Geophysical Research Abstracts
Vol. 19, EGU2017-5949-1, 2017
EGU General Assembly 2017

Comparison of hydrothermal activity between the Adriatic and the Red Sea rift margins

Philip Ball (1), Nicolò Incerpi (2), Peter Birkle (3), Elizabeth Lacsamana (4), Gianreto Manatschal (5), Susan Agar (6), Shuo Zhang (7), and Ron Borsato (8)

(1) Red Sea Exploration Department, Saudi Aramco, Dhahran, Saudi Arabia (philip.ball@aramco.com), (2) Dipartimento di Scienze della Terra, Università degli Studi di Torino, Torino, Italy (nincerpi@unito.it), (3) EXPEC Advanced Research Center, Saudi Aramco, Dhahran, Saudi Arabia (peter.birkle@aramco.com), (4) Geological Technical Services Division, Saudi Aramco, Dhahran, Saudi Arabia (elizabeth.lacsamana.1@aramco.com), (5) EOST-IPGS, Université de Strasbourg, Strasbourg, France (manat@unistra.fr), (6) Aramco Research Center, Houston, USA (susan.agar@aramcoservices.com), (7) Aramco Research Center, Houston, USA (Shuo.Zhang@aramcoservices.com), (8) Red Sea Exploration Department, Saudi Aramco, Dhahran, Saudi Arabia (ron.borsato@aramco.com)

Detailed field studies, and access to high-quality seismic reflection and refraction data have led to an improved understanding of the architecture and evolution of magma poor and magma rich margins. Associated with the spatial-temporal evolution of the rift, it is evident that there are evolving, extensive, fluid-rock interactions due to the infiltration of fluids within the sediment, basement and lithospheric mantle. Key questions therefore arise: What are the different fluid-rock reactions that can be typed to different geodynamic stages of the rift evolution? What are their compositions and how do they interact with their environment (basement, sediments, evaporites, hydrosphere, and magmatism)? What are the implications for the evolution of the margin rheology, thermal structure, depositional environments/organic matter maturity, and reservoir quality?

The Adriatic paleo-rifted margin is preserved in both SE Switzerland and northern Italy. The field exposures provide a unique opportunity to study the fluid flow history of a hyperextended magma poor extensional margin. Analysis of breccias, cement veins and replacement minerals reveal that the margin records a complex, long-lasting history of dolomitization, calcification and silicification during the Jurassic rifting. The Red Sea by contrast is a young rifted margin. It differs from the paleo-Adriatic margin by several characteristics: volcanism is more evident, and syn-tectonic sediments, including evaporites (halite and anhydrite) are thicker. Several core and fluid samples are available from both onshore and offshore wells, which reveal rift-related hydrothermal alteration. In addition, we find evidence for the presence of an extreme dynamic hydraulic system with infiltration of surface water into sub-salt units during Late Pleistocene.

In this study we present results from petrographic and geochemical analysis of basement and sedimentary rocks from Adriatic field-derived samples and core/subsurface fluid samples for the Eastern Red Sea margin. The results are presented using rift domain interpretations, thereby enabling the simple comparison of the observed hydrothermal alteration within a first-order (spatial temporal) rift geodynamic framework.