Expedition SO251

4. Weekly Report

After having dropped off the Japanese piston coring technician, RV SONNE headed back to the Kumano Basin for its final week of operations. For most of this period, we had fair weather so that we could dive using ROV PHOCA, run numerous hydroacoustic surveys to identify flares, acquire seismic lines for the geodynamic reconstruction of the Kumano Basin evolution, measure heat flow across several mud domes, and also take cores using an improvised system attached to the heat flow probe. The results can be summarised as follows:

Despite the extremely variable weather conditions with changing wind speeds and directions, we were able to dive four more times with ROV PHOCA. The very demanding work at the seafloor aimed at the recovery of the remaining MeBo-observatories, which was carried out successfully. The detailed analysis of the time series data, where pressure and temperature in the borehole inform us about mud volcanic activity as a function of seismicity in the Japan area, has to wait until the cruise has ended.

The less nice weather windows we used to do hydroacoustic surveys such as Parasound profiling and Multibeam mapping, during which we discovered two new mud volcanoes. Careful analysis of the water column data further attested that there are currently more than 40 flares seen in the study area. Interestingly, fluid seepage is not restricted to the mud volcanoes alone, but is also seen at the seafloor outcrops of prominent structures such as the so called Megasplay Fault of the Nankai accretionary complex.

During our station work we also acquired seismic profiles along strategic transectts and took additional sediment cores to unravel the sequence / seismic stratigraphy and geodynamicand sedimentological evolution oft he Kuamno Basin. A particular focus was on deposits from event layers such as earthquake induced turbidites and mass wasting deposits. Given that the Japanese piston coring technician had left, we were forced to improvise and developed a coring device mounted to the heat flow probe. With this instrument we successfully took another 5 sediment cores for description, analysis, and post-cruise geotechnical testing.

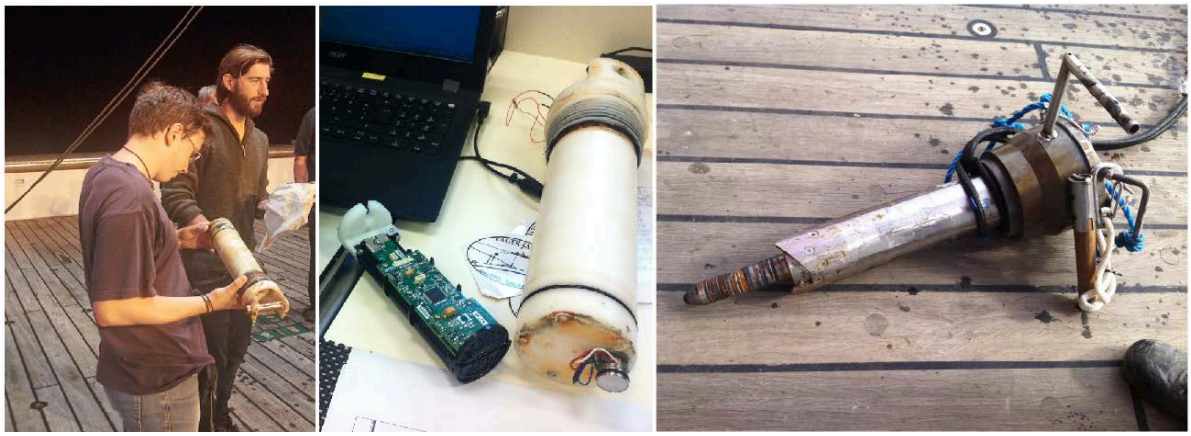
Work on the various mud volcanoes attested elevated heat flow, thermal conductivity and low strength, e.g. in a fresh mud flow from MV2. These mud extrusions must have been emplaced during the past 4 years they were not there during the earlier expedition SO222. Differential bathymetric charts support this finding by showing a rim of added material at the base opf the mud dome. We now try to use chemical pore water gradients to narrow down the exact time of emplacement of the mud flow and how it could have been triggered.

