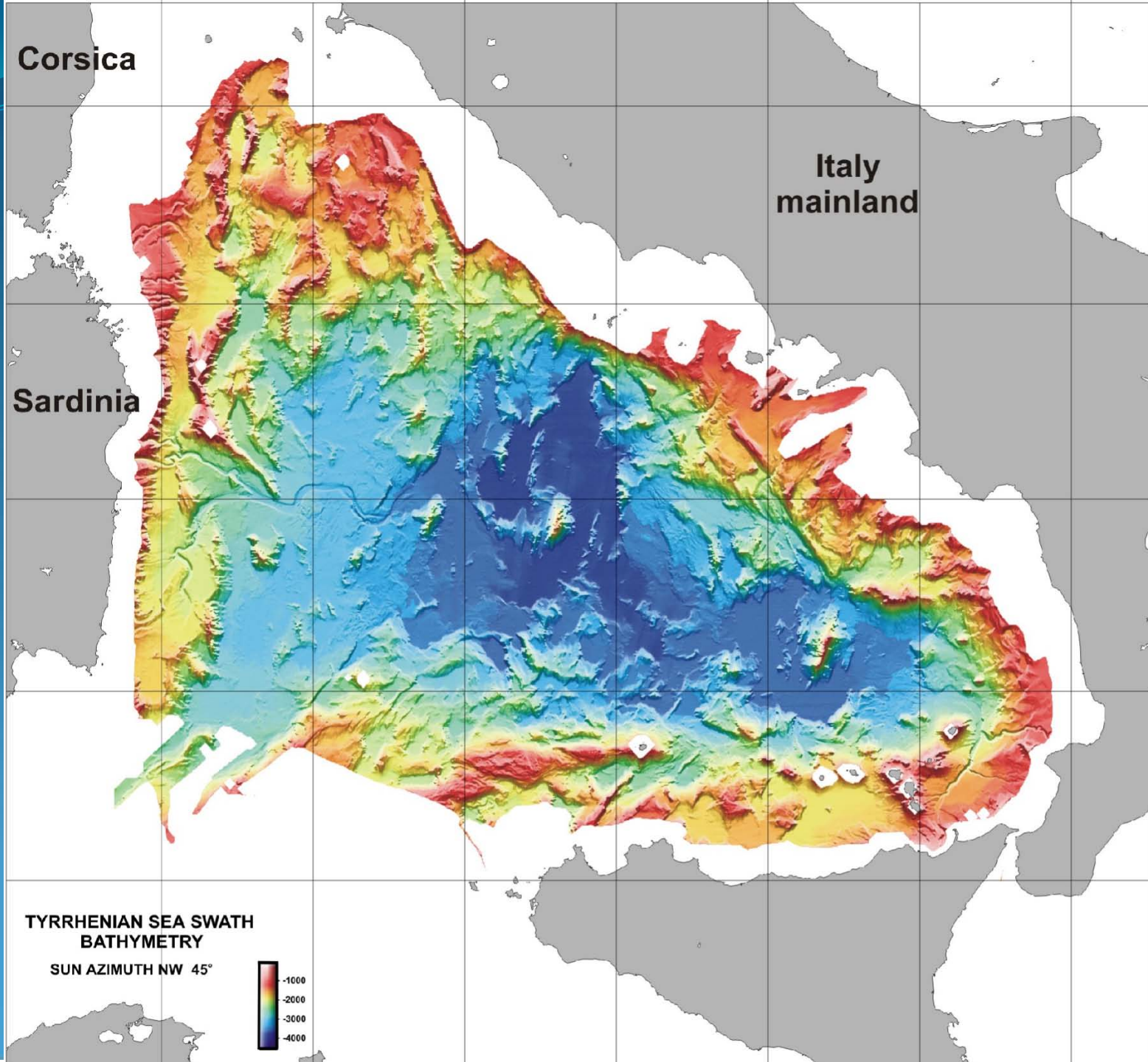
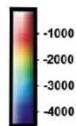


