Geophysical Research Abstracts
Vol. 19, EGU2017-12825-1, 2017
EGU General Assembly 2017

Extensional fault geometry and its flexural isostatic response during the formation of the Iberia – Newfoundland conjugate rifted margins

Júlia Gómez-Romeu (1), Nick Kusznir (1), Gianreto Manatschal (2), and Alan Roberts (3)

(1) Earth, Ocean and Ecological Sciences, University of Liverpool, Liverpool, UK, (2) IPGS-EOST, Université de Strasbourg, Strasbourg, France, (3) Badley Geoscience, Spilsby, UK

Despite magma-poor rifted margins having been extensively studied for the last 20 years, the evolution of extensional fault geometry and the flexural isostatic response to faulting remain still debated topics. We investigate how the flexural isostatic response to faulting controls the structural development of the distal part of rifted margins in the hyper-extended domain and the resulting sedimentary record. In particular we address an important question concerning the geometry and evolution of extensional faults within distal hyper-extended continental crust; are the seismically observed extensional fault blocks in this region allochthons from the upper plate or are they autochthons of the lower plate?

In order to achieve our aim we focus on the west Iberian rifted continental margin along the TGS and LG12 seismic profiles. Our strategy is to use a kinematic forward model (RIFTER) to model the tectonic and stratigraphic development of the west Iberia margin along TGS-LG12 and quantitatively test and calibrate the model against breakup paleo-bathymetry, crustal basement thickness and well data. RIFTER incorporates the flexural isostatic response to extensional faulting, crustal thinning, lithosphere thermal loads, sedimentation and erosion. The model predicts the structural and stratigraphic consequences of recursive sequential faulting and sedimentation. The target data used to constrain model predictions consists of two components: (i) gravity anomaly inversion is used to determine Moho depth, crustal basement thickness and continental lithosphere thinning and (ii) reverse post-rift subsidence modelling consisting of flexural backstripping, decompaction and reverse post-rift thermal subsidence modelling is used to give paleo-bathymetry at breakup time.

We show that successful modelling of the structural and stratigraphic development of the TGS-LG12 Iberian margin transect also requires the simultaneous modelling of the Newfoundland conjugate margin, which we constrain using target data from the SCREECH 2 seismic profile. We also show that for the successful modelling and quantitative validation of the lithosphere hyper-extension stage it is necessary to first have a good calibrated model of the necking phase. Not surprisingly the evolution of a rifted continental margin cannot be modelled without modelling and calibration of its conjugate margin.