Geophysical Research Abstracts
Vol. 18, EGU2016-545, 2016
EGU General Assembly 2016

Authigenic carbonate crusts and chimneys along the North Anatolian Fault in the Sea of Marmara, Turkey

Güliz Yıldız and M. Namık Çağatay

EMCOL Research Centre and Department of Geological Engineering, Istanbul Technical University, Istanbul, Turkey (gulizyldz@gmail.com)

The Sea of Marmara is located on the North Anatolian Fault (NAF) fault zone that is a major continental transform plate boundary. It has ca. 1250 m-deep Tekirdag, Central and Cinarcik basins that are separated by two NE-SW trending Central and Western Highs. Extensive cold seeps occur along the active fault segments of the NAF in the deep basins and highs, which are associated with authigenic carbonate crusts, carbonate chimneys and mounds, black sulphidic sediments, and local gas hydrates and oil seepage. The cold seep sites were observed and sampled during the Nautile submersible and Victor 6000 Remotely Operated Vehicle (ROV) dives carried out during MARNAUT and MARSITE cruises in 2007 and 2014, respectively. Here, we report the mineralogical and stable isotopic composition of the authigenic carbonates and discuss their environmental conditions and mechanisms of formation.

The carbonate crusts range up to 5 cm in thickness and the chimneys and mounds are up to 2 m high. Some chimneys are active emitting fresh to brackish water at ambient bottom water temperatures ($\sim 14^{\circ}$C). The carbonate crusts occur as a pavements, and are commonly covered with black sulphidic sediments and bacterial mats that accommodate a rich chemosynthetic community of bivalves, sea urchins and marine annelid worms (Polychaeta). The authigenic carbonates commonly consist mainly of aragonite, but in a few instances contain subequal amounts of aragonite and calcite. High Mg-calcite is usually a minor to trace component, except in one sample in which it is present as a cement of mudstone. In the active methane emission zones, the sulphate/methane boundary occurs at or close to the seafloor, whereas elsewhere in the Sea of Marmara, the same boundary is located at 2-5 m below the seafloor. This, together with very light stable carbon isotope values (δ^{13}C=-29.8 to – 46.3 ‰ V-PDB), indicates that the anaerobic oxidation of high methane flux emitted from the active faults is the major process that provides the necessary HS^- and HCO_3^- ions for the formation of Fe-sulphides in the black reduced sediments and the carbonates in the authigenic crusts, chimneys and mounds at or close to the seafloor. The oxygen isotope composition of the authigenic carbonates is similar to the Mediterranean water isotopic composition.

Acknowledgments: The authors would like to thank the scientific teams of Marnaut (Pierre Henry, Louis Geli, Celal Sengor, Naci Gorur) and Marsite (Livio Ruffine, Louis Geli, Nazli Olgun Kiyak), captains and crews of RVs Le'Atalante and Pouquoi Pas?, and also to TUBITAK for providing financial support for project no. 115Y471.

Keywords: Marmara Sea, cold seep, active fault, authigenic carbonate, stable isotopes