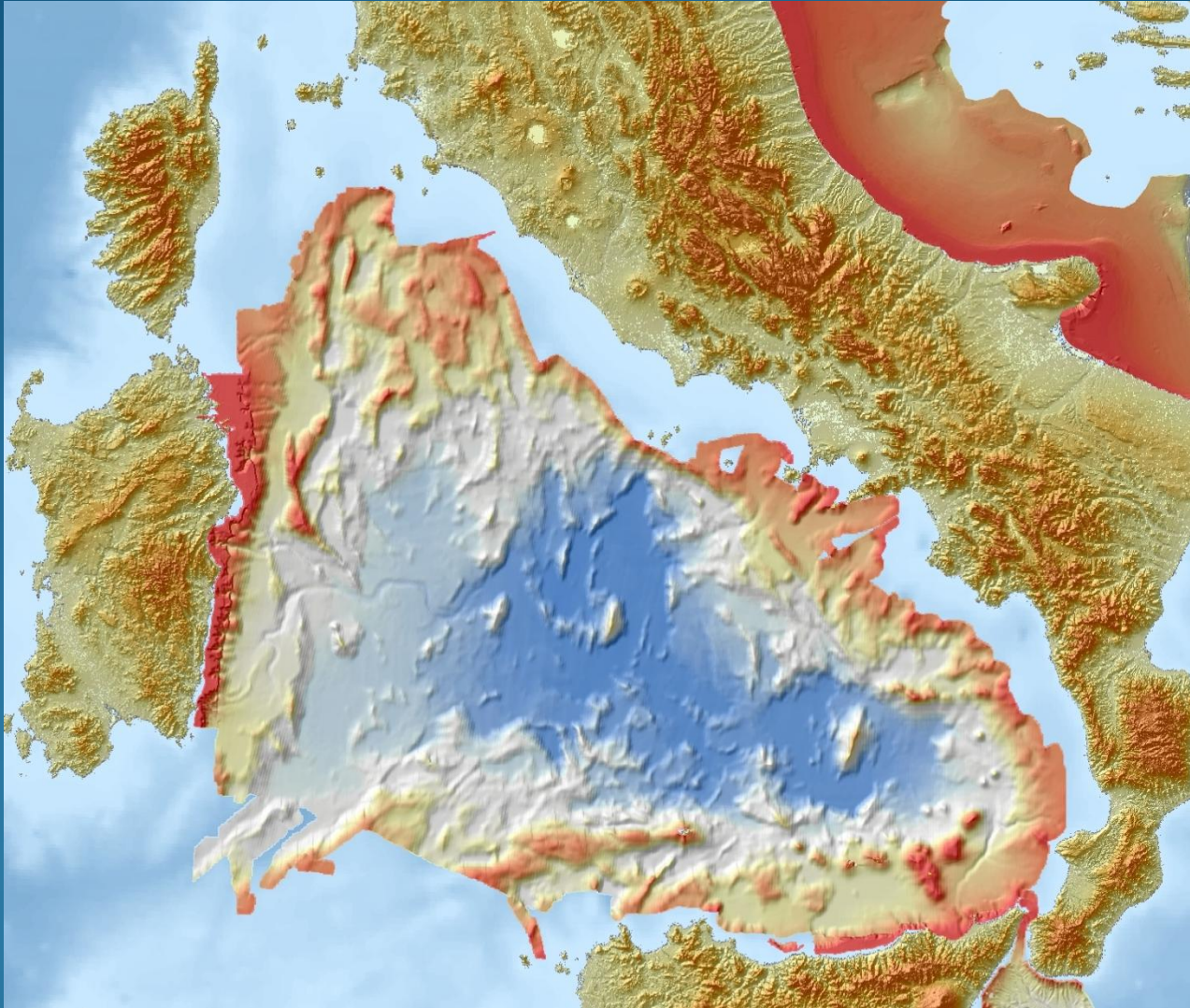
Corsica

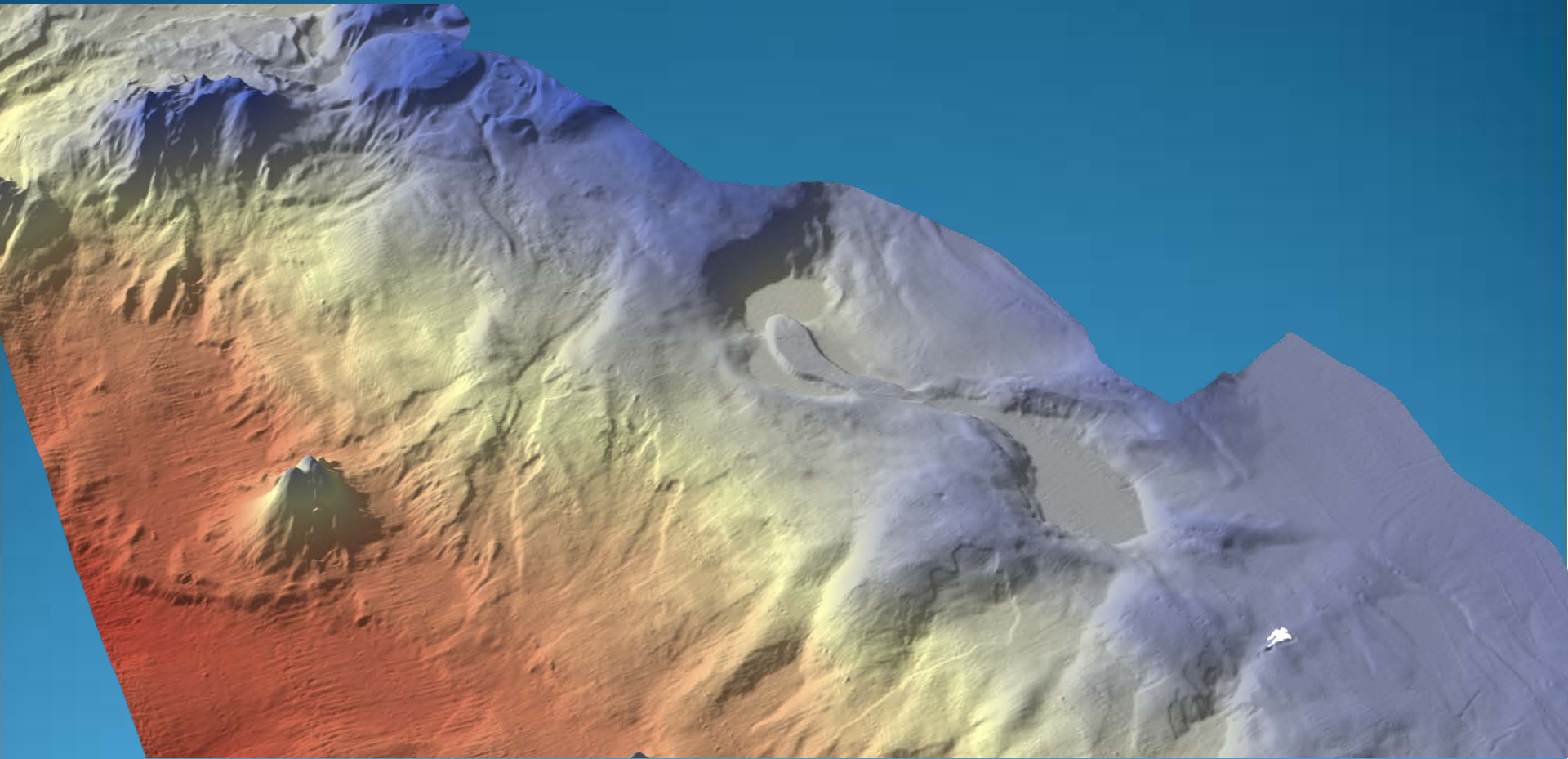
**Italy
mainland**

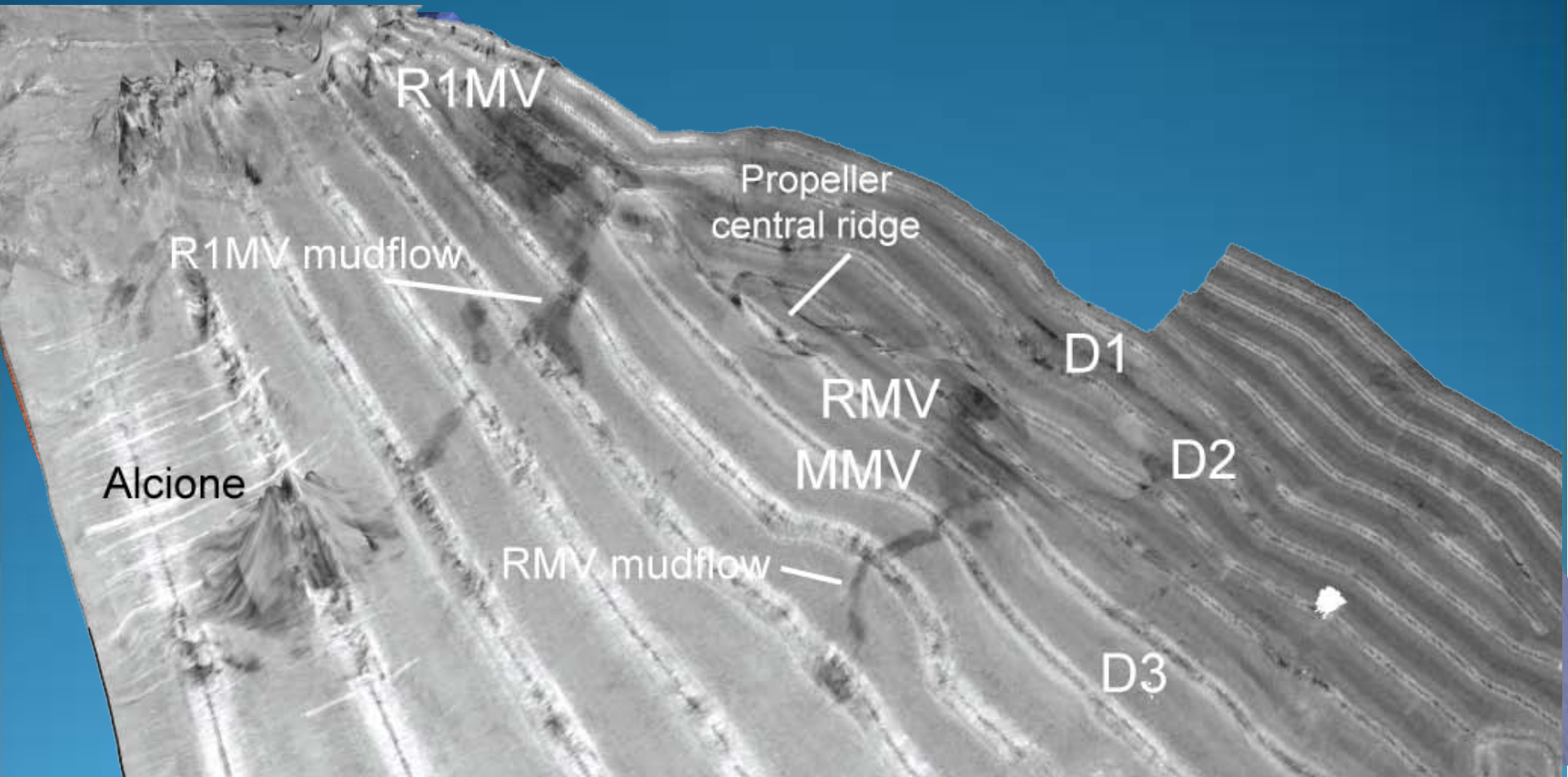
Sardinia

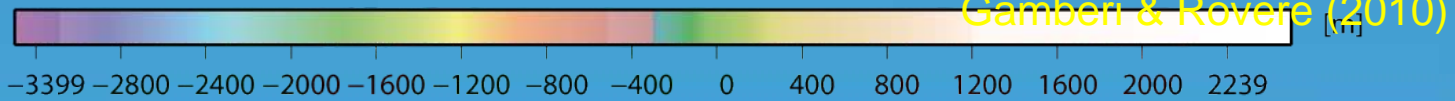
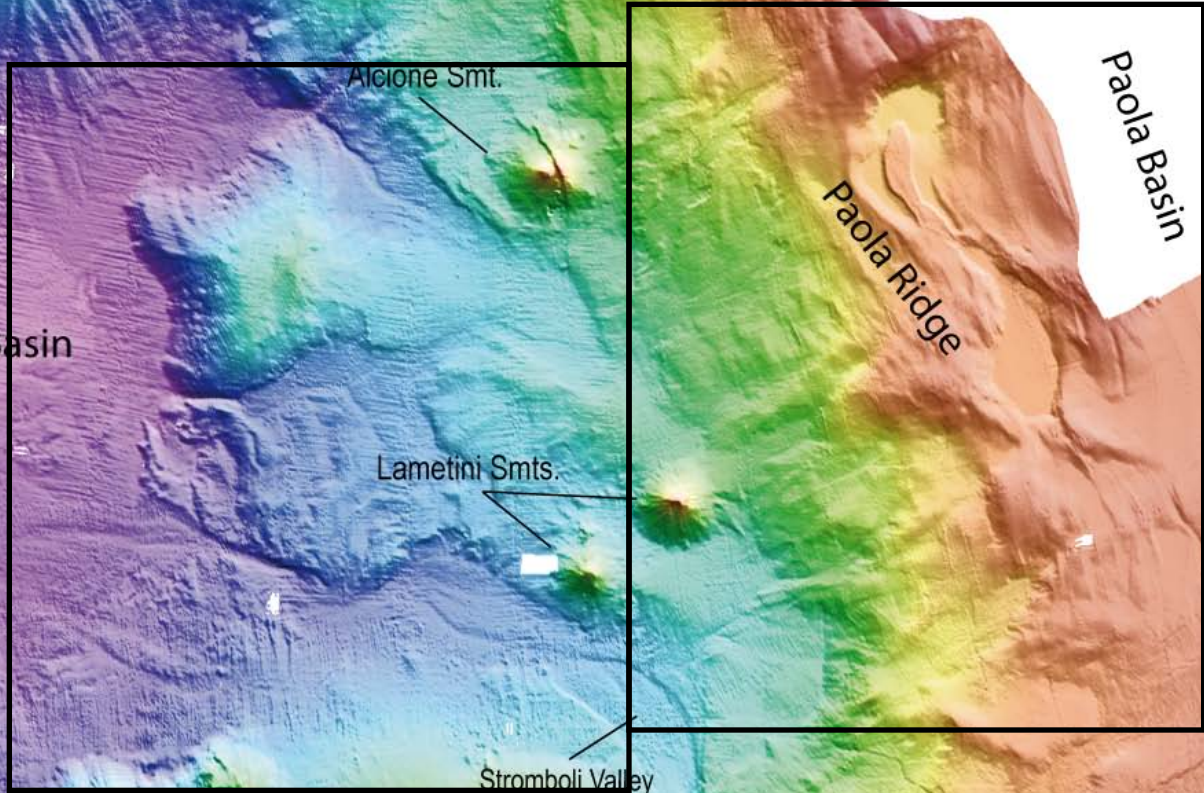
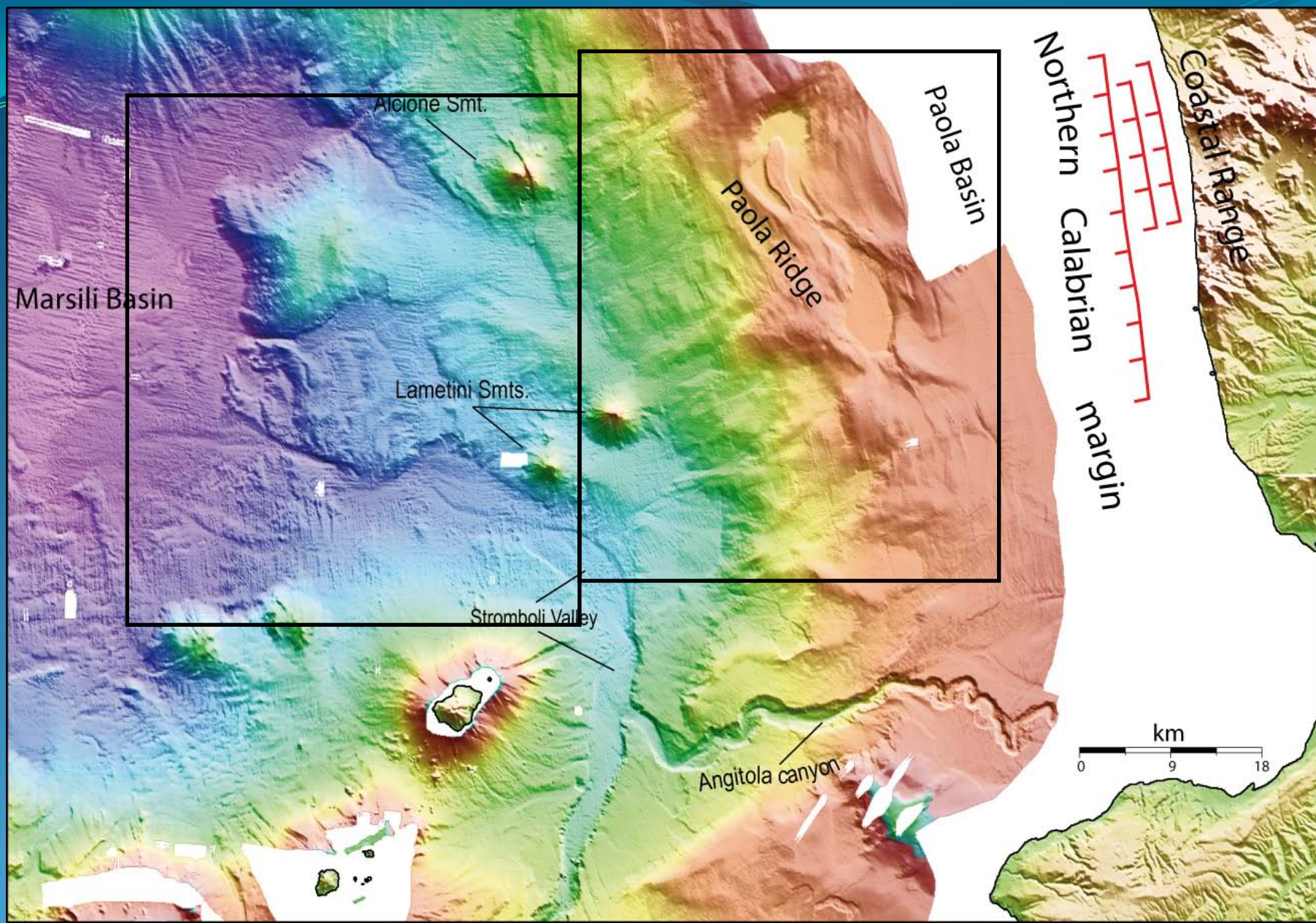
**TYRRHENIAN SEA SWATH
BATHYMETRY**
SUN AZIMUTH NW 45°



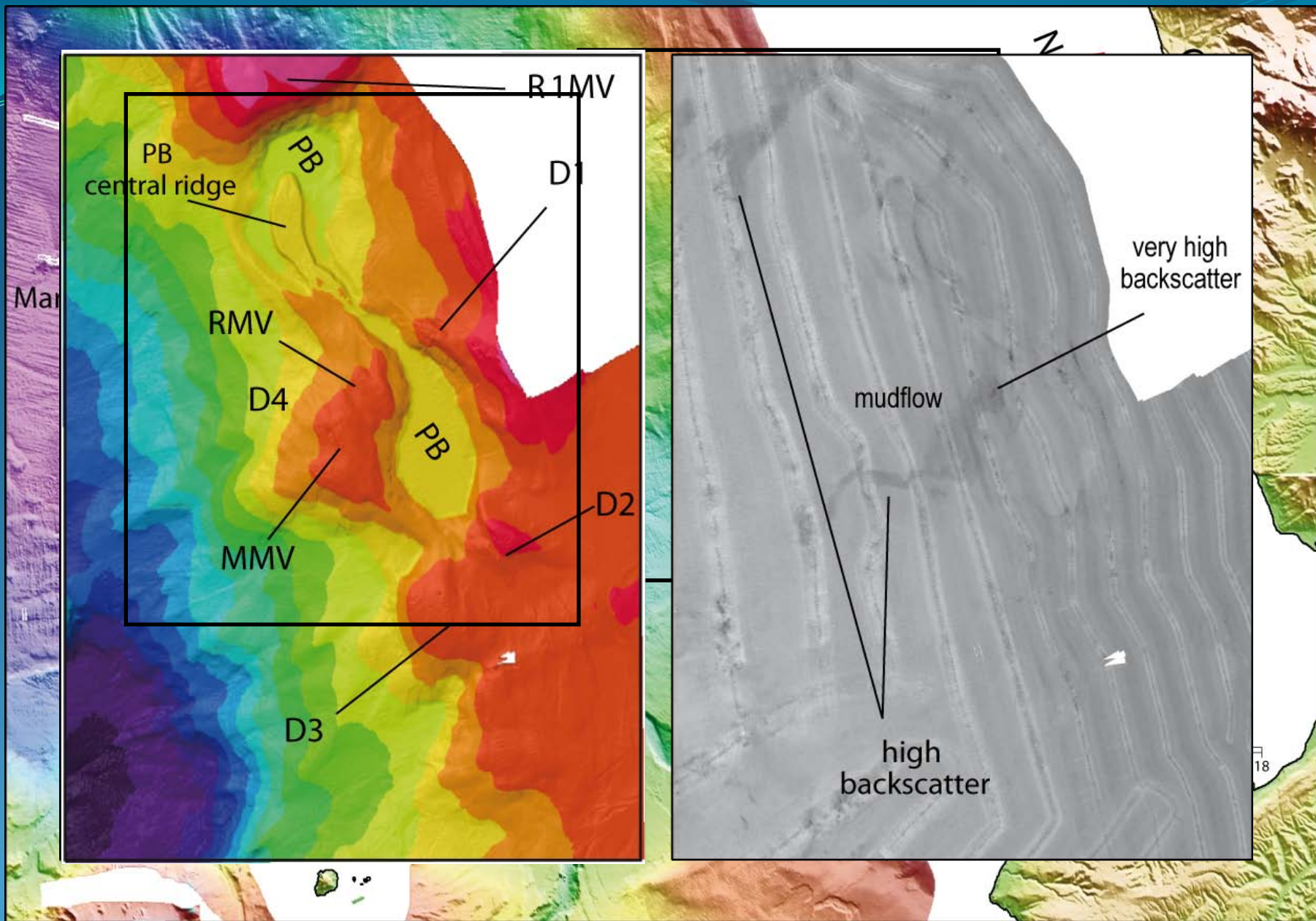




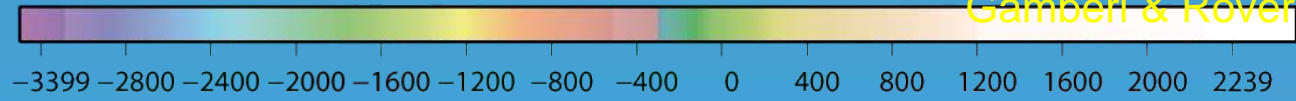


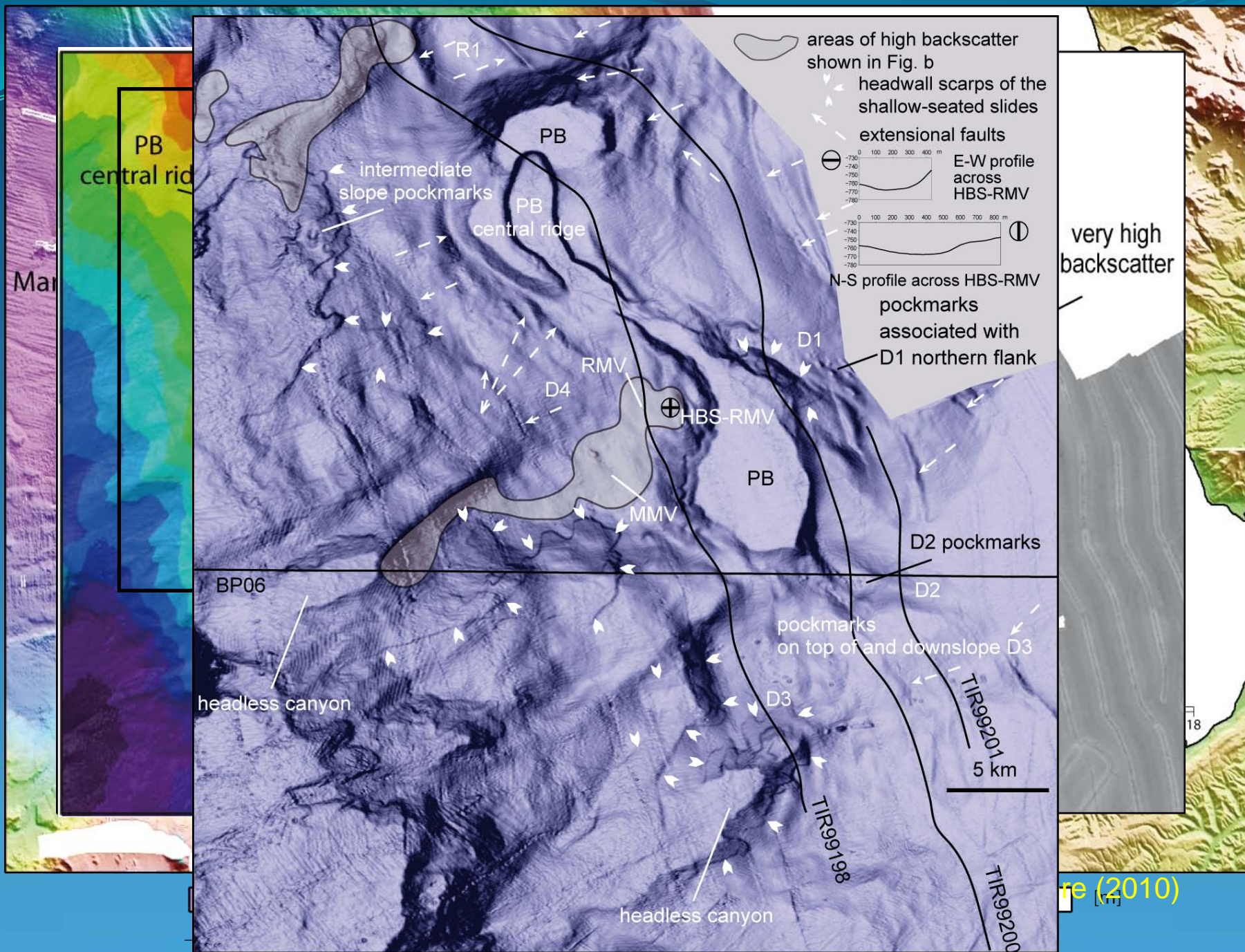


Gamberi & Rovere (2010)

