Geophysical Research Abstracts
Vol. 12, EGU2010-6322, 2010
EGU General Assembly 2010

The Role of Magma During Continent-Ocean Transition

Ian Bastow (1), Derek Keir (2), Tyrone Rooney (3), and J-Michael Kendall (1)

(1) Department of Earth Sciences, University of Bristol, UK (Ian.Bastow@bristol.ac.uk), (2) School of Earth and Environment, University of Leeds, UK, (3) Department of Geological Sciences, Michigan State University, USA

Passive margins worldwide are often considered magmatic because they are characterised by thick sequences of extrusive and intrusive igneous rocks emplaced around the time of continental breakup. Despite the global abundance of such margins, however, it is difficult to discriminate between different models of both extension and melt generation, since most ruptured during Gondwana breakup >100Ma and the continent-ocean transition (COT) is now hidden by thick, basaltic seaward dipping reflectors (SDRs). These margins are no longer tectonically active so the roles of faulting, stretching and magma intrusion in accommodating extension, and timing of SDRs emplacement during rift evolution have to be inferred from rifting models or from the geological record preserved at the fully developed passive margin. Similarly mantle processes during COT development have long since ceased, so whether breakup was characterized by broad thermal upwelling, small-scale convection or a fertile geoscientific mantle remains ambiguous. The East African rift in Ethiopia offers a unique opportunity to address all these problems because south-to-north it exposes subaerially the transition from continental rifting and incipient sea-floor spreading within a young flood basalt province. Here we present a suite of geophysical and geochemical observations from Ethiopia that document the significance of magma intrusion and extrusion as rifting evolves from an initially broad zone of stretching and faulting to a narrower axial graben in which magma injection dominates strain.