Expedition METEOR 84/2

3rd Weekly report: 07.03. – 13.03.2011

The third working week was entirely dedicated to the investigation of gas hydrates off Georgia, and we wanted to investigate in the depth the earlier well pre-investigated seepage areas of Batumi seep and the Pochori Mound by MeBo drillings. Yet on Saturday evening we started the drilling at Pechori Mound. The Pechori Mound is an active, relatively high in sea floor morphology seep structure overtopping the seafloor by several tens of meters. We could core a sediment sequence of about 20m providing in the majority massive gas hydrates. Above all the thickness of the gas hydrate layers were surprisingly high. The gas hydrates were associated with natural oil so that the originally white gas hydrates were stained in yellowish brown (Fig. 1, left). Big pieces of gas hydrate were freezed in liquid nitrogen for further analyses in our lab. Altogether this drilling was highly important to understand the formation of the Pechori Mound. This is one of a few structures in the Black Sea releasing constantly oil drops up to the water surface which can be observed for years already as thin oil slicks in satellite imaging analyses. We used those satellite imaging analyses to even find the seepage areas like Pechori Mound.

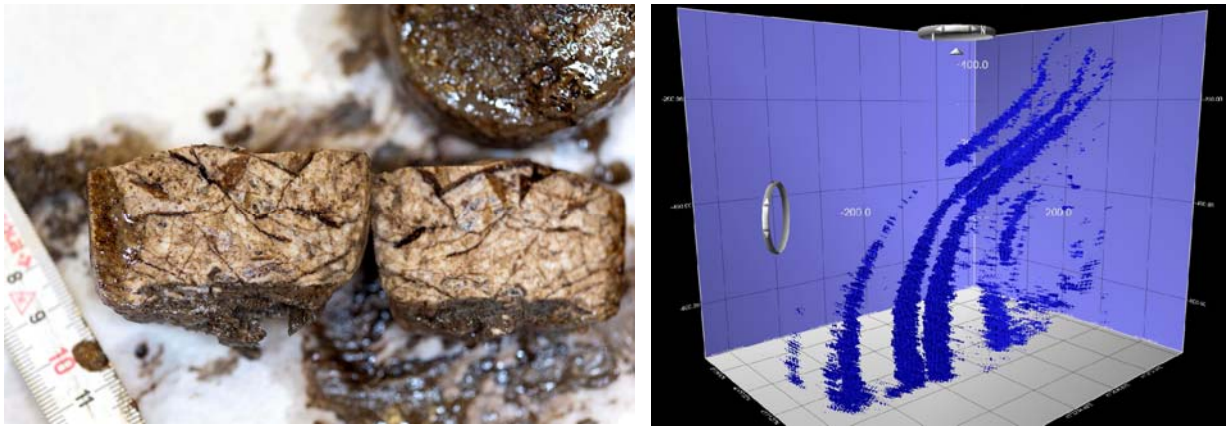

Fig. 1: Gas hydrate specimen from the MeBo-drill site 67. The gas hydrates from that site are brownish dark stained by their association with natural oil (left). 3-D-illustration of the methane emissions at Kulevi Ridge (right).

During the following nights we mainly performed profiles with the ship's own acoustic systems whereat we measured repeatedly the already known gas seeps in order to understand the time variability of the gas emissions. Monday night we investigated a so far unknown area at Kulevi Ridge, and also there we detected massive gas flares in the water column whose emissions almost reached the water surface. At this occasion we learned to combine the single beams of the echosound EM122, which often show due to the narrow overlapping of the water column, and to compose them in a 3-D-illustration to a very realistic image of the single gas plumes in the water column (Fig. 1, right). Much to our surprise we now can see that the upper ends of the gas plumes are clearly influenced by the flow conditions in the water. This might explain why in the 2-D-profiles view normally the gas plumes are cut to the upper end. It is an important conclusion that this is not true, but that the gas definitely migrates towards the water surface.

On Wednesday we started the MeBo drillings at Batumi Seep, our most important seep area. During a 20-hours deployment we could proceed only very slowly as the soft sediments of the Black Sea lead to a heavy sinking of MeBo, and therefore the motors of the drill rig constantly had to be cooled before continuing the drilling. Up to a drill depth of 10m we could drill plenty of gas hydrates which are very valuable for our scientific examination in Bremen (Fig. 2). Unfortunately, due to damage at the drill rig we had to cease our drilling activities for this cruise. Also the second hydraulic pump was broken during the drilling procedure so that we do not have further replacement part in order to repair the drill rig by ship's means. Probably the heavy load of the engine lead to a repeated breakdown of the pumps. This means that despite of the high efforts of the MeBo drill team we cannot further deploy our very important tool for this expedition. During an emergency meeting in the afternoon we discussed the consequences for our scientific program. After an intensive discussion we decided that it will be possible to successfully continue the last part of our expedition also by means of the remaining devices.

Fig. 2: MeBo-core tubes from the just finished drilling at Pechori Mound (left), Treatment of sediment cores in the Geolab (mid), Covering of gas hydrate samples in liquid nitrogen (right; photos Volker Diekamp, MARUM, Bremen).

We therefore decided to disembark the MeBo team and the drill rig on the occasion of our port stay in Trabzon at the forthcoming Thursday/Friday in order to continue the M84/2 expedition without drilling activities for the last 1.5 weeks. First of all this is a good opportunity the use more intensively than originally planned the echosounder and Parasound systems in order to study gas and gas hydrate occurrences. Since Friday we accomplish an intensive core sampling program in Georgia which will be finished tomorrow evening for examinations on the Turkish area of Samsun.

On behalf of the cruise participants,

Gerhard Bohrmann RV METEOR Sunday, 13 March 2011

Further information on the cruise (in German): http://www.marum.de/Logbuch_Meteor_84/2