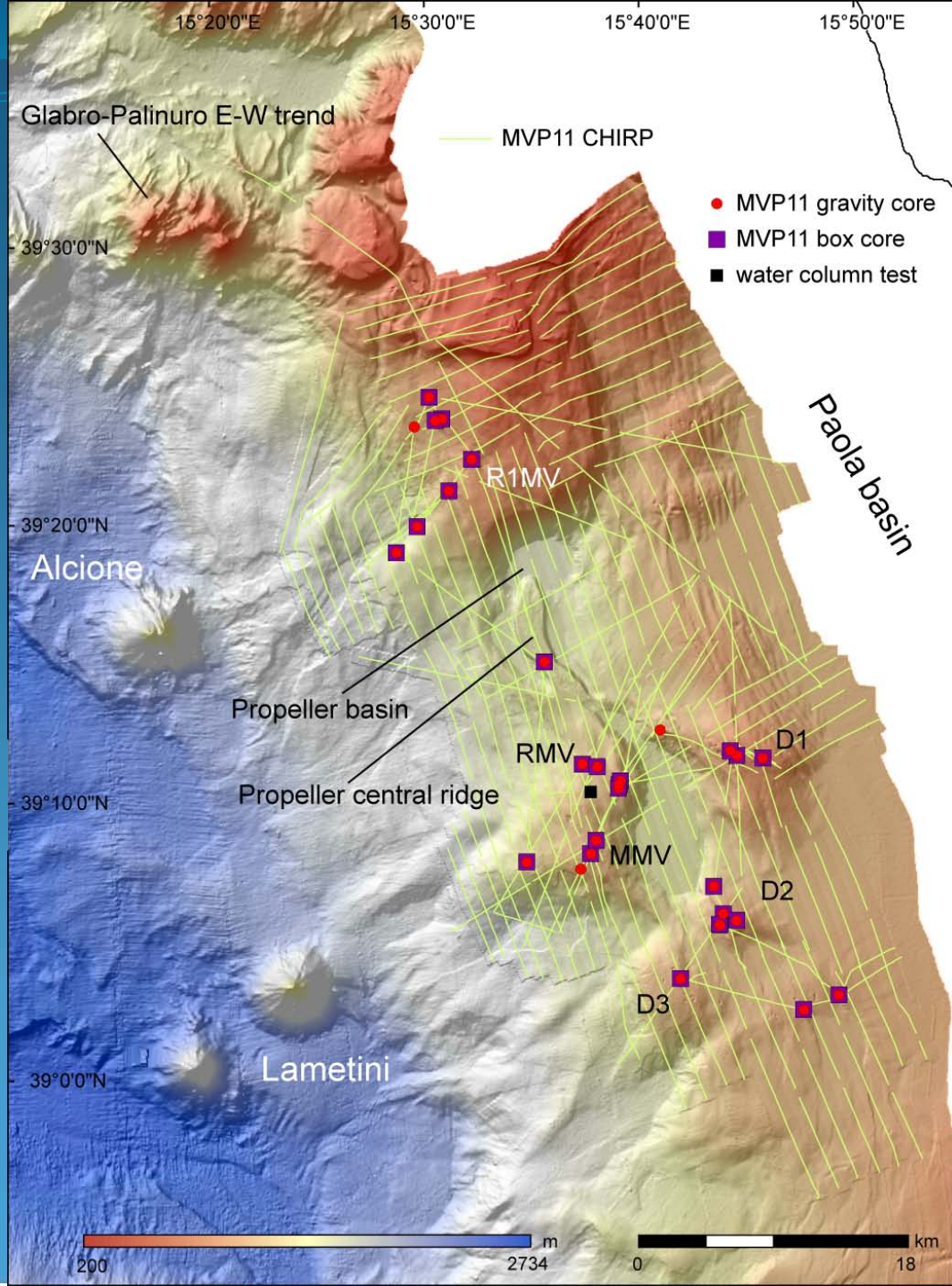


Gamberi & Rovere (2010)



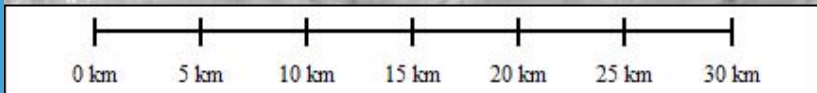
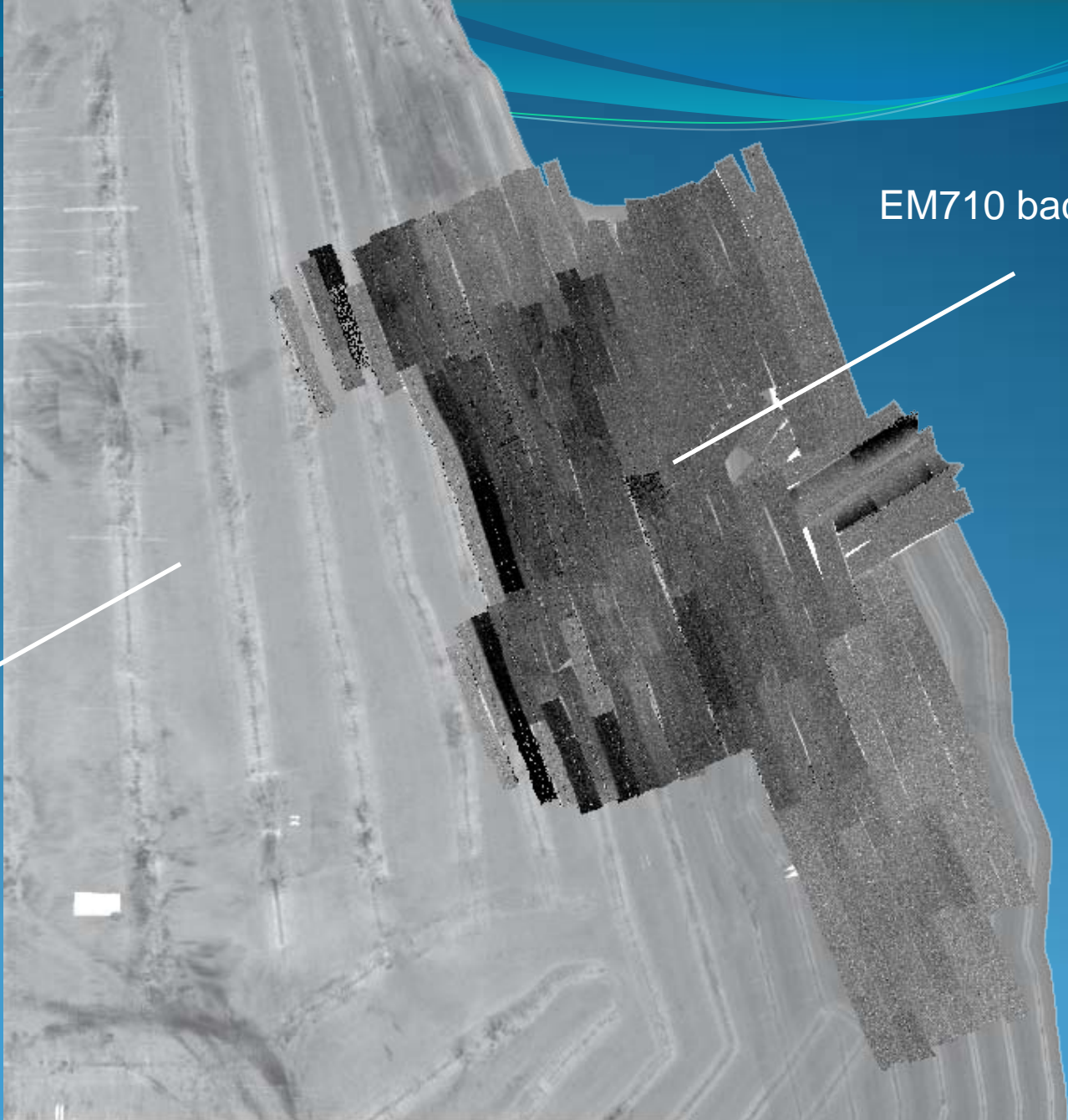


re (2010)



