New Heat Flow Data on the WA margin

Multi-Channel Seismic Survey of the Washington margin, off Grays Harbor; July, 2012 on the R/V LANGSETH



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Mud diapir:

The WA margin is a site of abundant methane vents, including on the upper shelf, and has large deposits of methane hydrate on the slopes.

Salmi et al, 2011





LOTS of methane on the WA margin

HEAT FLOW – from Bottom Simulating Reflectors From the LANGSETH 2012 Cascadia data



An example of heat flow from BSRs from the Langseth dataset.



Distance (km)

Reality Check:

Topographic **highs** should have a locally **lower** heat flow

(if there is no fluid flow).

The isotherms are spread wider apart.





IN CONTRAST,

Upward flow of fluid can give heat flow values that are locally HIGH.

BSR-derived heat flow over Line 7

Showing increase in heat flow from upward migration of fluid within mud diapir;

that continues all the way to basement.



Preliminary Results:

Line 9 shows basement slab temperatures <u>cooler</u> than previous models.







Red bar shows heat flow profile on Washington margin, off Grays Harbor, WA.

Survey is planned for August 2013 and will be conducted over one of the LANGSETH 2-D multi-channel seismic lines.

R/V ATLANTIS and Jason II.

Heat flow profile will begin west of the deformation front and continue up the margin to a water depth of 500 meters.





JASON loaded up with 13 UW thermal blankets, prior to our previous deployment on the Endeavour Segment, Juan de Fuca Ridge.

August, 2011



Blankets and sensors were deployed at 600, 800 and 1000 meters depth in 2011 by Maya Tolstoy,

for 12 months, to remove seasonal temperature variations.

Thermal blankets – a method for measuring heat flow in hard rock on the seafloor – where probes can't penetrate.





Deployment strategy for the 2.5-D heat flow/fluid flux profile

Profile with 11 sites orthogonal to the margin using JASON II heat flow probe, thermal blankets, thermistors on multi-corer and Evan Solomon's Mosquito flow meters.



Langseth EM122 swath bathymetry data, reprocessed by Bill Dansforth, USGS, WHOI.

SAND WAVES, with kilometer-scale wavelengths, using backscatter on top of swath bathymetry.

Arrow is 10 km.



Just for fun:

Superposition of Langseth EM122 backscatter on top of swath bathymetry, at the base of Willapa Canyon.

