Geophysical Research Abstracts
Vol. 15, EGU2013-12734, 2013
EGU General Assembly 2013

Analogue models of oblique rifting: the role of structural inheritance

Julia Autin (1), Nicolas Bellahsen (2), Sylvie Leroy (2), Laurent Husson (3,4), Marie-Odile Beslier (5), and Elia d'Acremont (2)

(1) CNRS UMR7516, IPGS, IPGS, Strasbourg, France (autin@unistra.fr, 0033 3 68 85 04 02), (2) Univ. Pierre et Marie Curie, iSTeP UMR 7193 UPMC-CNRS, 4 place Jussieu, Case 129, T46-00, 2ème étage, 75252 Paris cedex 05, France, (3) Université Rennes 1, CNRS UMR 6118, Géosciences Rennes, Rennes, France, (4) Université de Nantes, CNRS UMR 6112, LPG Nantes, Nantes, France, (5) Université de Nice Sophia-Antipolis, CNRS (UMR 7329), Observatoire de la Côte d'Azur, Géoazur, BP48, 06235 Villefranche-sur-Mer cedex, France

The geometry and kinematics of rifts are strongly controlled by pre-existing structures in the lithosphere. Such features may be present in both the crust and the lithosphere mantle. In the oblique Gulf of Aden tertiary rift, inherited mesozoic basins are orthogonal to the direction of Oligo-Miocene divergence. Thus, lateral variations in the rheology may occur in both the crust and the mantle lithosphere mantle. Oceanic transform zones crosscut these basins and crop out on both the Arabian and Somalian conjugate margins. These observations suggest that inherited basins control at least partly the present -day geometry of oblique rifts and even may locally overcome the impact of the rift -parallel rheological weaknesses that in certain cases control the overall trend of the rift system. In particular, they possibly control the formation of major fracture zones that segment the rift. The analogue models presented in this contribution are brittle-ductile multilayer and reproduce oblique rifts, wherein an oblique rheological weakness in the lithospheric mantle is alternatively a priori imposed or dismissed. We further added an elongated thicker brittle mantle, orthogonal to the direction of extension, representing an inherited basin (mesozoic basin in the Gulf of Aden). These last models mainly show en-échelon patterns with orthogonal faults and few rift-parallel faults, suggesting that the inherited orthogonal discontinuity is more influential than the oblique weakness in the lithospheric mantle. These results suggest that the presence in the lithosphere of an inherited basin can constitute a barrier to the deformation and sufficiently offset the spreading centers to lead to independent rift systems separated by major transform faults. Moreover, the origin of the obliquity (with or without oblique weakness) could control the length of the transform offset between two spreading centers and thus, the length of the future transform margin (continental domain affected by a transform fault).