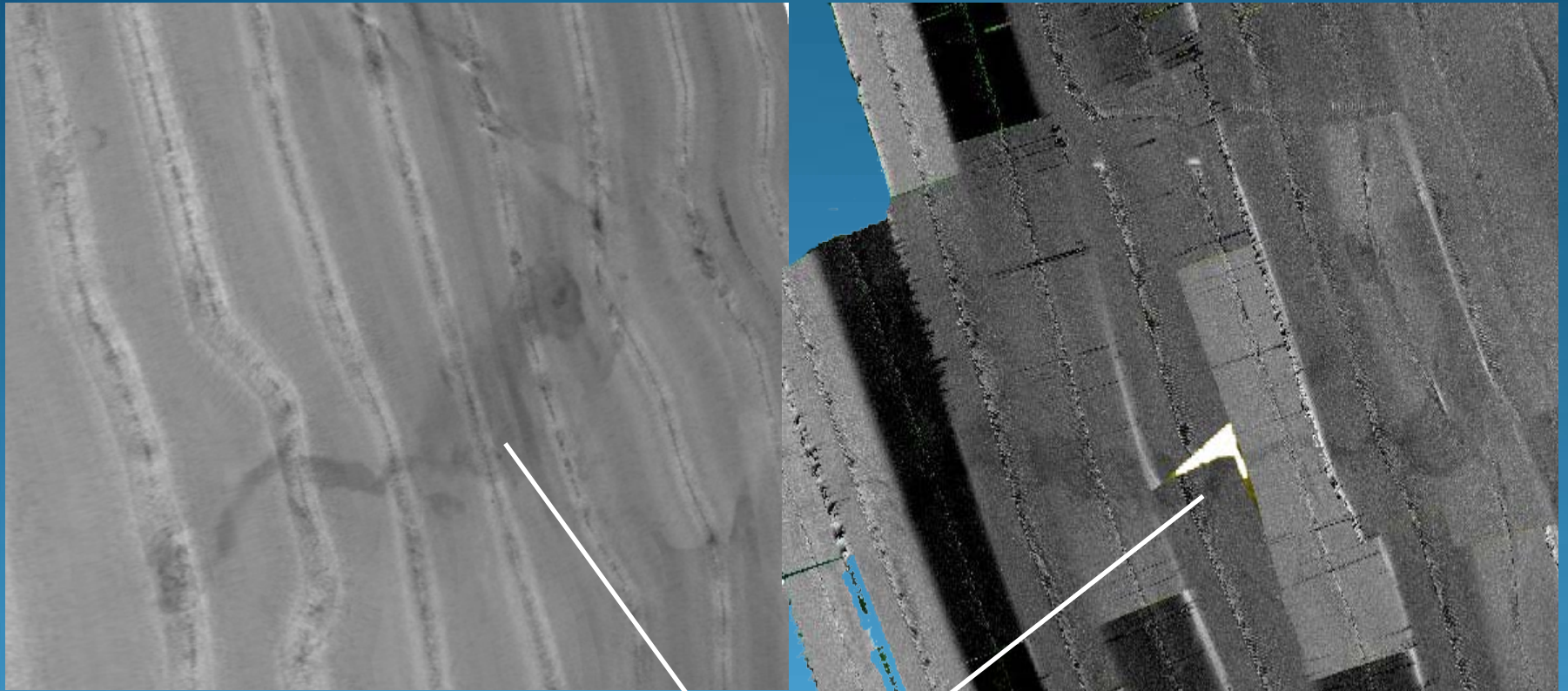
EM710 backscatter

EM12 backscatter



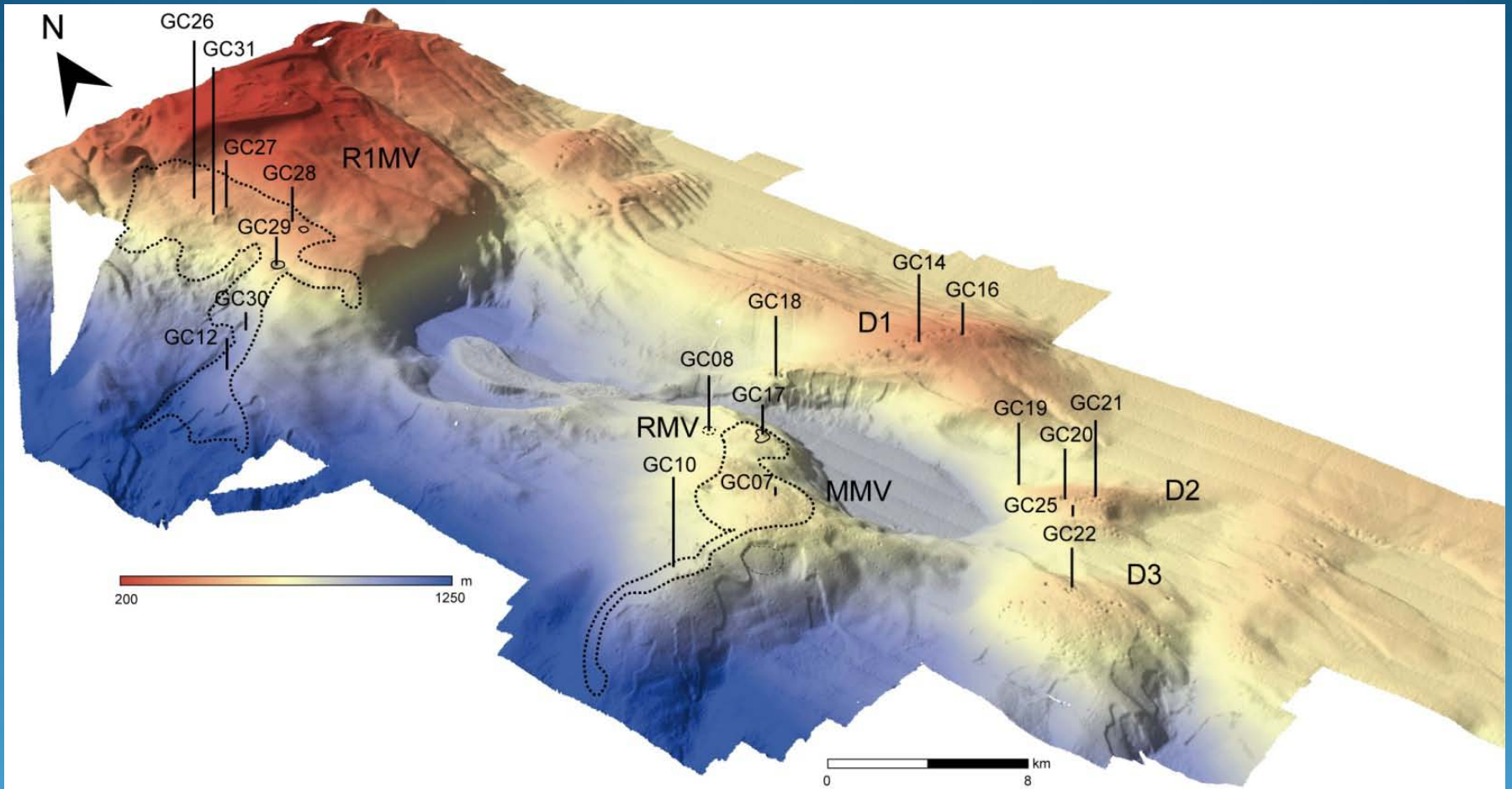
EM12 1996

EM710 2011

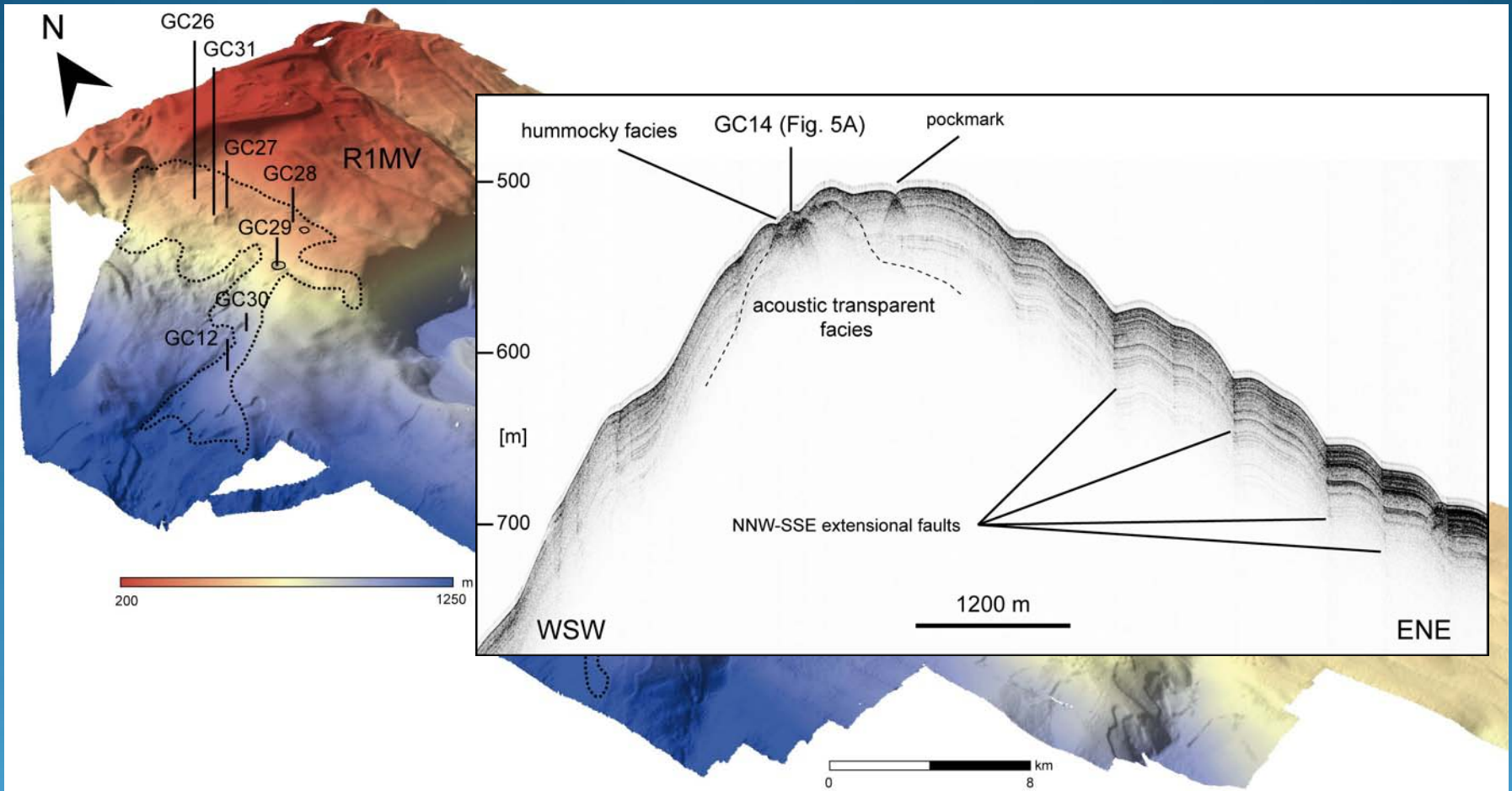


mudflow

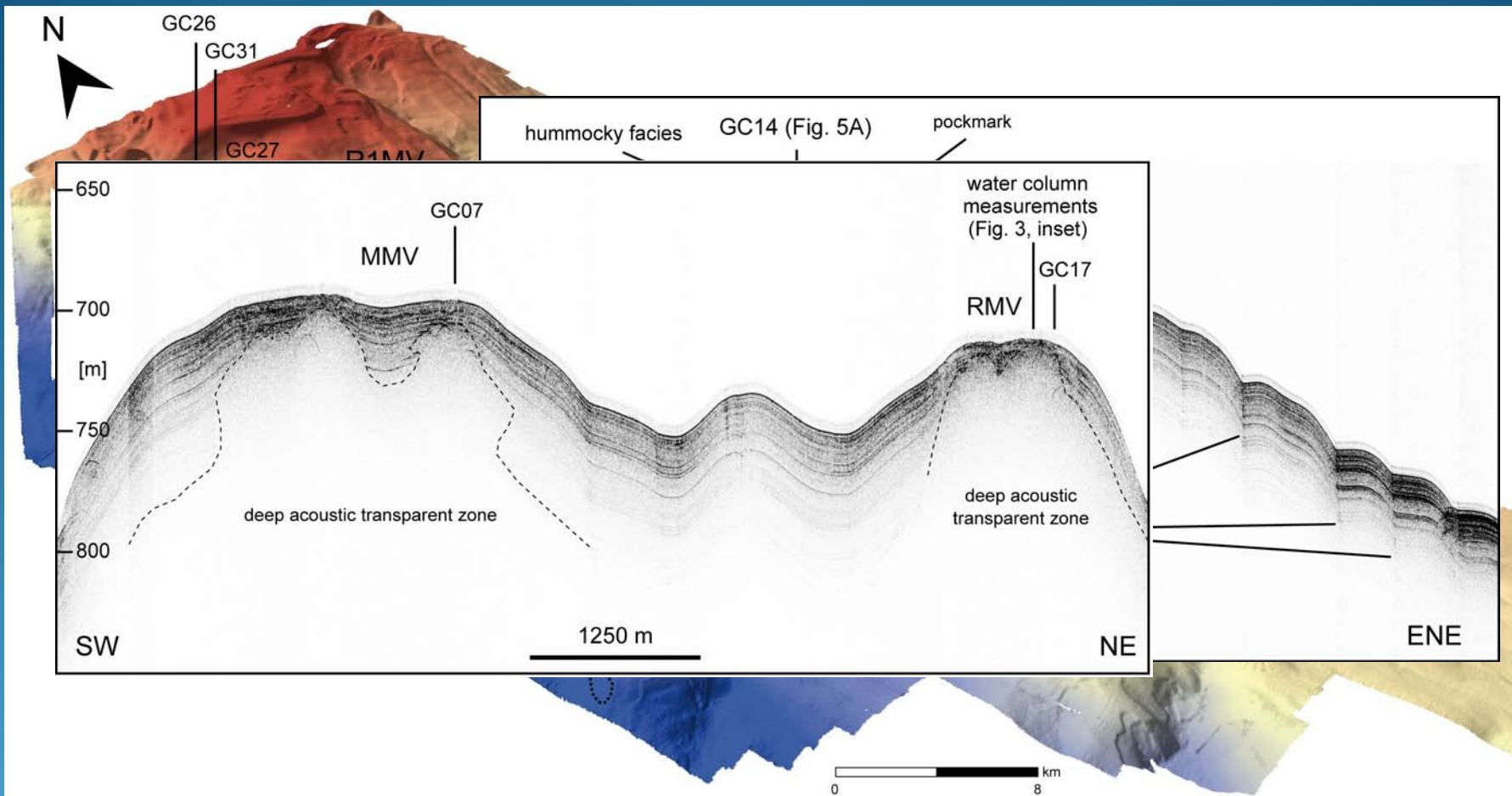
New acquisition EM710



New acquisition EM710



New acquisition EM710







MVP11-GC17
VI



MVP11-GC17
V



MVP11-GC17
IV



MVP11-GC17
III



MVP11-GC17
II



MVP11-GC17
I



MVP11-GC28
IV

MVP11-GC28
III

MVP11-GC28
II

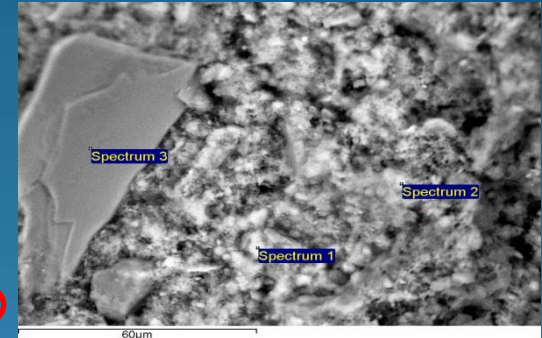
MVP11-GC28
I



mud volcano RMV - BOXCORE



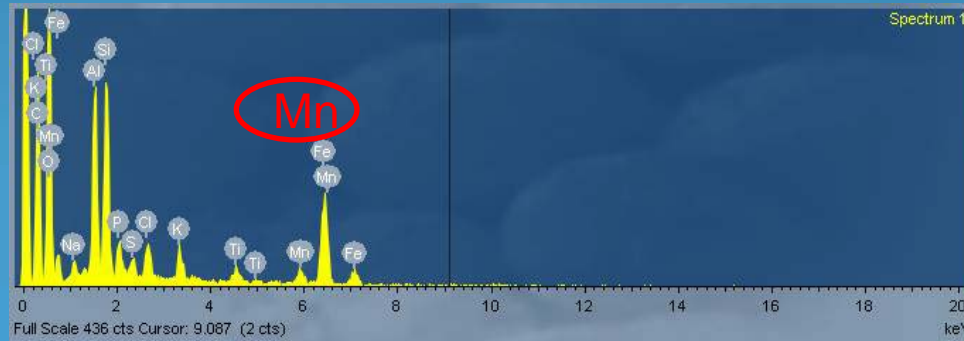
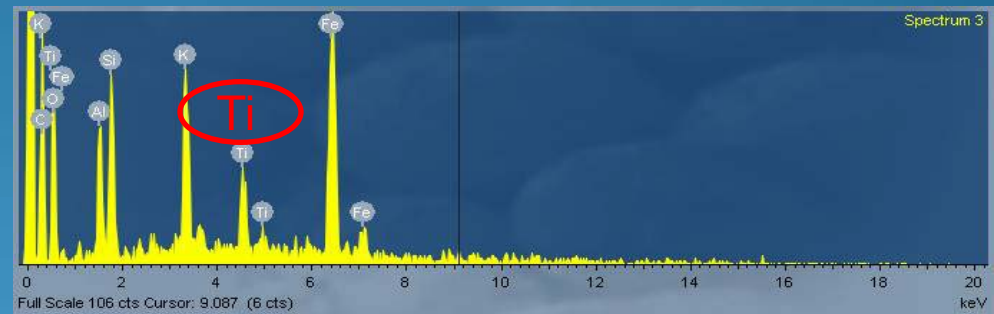
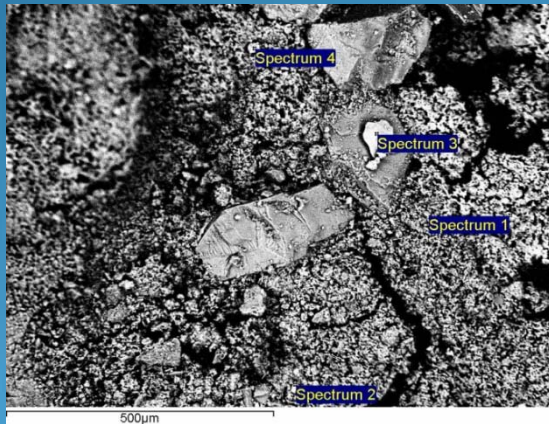
SEM images



Fe

5 cm

XRD: goethite

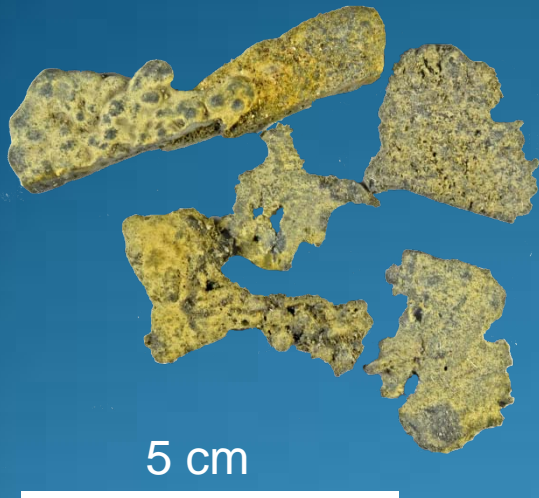


goethite

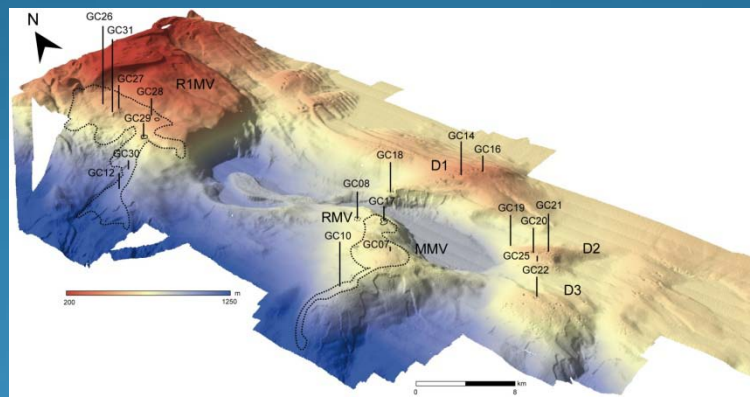


oxic geochemical zone

mud volcano RMV - BOX CORE

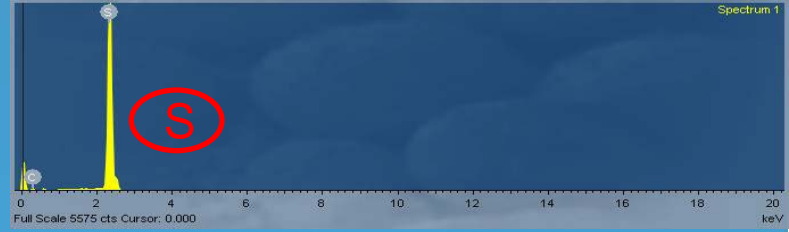
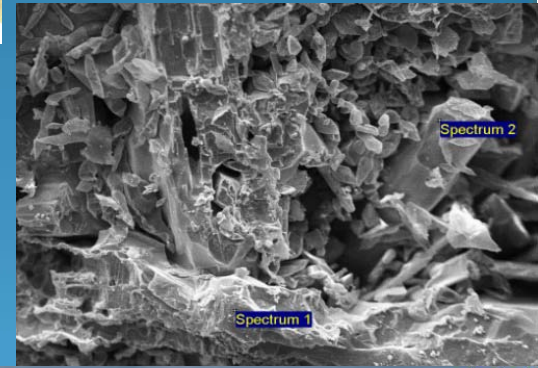
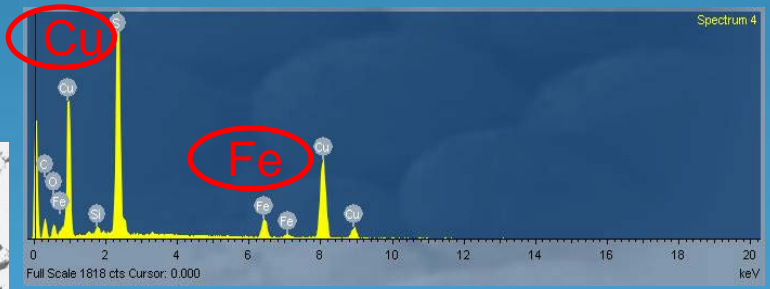
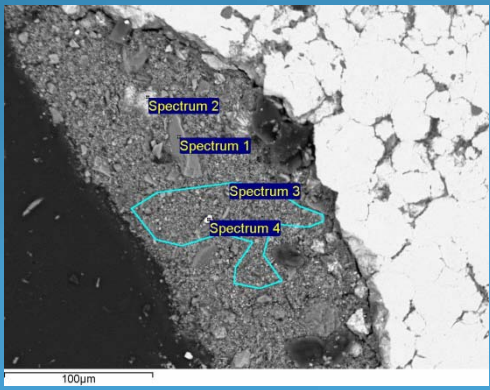


