Geophysical Research Abstracts
Vol. 19, EGU2017-7337, 2017
EGU General Assembly 2017


# Breaking the paradigm at magma-poor and magma-rich rifted margins

Julie Tugend (1), Gianreto Manatschal (1), Morgane Gillard (1), Michael Nirrengarten (1), Marie-Eva Epin (1), Daniel Sauter (1), Julia Autin (1), Caroline Harkin (2), and Nick Kusznir (2)

(1) Institut de Physique du Globe, Université de Strasbourg, CNRS/UMR 7516, Strasbourg, France (tugend@unistra.fr), (2) Geology and Geophysics - SoES, University of Liverpool, Liverpool, United Kingdom

Rifted margins used to be classified into volcanic or non-volcanic passive margins. Because magmatism is evidenced even in so-called 'non-volcanic' settings, this terminology was later adjusted to magma-poor and magma-rich rifted margins. This classification represents a simplification into end-member magmatic types depending on the magmatic budget related to rifting and/or breakup processes. New observations derived from higher quality geophysical data sets and drill-hole data revealed the great diversity of rifted margin architecture and highly variable distribution of rift-related and/or breakup related magmatism. Recent studies suggest that rifted margins have a more complex tectono-magmatic evolution than previously assumed and cannot be characterized based on the observed volume of magma alone.

In this study, we present seismic observations from 2D high resolution long-offset deep reflection seismic profiles across the East-Indian and South-Atlantic rifted margins. We aim to compare structural similarities between rifted margins with different magmatic budgets. We apply a systematic seismic interpretation approach to describe and characterize the first-order architecture and magmatic budget of our case examples. The identification of magmatic additions based on seismic observations only is indeed not unequivocal, in spite of the high-resolution dataset. Interpretations are related to large uncertainties in particular at ocean-continent transitions (i.e. outer highs) where most of the magmatism seems to be located. For each line, we present three different interpretations based on offshore and/or onshore field analogues. These interpretations illustrate scenarios for the nature of the outer highs that we believe are geologically meaningful and reasonable, and imply different magmatic budgets at breakup.

Based on these interpretations we discuss different mechanisms for lithospheric breakup involving either a gradual or more instantaneous process independently of the type of rifted margin (magma-poor or magma-rich). We consider several tectono-magmatic scenarios with the onset of magmatism occurring at different stages of the extensional evolution of a rifted margin and compare them to our case examples. Eventually, we suggest that the difference between so-called "magma-poor" and "magma-rich" rifted margins not only corresponds to the amount of magmatism involved, but also to the timing and rates of magmatism relative to their tectonic evolution.