Geophysical Research Abstracts
Vol. 18, EGU2016-5315, 2016
EGU General Assembly 2016

The magmatic budget of Atlantic type rifted margins: is it related to inheritance?

Gianreto Manatschal (1), Julia Tugend (1), Suzanne Picazo (2), and Othmar Müntener (2)

(1) University of Strasbourg-CNRS, IPGS, EOST, Strasbourg, France (manat@unistra.fr), (2) University of Lausanne, Institut des Sciences de la Terre, Bâtiment Géopolis CH-1015 Lausanne, Switzerland

In the past, Atlantic type rifted margins were either classified as volcanic or non-volcanic. An increasing number of high quality reflection and refraction seismic surveys and drill hole data show a divergent style of margin architecture and an evolution in which the quantity and distribution of syn-rift magmatism is variable, independently of the amount of extension. Overgeneralized classifications and models assuming simple relations between magmatic and extensional systems are thus inappropriate to describe the formation of rifted margins.

More recent studies show that the magmatic evolution of rifted margins is complex and cannot be characterized based on the volume of observed magma alone. On the one hand, so-called “non-volcanic” margins are not necessarily amagmatic, as shown by the results of ODP drilling along the Iberia-Newfoundland rifted margins. On the other hand, magma-rich margins, such as the Norwegian, NW Australian or the Namibia rifted margins show evidence for hyper-extension prior to breakup. These observations suggest that the magmatic budget does not only depend on extension rates but also on the composition and temperature of the decompressing mantle. Moreover, the fact that the magmatic budget may change very abruptly along strike and across the margin is difficult to reconcile with the occurrence of plumes or other deep-seated large-scale mantle phenomena only. These overall observations result in questions on how magmatic and tectonic processes are interacting during rifting and lithospheric breakup and on how far inheritance may control the magmatic budget during rifting.

In our presentation we will review results from the South and North Atlantic and the Alpine Tethys domain and will discuss the structural and magmatic evolution of so-called magma-rich and magma-poor rifted margins. In particular, we will try to define when, where and how much magma forms during rifting and lithospheric breakup. The key questions that we aim to address are: 1) whether decompression melting is the driving force, or rather the consequence of extension, 2) how far the magmatic budget is controlled by inherited mantle composition and how important magma storage is during initial stages of rifting, and 3) to what extend the evolution of margins reflect the interplay between inheritance (innate/"genetic code") and the actual physical processes (acquired/external factors).