

ANT-XXIX/4 - Weekly Report Nr. 2

25. – 31. March, 2013

During our transit to South Georgia we reached greater water depth of 3.000 to 4.000 m on Monday, 25 March, to test the data quality of our multi-beam system HYDROSWEEP at these depths. On the following Tuesday the calibrations of the system for pitch, roll and patch tests were done; for each time calibration a transect of 7-8 nautical miles was driven in two directions along set lines, comprising flat seafloor areas as well as slopes with different angles. In the same area a CTD sensor was lowered to 2200 m water depth to obtain a detailed sound velocity profile, parameters which form the basis for the acoustic depth measurements of HYDROSWEEP. At the same time the first water samples were collected at different depths with the water bottles on the CTD, which were then filtered for organic particles for later analysis.

On Wednesday, 27 March, we reached the NW corner of the island of South Georgia and there mapped a ~ 400-500 m wide strip of the shelf by steaming in parallel to the shoreline in a southeastern direction. While in the lee of the island the thick cloud cover broke to reveal in brilliant sunshine the magnificent scenery of South Georgia, with its heavily indented coastline backed by snow covered mountains, from which large glaciers with side and middle moraines descend down to the sea. At the mouths of the glaciers we saw our first icebergs of the expedition stranded on the shallow shelf areas. Our five Belgian colleagues, responsible for the bird and whale observations, were very busy recording the rich bird and sea mammal life at sea and in the air (Fig. 1). South Georgia is about 160 km long, 30 km wide and characterized by deep fjords which penetrate into the island, of which those of Cumberland Bay are the longest. At around 6 pm shiptime we reached the 7 km wide entrance of Cumberland Bay between Larsen and Barff Points and steamed between variously shaped icebergs into the eastern arm of the bay, directly in front of the Nordenskjöld glacier (Fig. 2). This glacier receives most of its ice from the highest mountain range on South Georgia, topped by Mount Paget at 2934 m. An hour after arrival the milky blue glacier waters of the inner bay were the background for a beautiful sunset and then a rising full moon.

At 8 am on Thursday, 28 March, RV POLARSTERN arrived at the entrance to King Edward Bay to receive representatives of the Government of South Georgia and the South Sandwich Islands, who live at the King Edward Point (KEP) station. The Governmental Officer and the base commander came on board to clear customs for our shore-based research team of six. A detailed introduction to the way of life on the island and its current problems were important parts of the briefing, as well as the regulations for environmental protection and behavior towards the wild life. At present a large-scale rat eradication program is underway. Rats reached South Georgia in the 18th century with the whaling fleets and then, by feasting on the local seabirds and their eggs, multiplied to millions of individuals, threatening to drive the many seabirds (including endemic species) to extinction. The briefing on board was



Figure 1: Leaping Hourglass Dolphins are a rare sighting.



Figure 2: View towards the Nordenskjöld Glacier with the 2.000 m plus high mountains of the central South Georgian range in the background.



Figure 3: Cargo transport for the shore-based camp in Jason Lagoon in a sheltered part of Cumberland

seasons (including endemic species) to extinction. The landing on board was interesting and useful for the ship's captain and chief scientist, and the official clearing was done in good time that RV POLARSTERN was able to steam to Cumberland Bay West. Here a RV POLARSTERN RIB and the purpose designed, floating drilling platform were launched (Fig. 3). The vessels took the cargo of the international shore-based team to the beach of Jason Bay. This team, comprising six glacial sedimentologists and geomorphologists, will take sediment cores in the small Jason Lagoon and further lakes in the vicinity of the bay. The landing of the team went well in this calm, wind-sheltered bay. These conditions were a stark contrast to those around the corner in the centre of Cumberland Bay West where strong katabatic winds from at the end of the inlet glaciers were responsible for choppy sea conditions. In the afternoon we followed the earlier PARASOUND profile to sample post-glacial sediments in Cumberland Bay West. The PARASOUND data showed nicely layered sediments in the glacially scoured troughs (Fig. 4), but also wipe-out zones, which are unmistakable clues for the presence of free gas. A big, unexpected surprise for us were the numerous gas flares in the water column which appeared as acoustic signals in the 18kHz signal display of the echo-sounder. These documented the exit of gas from the seafloor into the water column (Fig. 5). More than 50 of these flares and gas exit points were registered by PARASOUND, and they seem to be concentrated in the glacial channels and troughs along the continental shelf of South Georgia. To our knowledge these are the first gas flares found in the sub-Antarctic and Antarctic regions found by RV POLARSTERN.