mud volcano R1MV - CORE



SEM: sulfur

SEM: pyrite

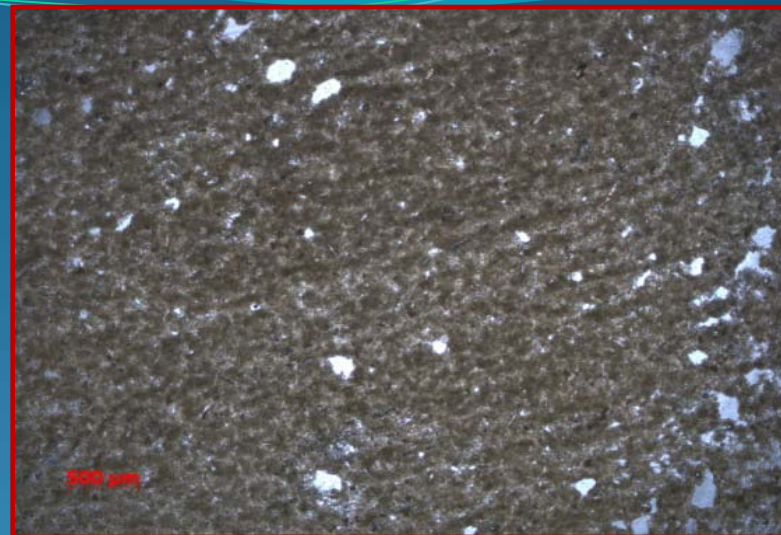


sulfurs



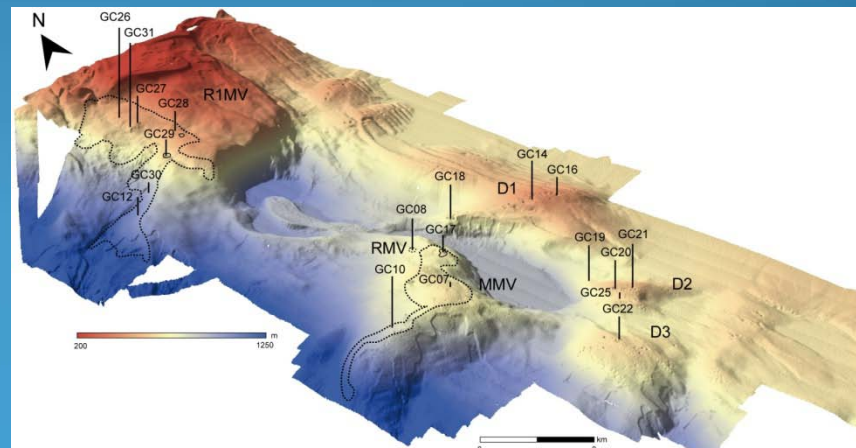
sulfidic geochemical zone

mud volcano RMV



Siderite – mudstone at optical microscope

XRD analysis: siderite

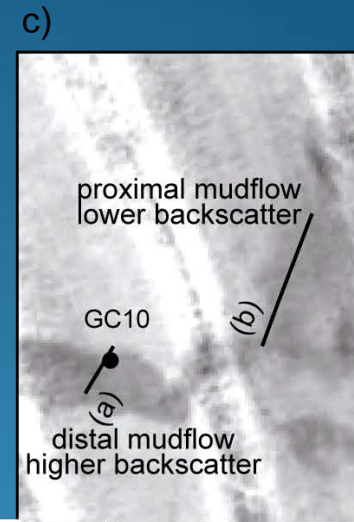
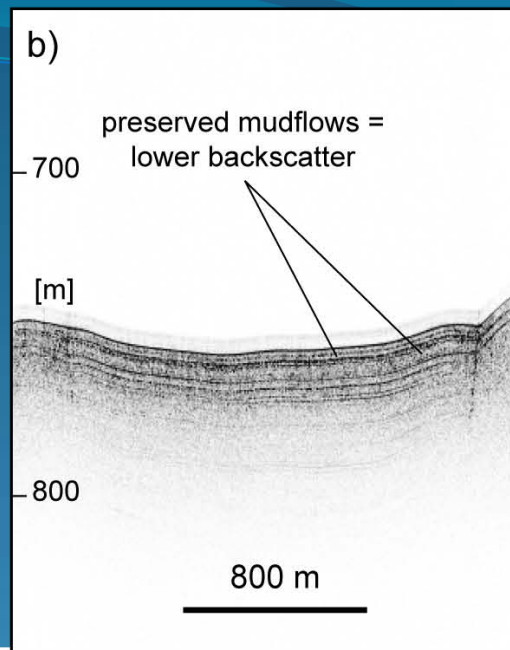
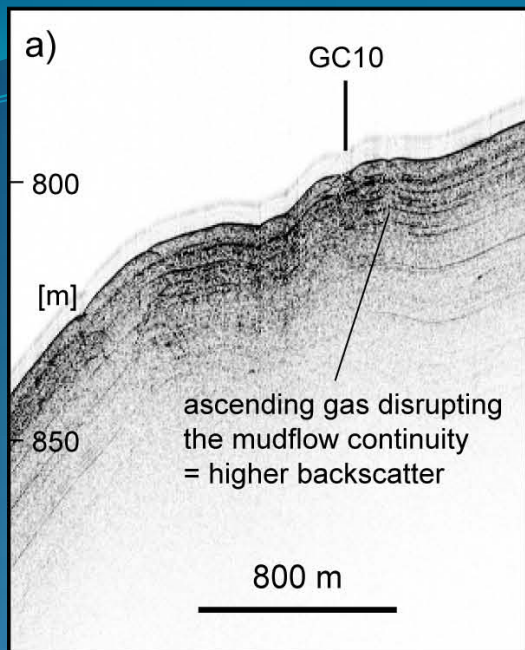


siderite

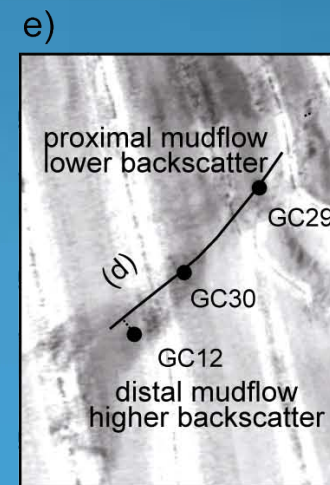
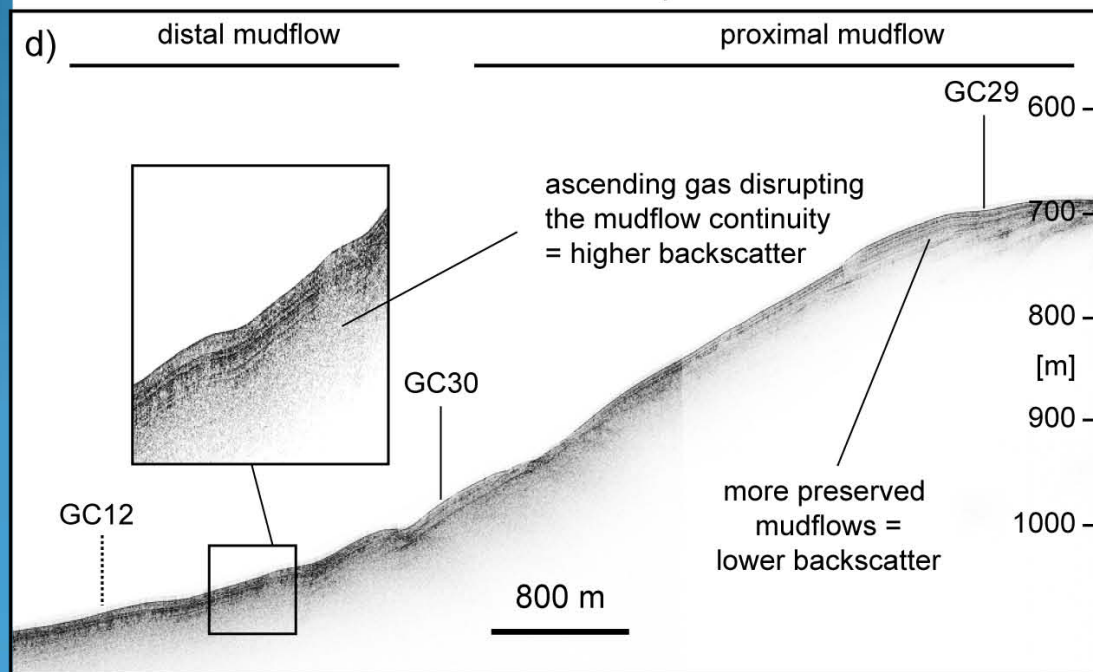


methanogenic geochemical zone

SW distal mudflow RMV slope proximal mudflow NE



R1MV slope







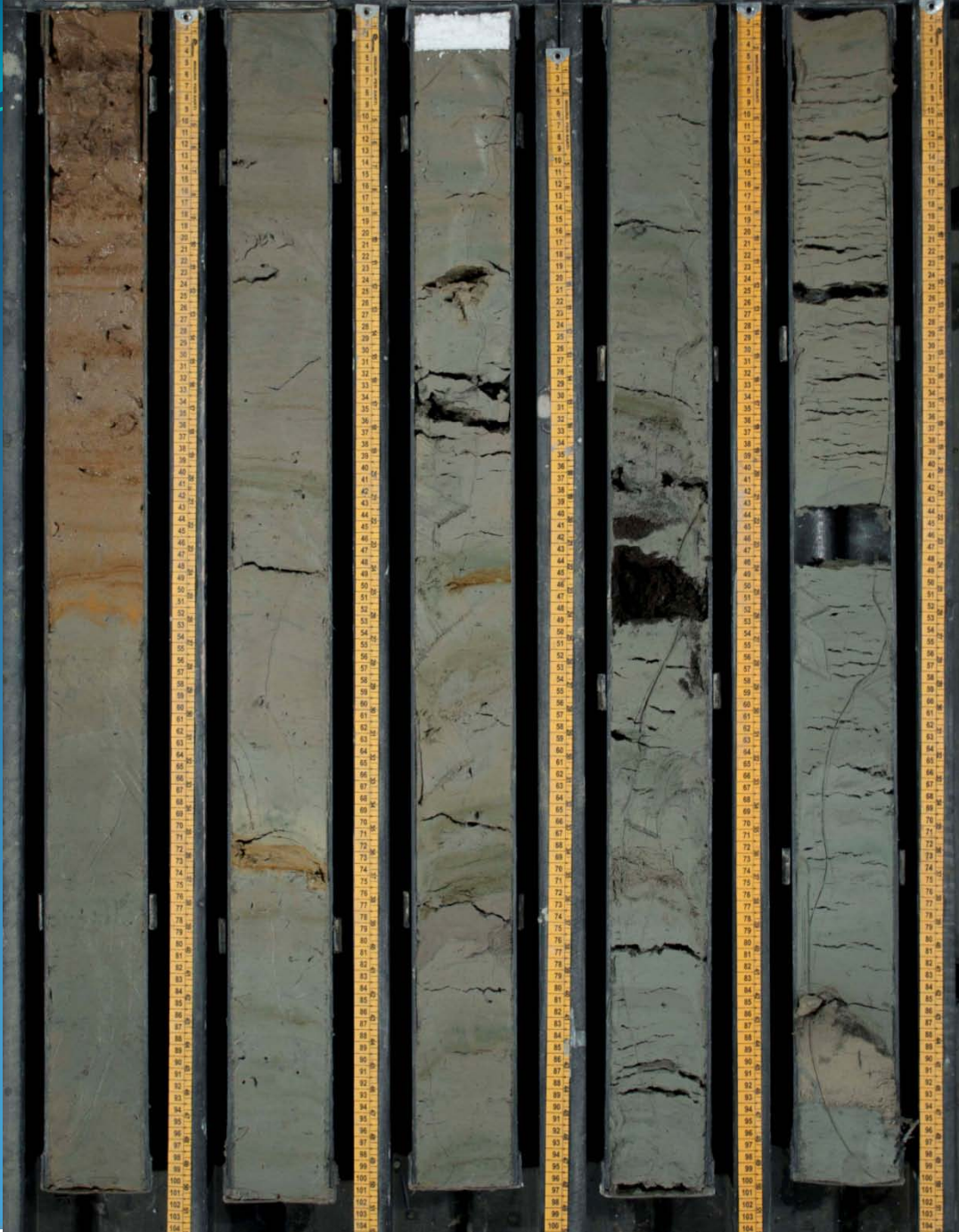
MVP11-GC10
V

MVP11-GC10
IV

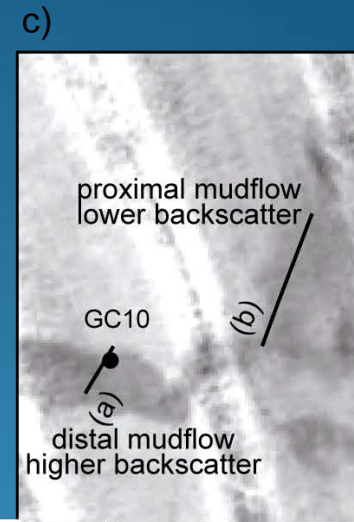
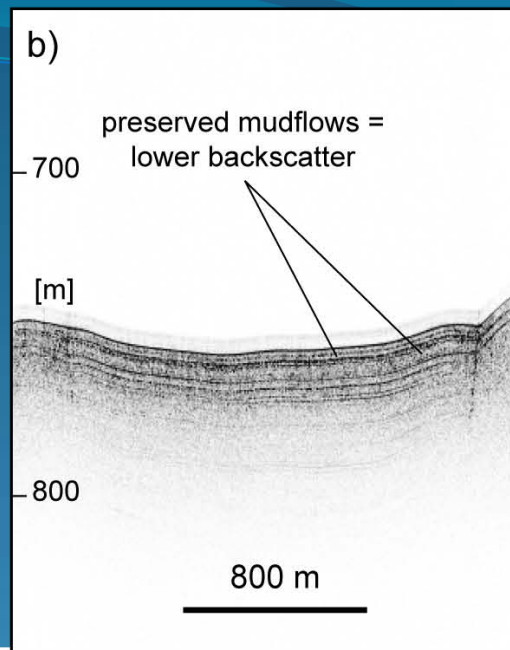
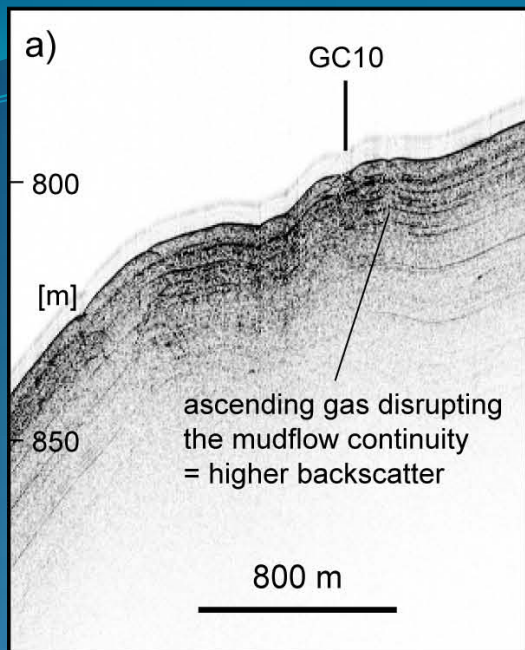
MVP11-GC10
III