In a parallel approach, we measure shear strength at the slope of the Nankai-accretionary complex and compare it to values of Japan Trench (Leg SO251-1). In both regions, the skope deposits undergo so called seismic strengthening, an increase in undrained shear

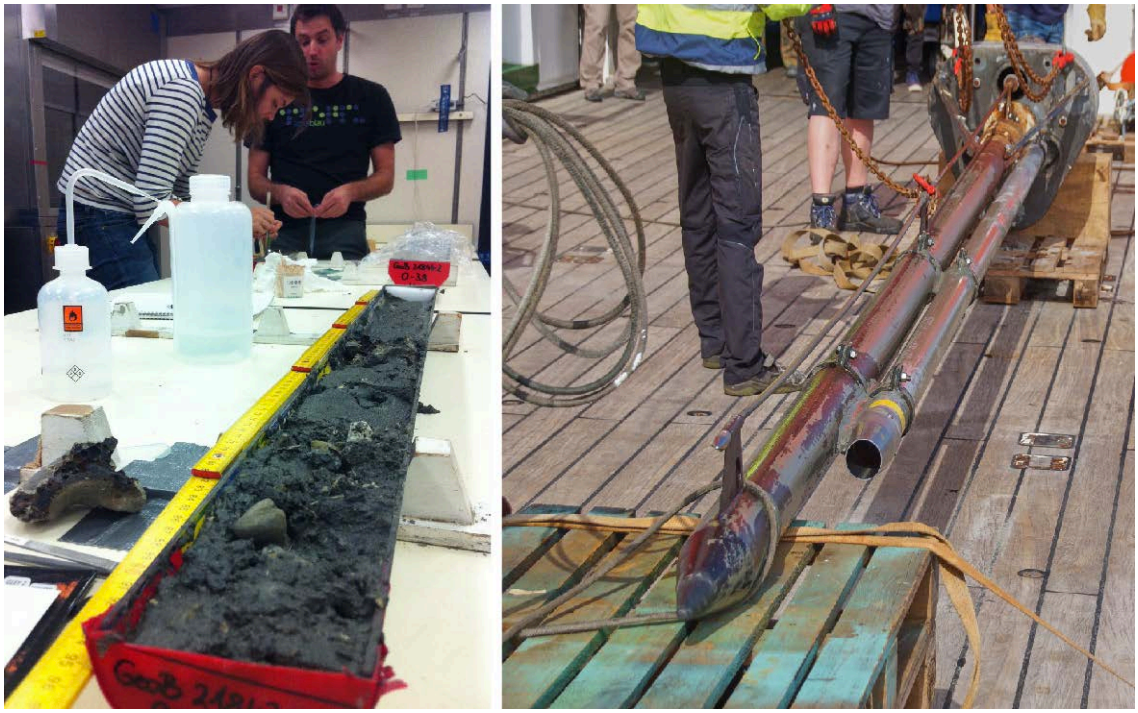
strength as a function of dynamic loading and pore water drainage. Our preliminary data suggest that the Japan Trench deposits are stronger than their Nankai counterparts.

On 01.11.2016 we left the research area at about 14h and are now on transit to Yokohama where expedition SO251 will end tomorrow. All station work was very successful and the main goals of the cruise were reached. We hence want to conclude with our sincere gratitude for the additional support we received to overcome the problems with the missing equipment containers, most importantly PtJ/BMBF and also our Japanese colleagues.

Achim Kopf (chief scientist SO251-2) on behalf of the entire SO251 team



Links und Mitte: Der „MeBoPlug“, ein kleines Bohrlochobservatorium, kam mit ROV PHOCA sicher an Deck. Auf der Platine befinden sich 720 Mbyte an Daten des Schlammvulkans, die auf dem Laptop gesichert werden. Rechts: Der MeBoCORK-A an Decke, nachdem er aus dem Bohrgestänge gelöst wurde.



Links: Typischer Schlammvulkankern vom Gipfel des MV1, zum Teil mit mächtigen authigenen Karbonatkrusten. Rechts: Das improvisierte Kerngerät an der Wärmestromlanze.