Geophysical Research Abstracts
Vol. 19, EGU2017-3548, 2017
EGU General Assembly 2017

Long-lasting hydrothermal fluid flow recorded in the Adriatic distal rifted margin: a multi-disciplinary approach

Nicolò Incerpi (1,2), Luca Martire (1), Gianreto Manatschal (2), Stefano M. Bernasconi (3), Gyorgy Czuppon (4), and Axel Gerdes (5)

(1) Dipartimento di Scienze della Terra, Università degli Studi di Torino, Torino, Italy (nicolo.incerpi@unito.it), (2) EOST-IPGS, Université de Strasbourg, Strasbourg, France (nincerpi@unistra.fr; manat@unistra.fr), (3) Department of Earth Sciences, ETH Zurich, Zurich, Switzerland (stefano.bernasconi@erdw.ethz.ch), (4) Institute for Geological and Geochemical Research, Hungarian Academy of Sciences, Budapest, Hungary (czuppon@geochem.hu), (5) Institut für Geowissenschaften, Facheinheit Mineralogie - Petrologie und Geochemie, Frankfurt am Main, Germany (gerdes@em.uni-frankfurt.de)

The increasing availability of high resolution seismic and deep drill hole data from deep-water distal rifted margins allow to understand the architecture and evolution of these yet little investigated domain. Nonetheless, the thermal evolution of distal rifted margins is poorly constrained although the presence of hydrothermal systems seems to play a key role in determining the heat fluxes. Because of the weak metamorphic overprint and the spectacular exposure, the Adriatic distal margin actually preserved in SE Switzerland, represents a unique opportunity to observe, sample and understand the fluid flow history recorded in this hyperextended domain. A detailed sampling was carried out on Triassic and Jurassic carbonate rocks in two key areas in the Grison region characterized by the presence of extensional allochthons lying onto extensional detachment faults. The main goal of our study was to investigate breccias, cements, veins and replacement minerals within pre- to post-rift sediments that could testify the space and time evolution of rock-fluid interactions. Field evidence, petrography and cathodoluminescence investigations reveal a strong heterogeneity in the composition of the fluids: dolomitization, calcitization, silicification and Fe-Mn oxides coating widely characterize the multistage evolution of the Adriatic distal margin. Different analytical results point to hot fluid systems. Microthermometry on fluid inclusions (Th up to 150-160°C) coupled with O and C isotopic values (δ13C 0‰ to 3‰ VPDB; δ18O -1.00‰ to -14.00‰ VPDB) suggest a hydrothermal origin of the fluids. These data, moreover, are comparable with those of the present-day Iberia continental margin (ODP-Leg-103) where diffuse dolomitization is documented. Sr87/Sr86 isotopic ratios, higher than those of Triassic-Jurassic seawater, imply an important fluid-basement interaction. Finally, trace elements (e.g. Ba, Cr, Ni, V), rare earth elements and He isotopes suggest the presence of fluid pathways involving either the continental crust and the exhuming mantle further oceanwards. Interestingly, as documented by U-Pb dating (LA-ICP-SFMS) on carbonate, the Adriatic distal margin recorded not only the late Early to Middle Jurassic history related to detachment fault activity, but also the earlier phases of rifting, which are usually thought to be recognizable only in the inner part of the margin (proximal domain). The results of our study highlight how specific changes in the chemistry of the fluid system are intimately linked to the tectonic evolution of rifted margins.