MVP11-GC10
II

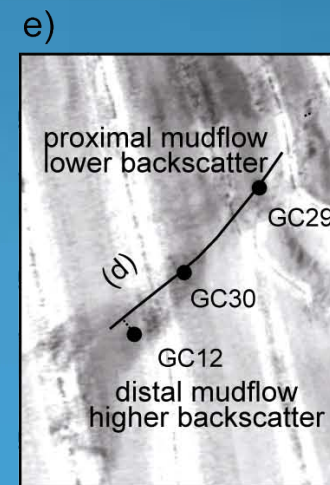
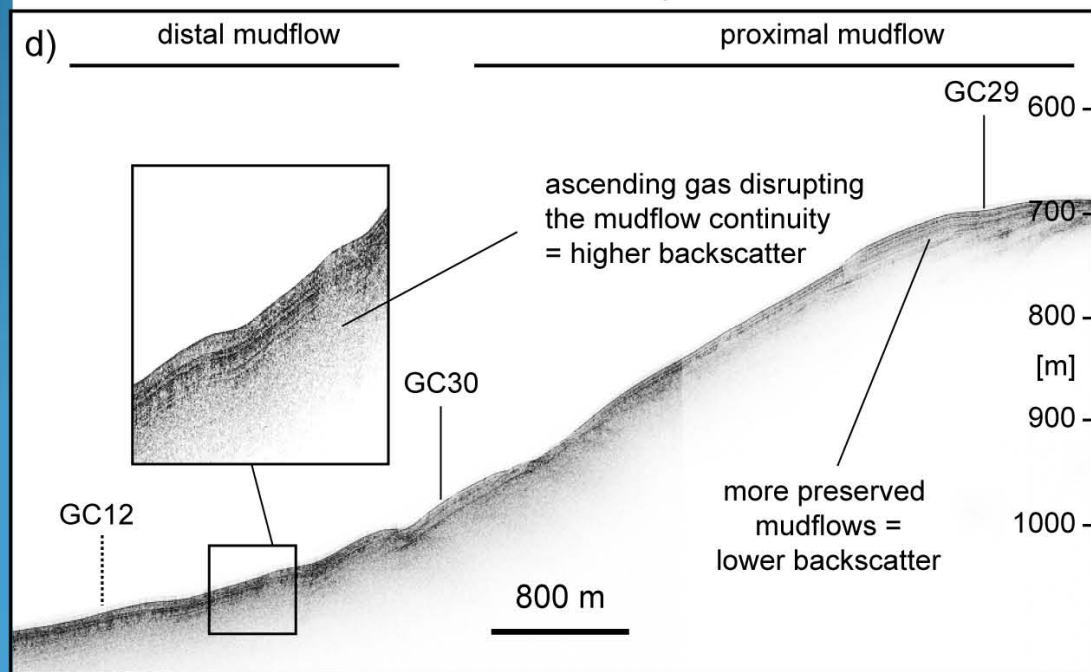
MVP11-GC10
I

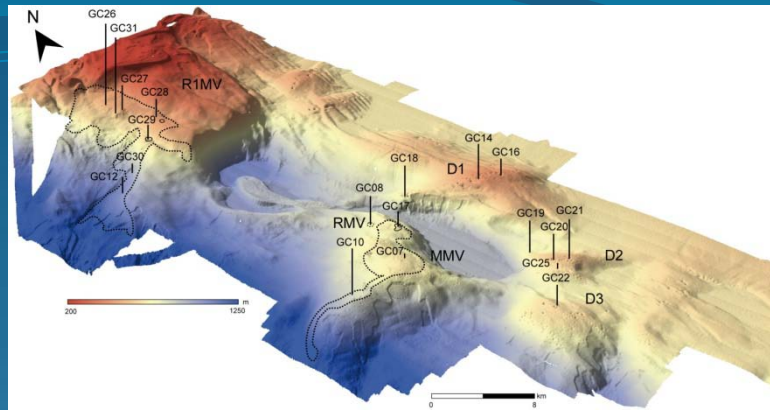
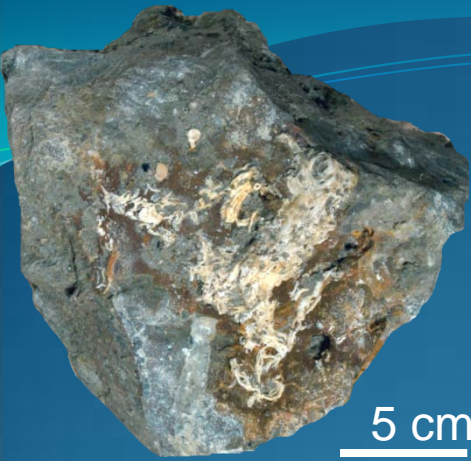


SW distal mudflow RMV slope proximal mudflow NE



R1MV slope

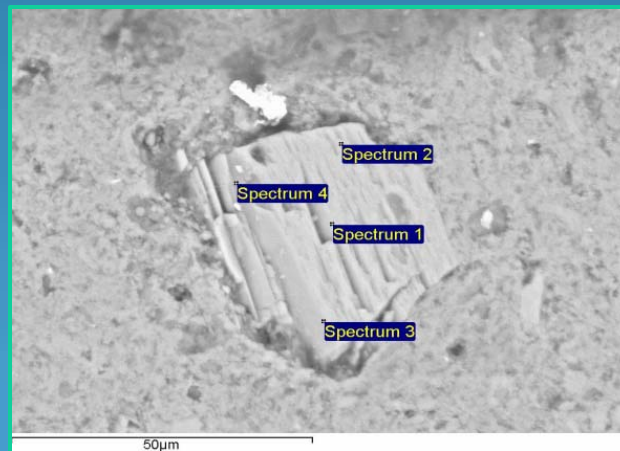




diapir D1 – authigenic dolomite with oxyhydroxides coating, serpulids traces



Optical microscope: bioclastic wackestone

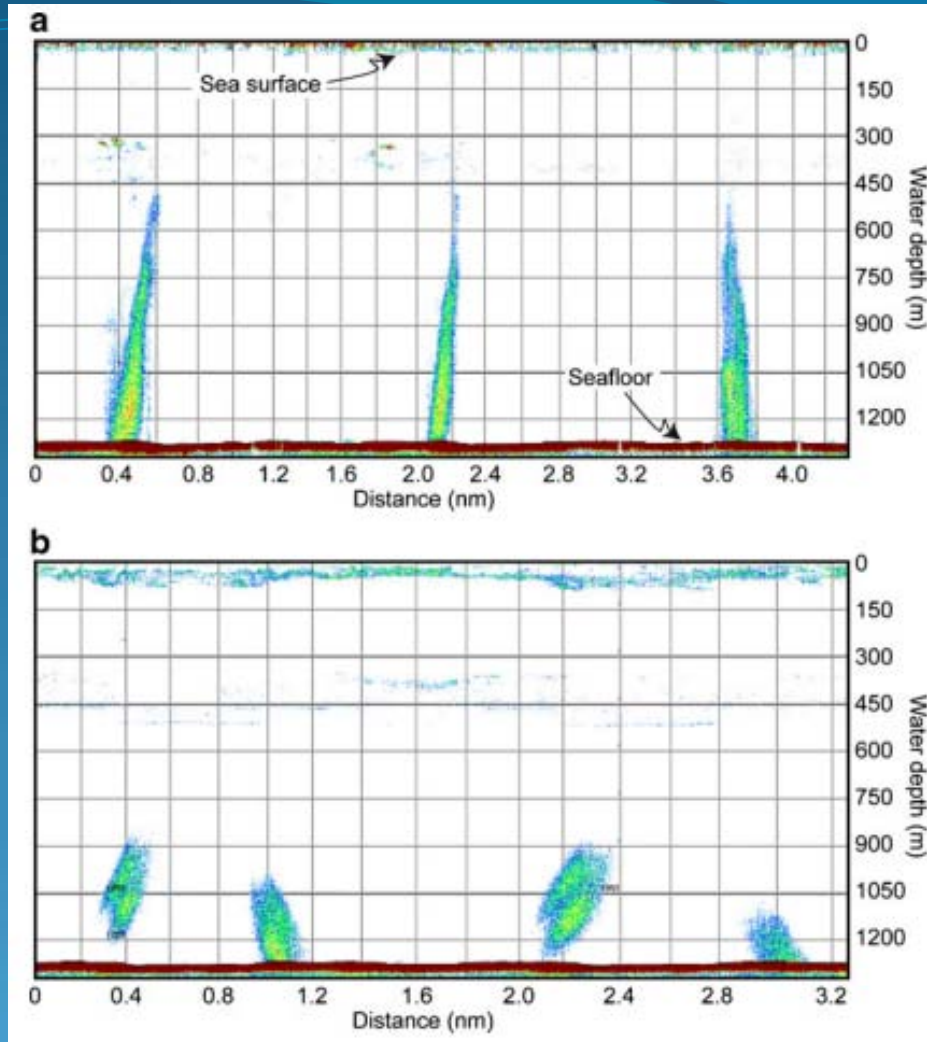


SEM: neovolcanic pyroxen in the carbonatic matrix

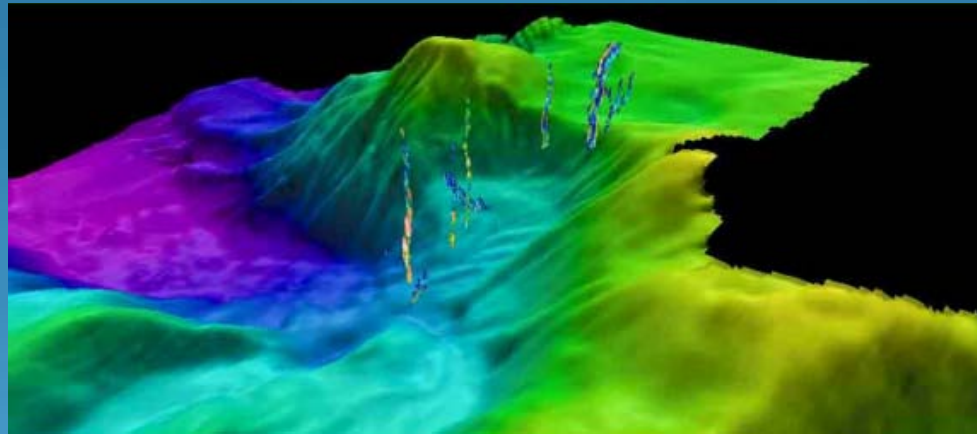
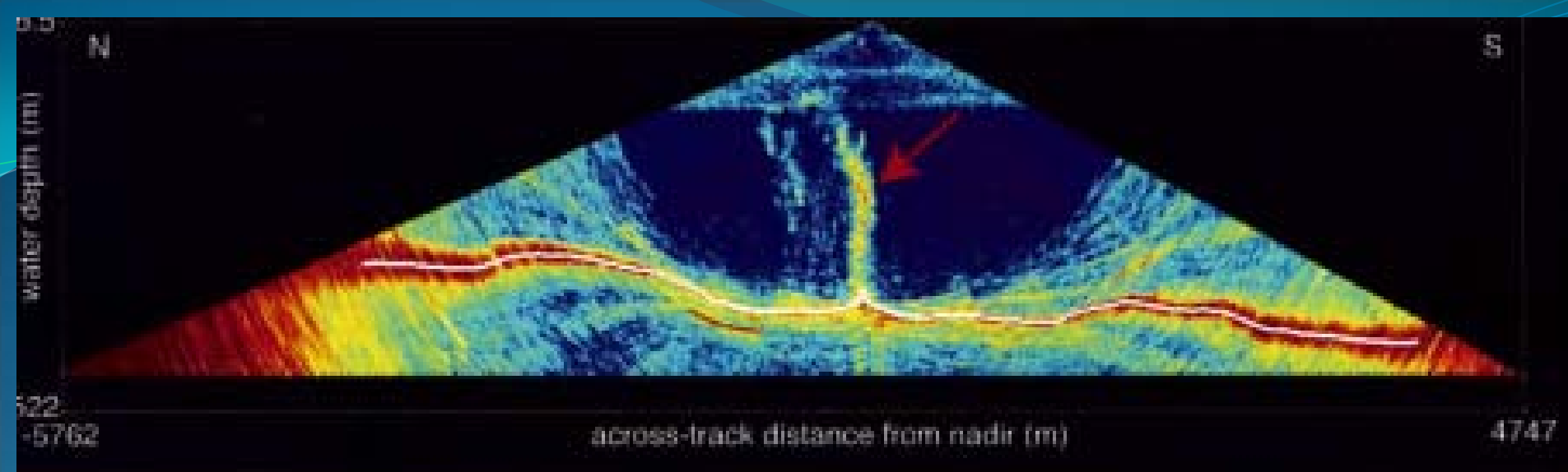
Lucinids and crustaceans