A further short visit to KEP on Good Friday needed to drop off the HYDROSWEET engineer, Jörn Ewert, who was kindly picked-up by the station's patrol boat and brought to KEP. Later he boarded the cruise ship MS ORTELIUS which was visiting the neighboring former whaling station Grytviken to start his home journey back to the office in Germany via Montevideo. RV POLARSTERN then set sail in easterly direction towards the South Sandwich Islands. Because of subduction in the South Sandwich Trench eleven volcanic islands and several submarine volcanos form an arc of ~300 km from North to South in the centre of the South Sandwich micro-plate. Particularly in the northern area of the arc, acidic volcanic cones reach up to 400 – 50 m below sea level. We measured eight of these volcanic structures by PARASOUND and HYDROSWEET, and monitored the screens for interesting submarine structures and potential gas emissions. Unfortunately, we were not able to detect any gas flares in the vicinity of the volcanos, which might have indicated hydrothermal activity was present. In addition, a dive with the AWI underwater video sledge OFOS (Ocean Floor Observation System) in the QUEST Caldera found no evidence of hydrothermal activity. A second OFOS dive over a promising, unknown volcano could not go ahead as a long-line fishing vessel was working there. Therefore, RV POLARSTERN steamed towards the South-West on Easter Sunday afternoon to start investigations in the forearc area of the South Sandwich Island. Our findings from there will be reported next week.

Despite the never-ending science programs we were able to enjoy Easter on board and ashore with tasty food, plenty of Easter eggs and relaxing breaks from work. Everybody on board is well and happy.

Best wishes in the name of all crew and scientists

Gerhard Bohrmann

RV Polarstern Sunday, 31st March 2013

Further information on the expedition:

<http://www.nationalgeographic.de/polarstern>

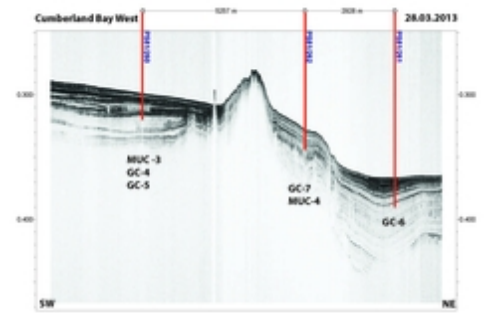


Figure 4: PARASOUND profile of an area of Cumberland Bay West showing distinct layering of the post-glacial deposits and the position of three gravity cores.

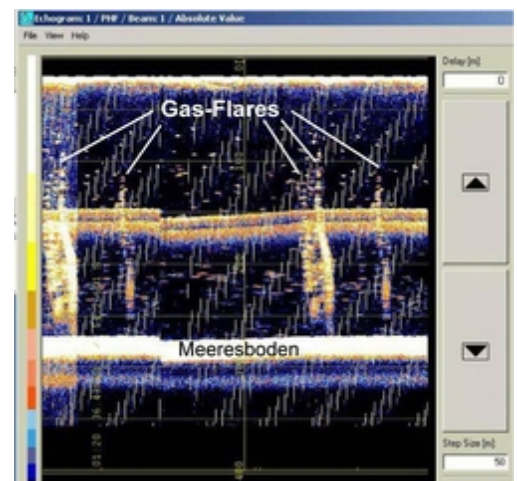


Figure 5: Gas flares in Cumberland Bay East, South Georgia.