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Subsea salt flows in the Atlantis II Deep and Thetis Deep, Red Sea

P. Feldens (1), M. Schmidt (1), N. Mitchell (2), and A.S. Basaham (3)

(1) Helmholtz Centre for Ocean Research Kiel (GEOMAR), Germany (pfeldens@me.com), (2) School of Earth, Atmospheric and Planetary Sciences, University of Manchester, United Kingdom, (3) Faculty of Marine Sciences, King Abdulaziz University, Jeddah, Saudi Arabia

In the area of today's Red Sea, evaporites were widely deposited during the Miocene. Due to the ongoing rifting and seafloor spreading, the evaporites have lost their lateral constraint and started to move downslope. High sediment temperatures near the Red Sea graben and the weak rheology of halite may also favour evaporite movement. However, the deformation mechanism as well as the velocity of these flows is largely unknown.
New high-resolution multibeam and seismic data were recorded in March 2011 (P408-2 cruise) within the framework of the project "The Jeddah Transect", a cooperation between King Abdulaziz University, Saudi-Arabia and GEOMAR, Germany. The data give new insights into evaporite flows in the area of the Atlantis II Deep. This $\sim$400 m deep seafloor depression is located at about 21°N in the central Red Sea graben and is partly filled with hot saline brine (T$\sim$68°C, S$\sim$270‰. The brine-seawater interface at about 2050 mbsl coincides with the depth of a subseafloor salt layer in the seismic reflection data. The rough seafloor morphology of the Atlantis II Deep area is dominated by a sequence of normal faults showing vertical offsets of several hundred meters. However, SW-NE directed lineaments parallel to the seafloor gradient in the south east and possibly north-west of the deep, with typical heights between 20 and 40 m, widths between 300 and 1000 m and lengths exceeding 10 km in places, are interpreted as surface indications of subsurface evaporite flow. The fronts of some of these flows are well rounded, and their occurrence is limited to areas of low seafloor gradients. Generally, the appearance of evaporite flows in the Atlantis II Deep is comparable to salt flows in the Thetis Deep at $\sim$23°N (Mitchell et al., 2010). Furthermore, deformed hemipelagic layers deposited on top of the Miocene evaporites indicate salt movement 60 km off the central rift axis.
A second research cruise is planned in March 2012 (RV Pelagia) to obtain more high-resolution seismic data on the morphological structures related to the evaporite flows at 21°N. Additionally, repeated multibeam measurements in the Thetis Deep will constrain the maximum movement rate of the evaporites.

Mitchell, N. C. ; Ligi, M. ; Ferrante, V. ; Bonatti, E. ; Rutter, E.: Submarine salt flows in the central Red Sea. In: Geological Society of America Bulletin vol. 122 (2010), Nr. 5-6, pp. 701–713