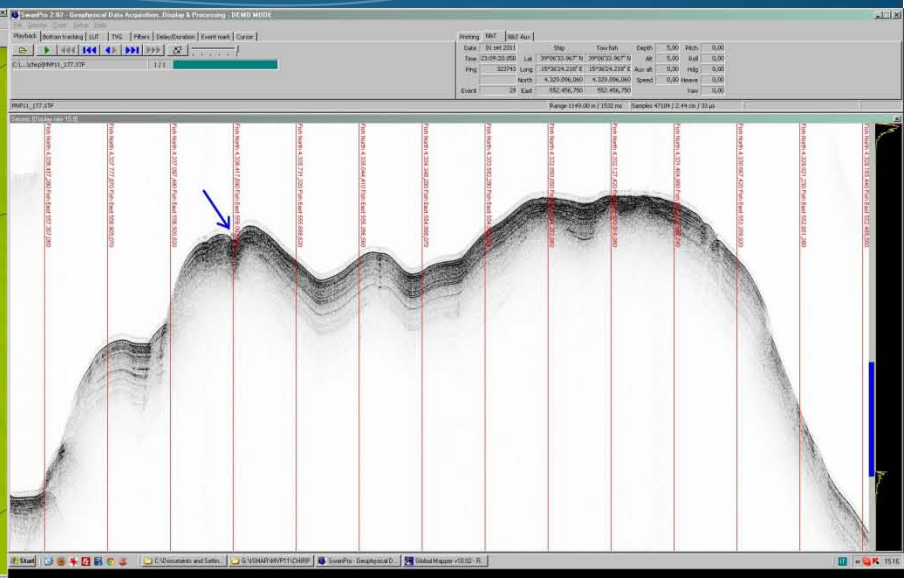
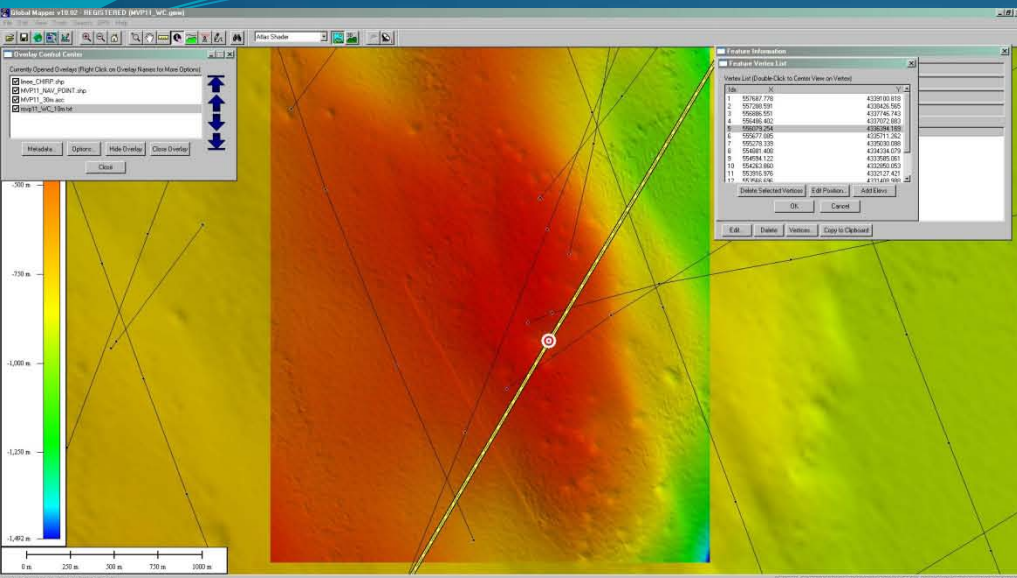
Callinectes lobata



Gas flares detected in the water column above the Håkon Mosby mud volcano using a 38-kHz echosounder of the R/V Pourquoi pas? during the Vicking cruise in 2006. Foucher et al. (Geo Mar Lett, 2010).



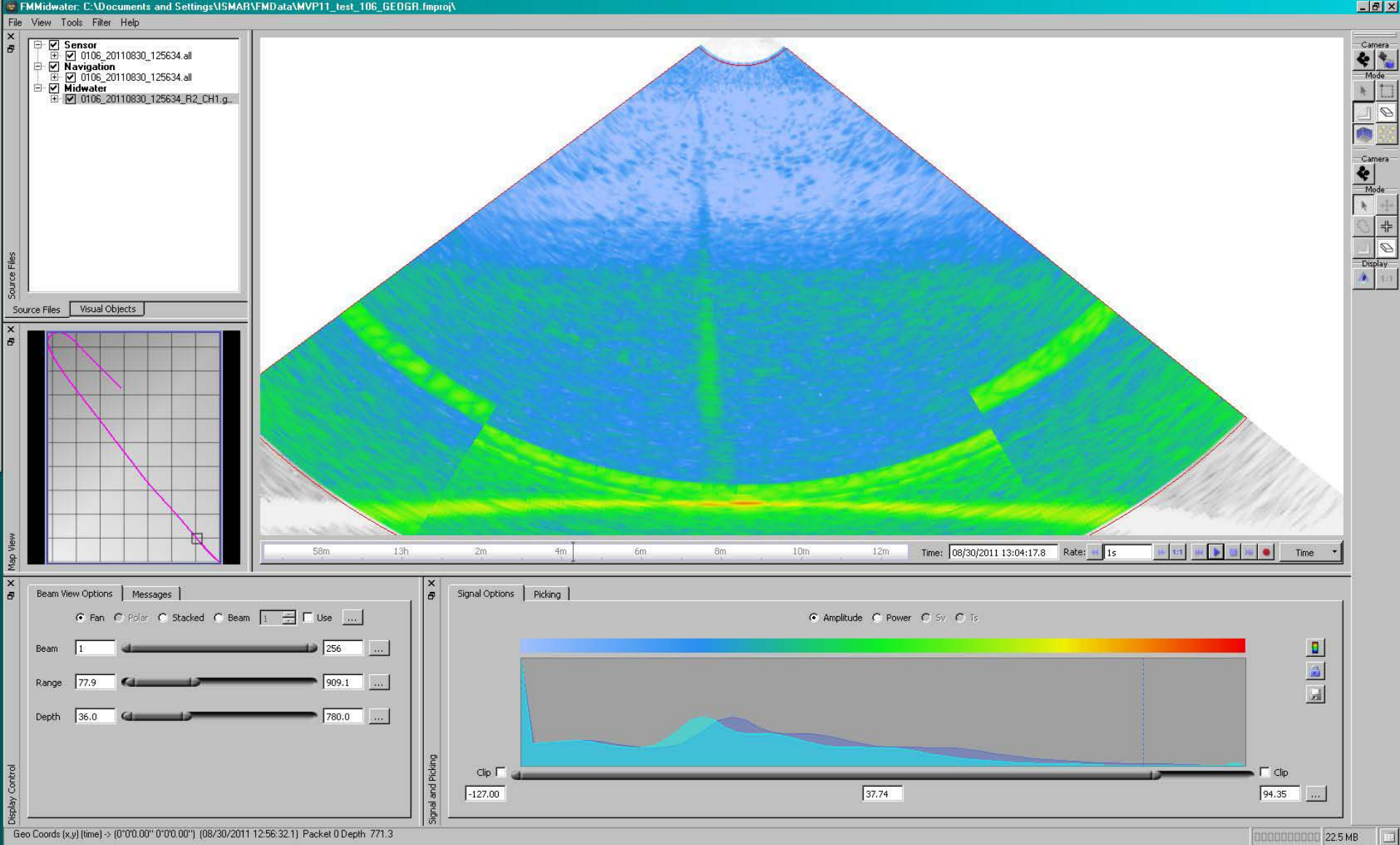
In 2009 onboard Okeanos Explorer (NOAA) a previously undiscovered 1400- meter-high plume was imaged offshore of northern California with a Kongsberg EM302 multibeam echo sounder. The plume disappears from the water column at roughly 400 meter water depth. Gardner et al. (EOS, 2009)



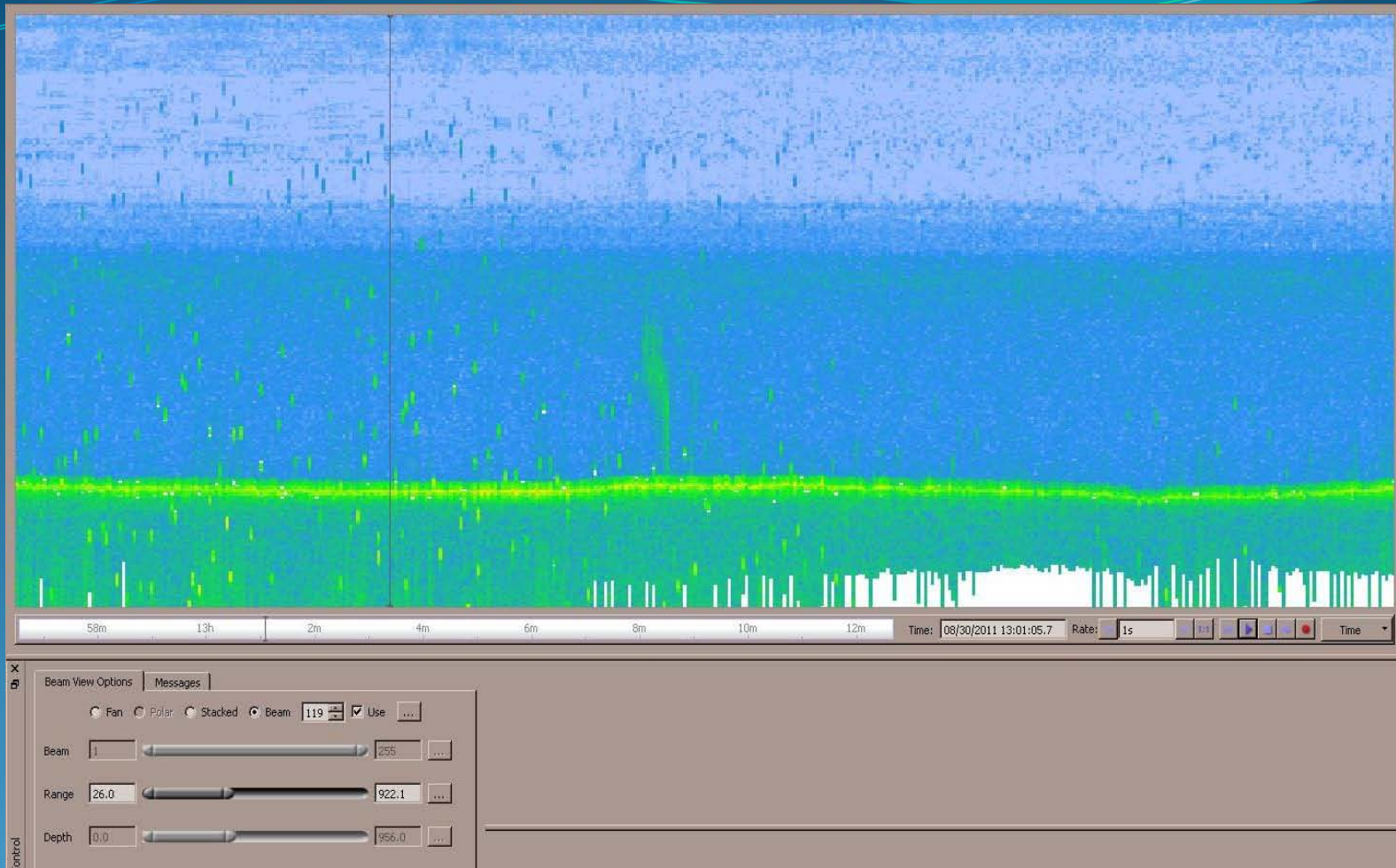
We run the test above the point where gas emission was revealed during core recovery with a Kongsberg EM710 multibeam echo sounder while doing a CTD cast. It operates at sonar frequencies in the 70 to 100 kHz range. The area insonified is about 19,5 square kilometers (7,52 square miles) and his depth changes from 700 to 900 meters.

FM Midwater Water column feature extraction tool

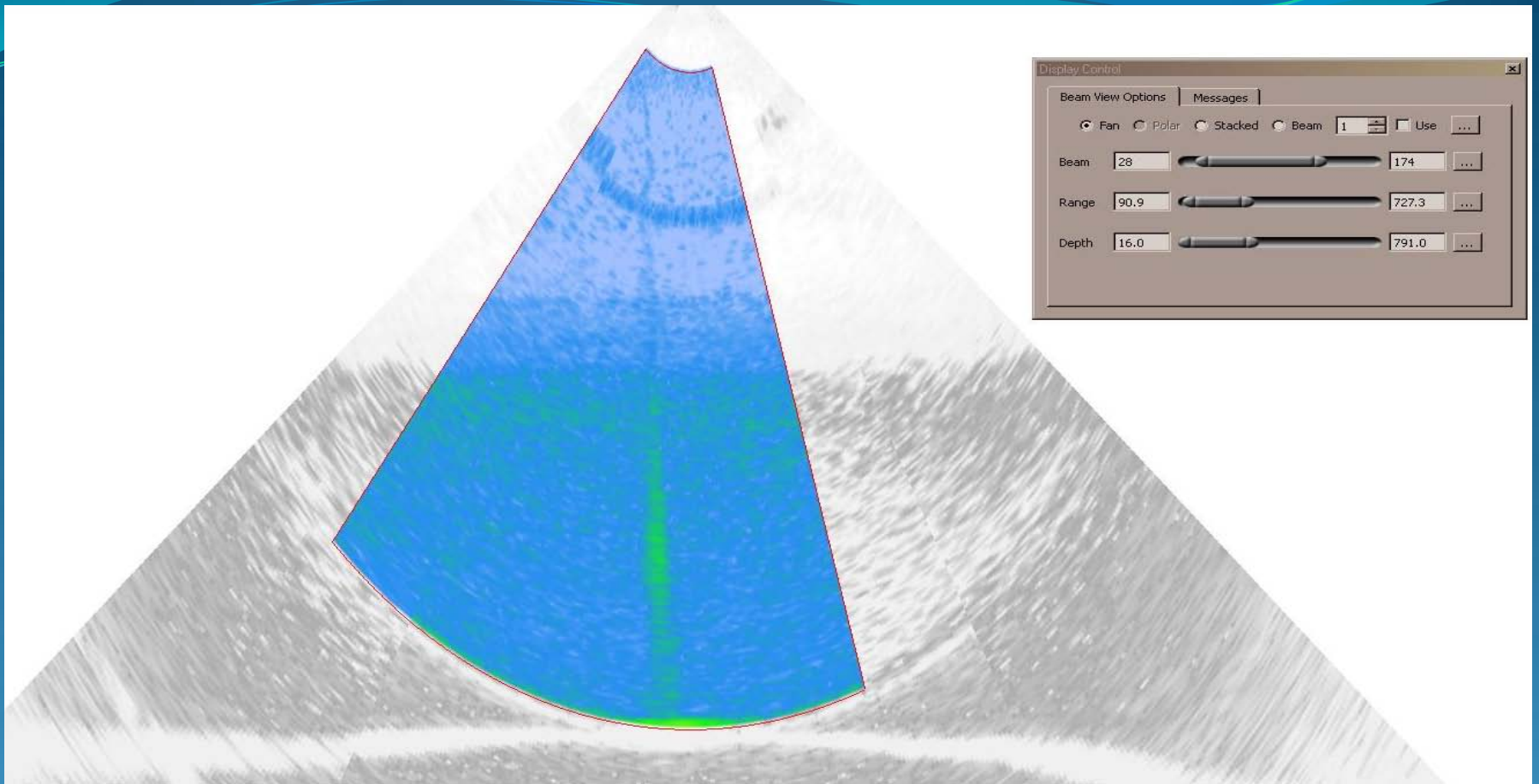
- Step 1: Import sonar file
- Step 2: Convert to GWC format and downsample
- Step 3: Identify features of interest
- Step 4: Export to Fledermaus objects



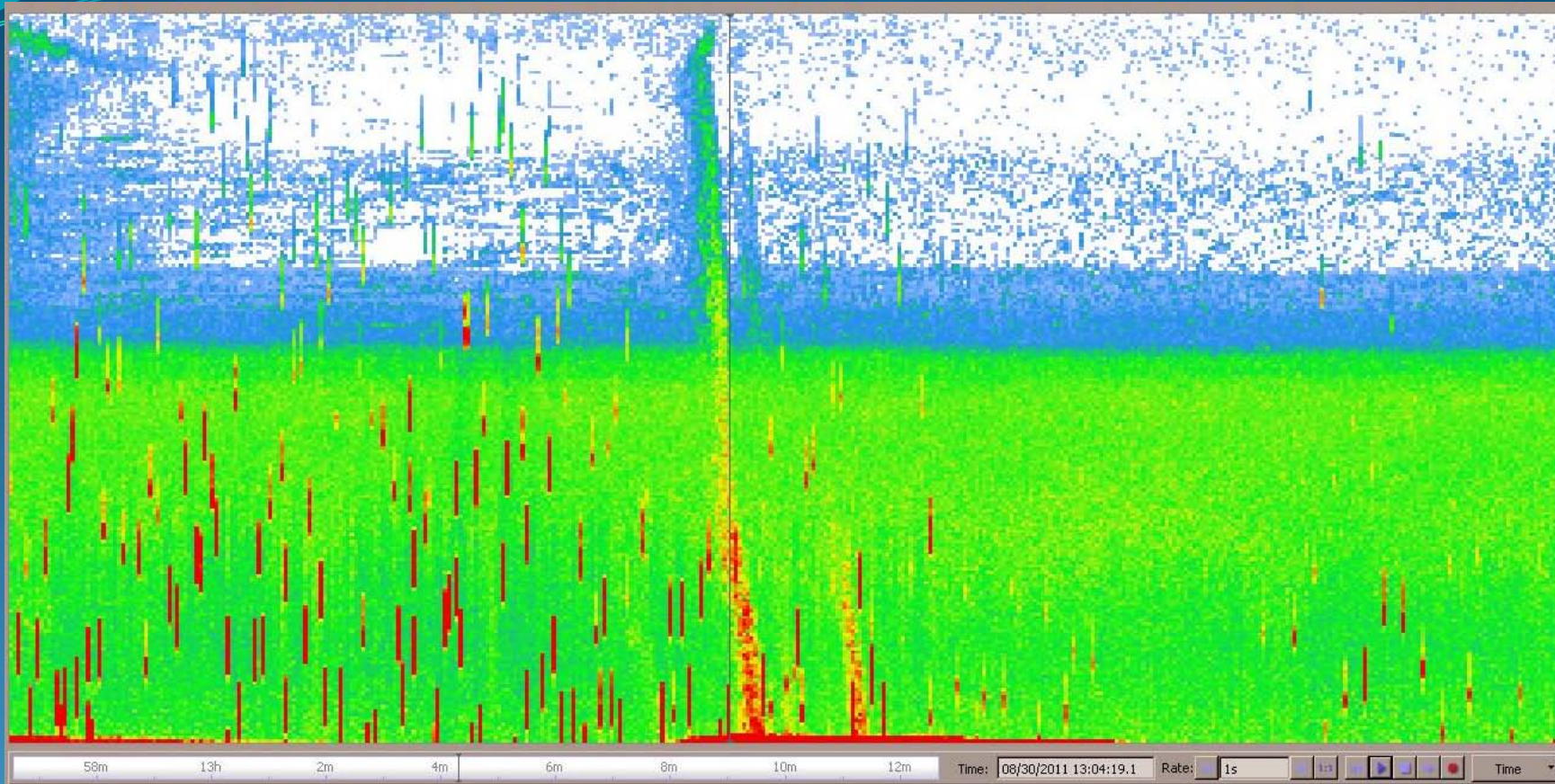
FAN VIEW

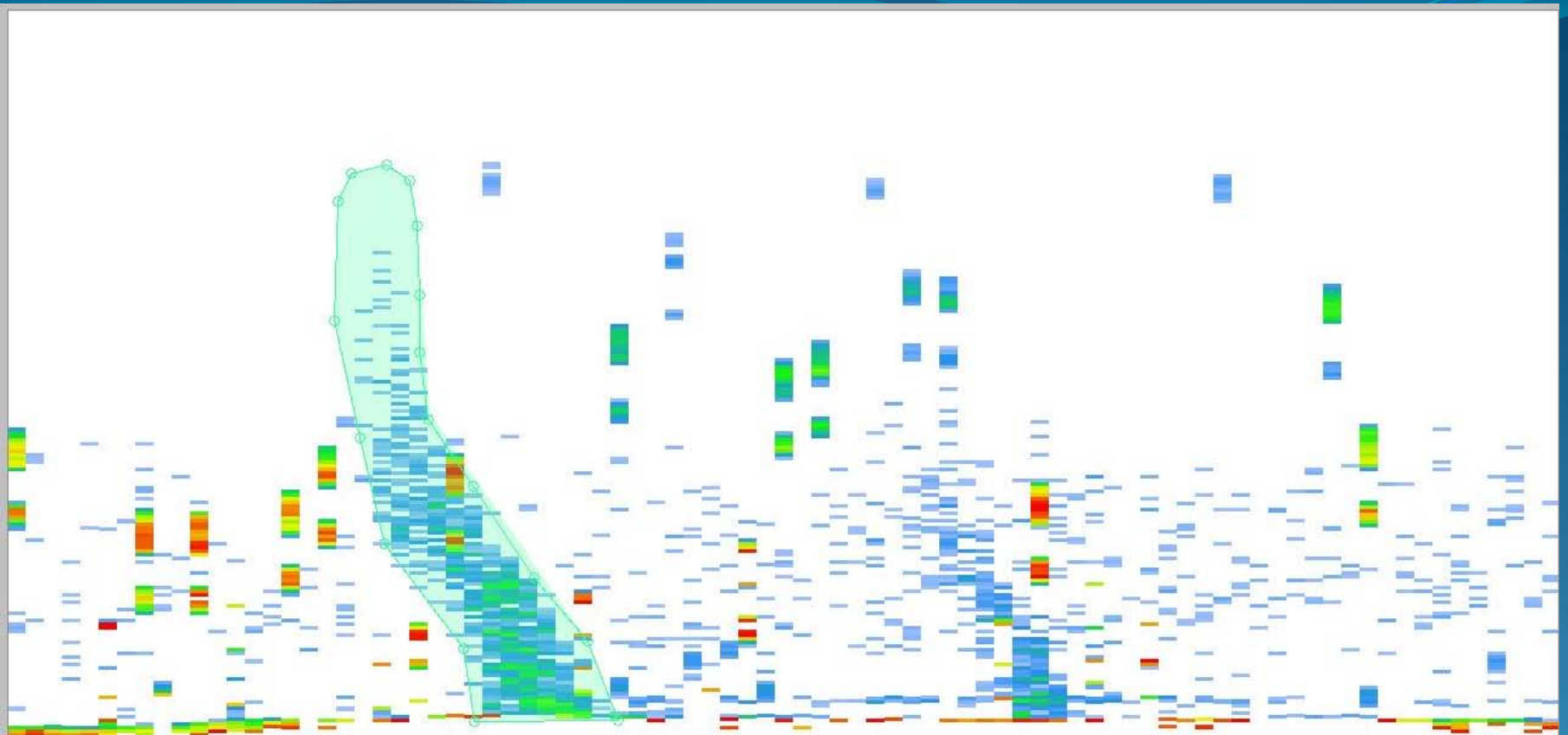


BEAM VIEW



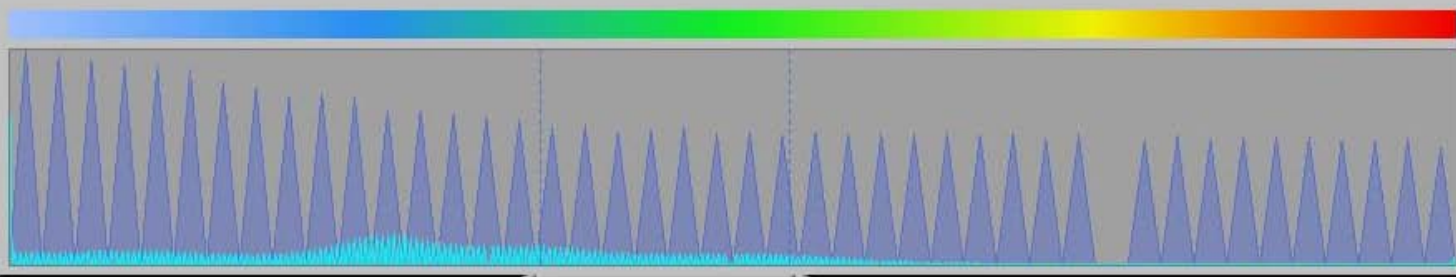
First, we reduced the number of beams and the beam range, in order to isolate the plume that the instrument detected during the survey. We cut also the depth range.





Signal Options | Picking

Amplitude Power Sv Ts



Clip

-16.69

-7.73

Clip

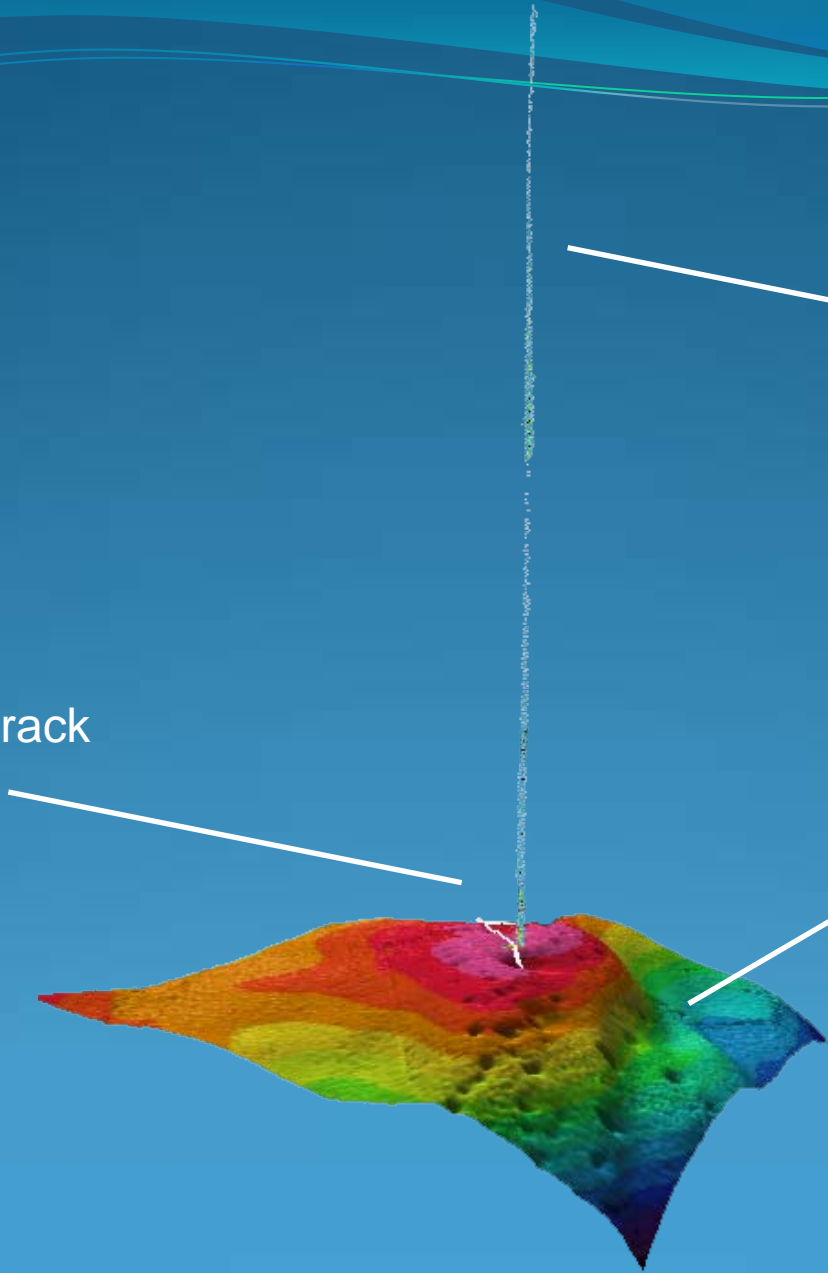
5.13

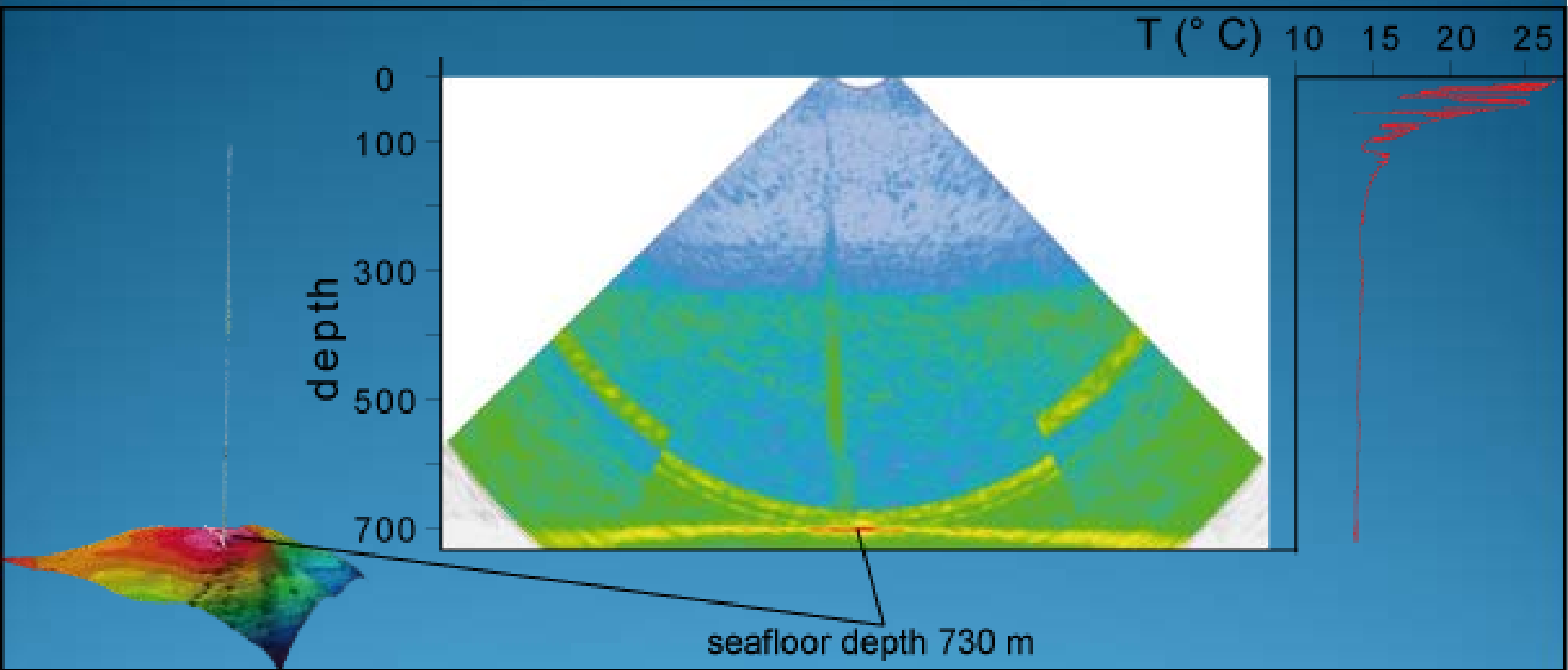
...

navigation track

plume

bathymetry





VHBS active seafloor venting sites

Backscatter pattern allowed to map:

HBS gas seepage

LBC carbonate clogged gas seepage

Backscatter-driven sampling allowed to locate different vertical geochemical zones

