Explaining the synrift subsidence deficit at rifted margins.

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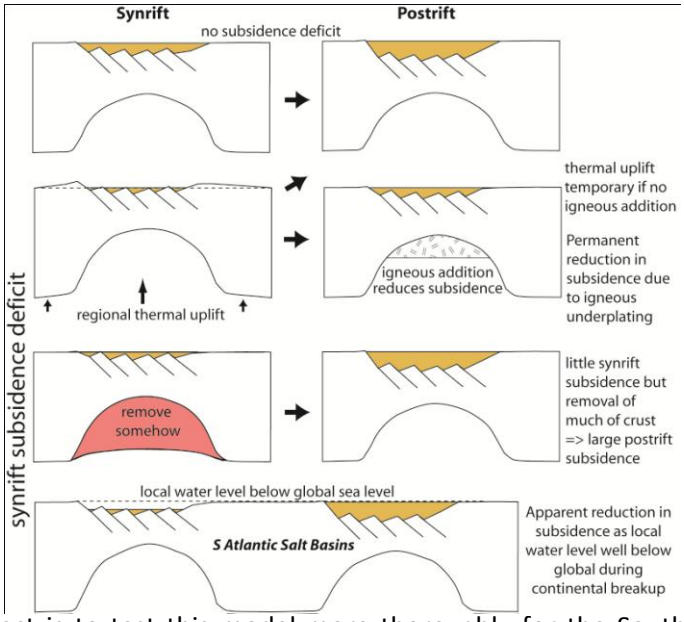
Background: Rift basins and rifted margins form through the extension and thinning of the lithosphere, with subsidence occurring both during the rifting (synrift) and after the rifting (postrift) as the systems cools and the lithosphere rethickens. Both the synrift and the postrift subsidence depend on the amount of thinning that has taken place and thus provide independent estimates of the amount of thinning and by association, extension. However, although these independent estimates generally agree quite closely, at some rifted margins subsidence appears to be overly concentrated into the postrift, with considerably less occurring during rifting than predicted by the current crustal thickness and the total subsidence. The project explores possible explanations for this "synrift subsidence deficit".

The "synrift subsidence deficit" has been explained in a variety of different mechanisms (Reston, 2009 – See Figure), including (Reston, 2010) the postrift infilling of a deep, subaerial basin well below sealevel, first by salt and other evaporites as seawater invaded the rift and subsequently by open marine sediments once a complete connection to the ocean had been made. As a result, much of the accommodation space produced by synrift subsidence is filled by sediments deposited after rifting, producing an apparent synrift subsidence deficit.



Aims and objectives: The aim of this project is to test this model more thoroughly for the South Atlantic as well as to test the general applicability of the concept of a deep, partly empty rift basin developed in the middle of a continent during breakup. Thick salt deposits formed along the line of eventual breakup not only in the South Atlantic but also in the Central Atlantic between North America and Africa, in the Gulf of Mexico and in the Red Sea: the hypothesis is that these were all deposited in deep, largely empty basins below global sealevel as seawater first spilled into isolated deep dessicating basins.

Methods: The project will combine modelling of subsidence through time (training and analysis in Birmingham) with plate reconstructions (in collaboration with Trond Torsvik in Oslo) to identify both barriers isolating the deep basins from the outside ocean and also erosive inspill channels.

Applicants: We are looking for BSc or MSci applicants in Geoscience with particular interests in tectonics. Experience with computer modelling would be an advantage.

References:

Reston TJ, 2010. The Opening of the Central Segment of the South Atlantic: Symmetry and the Extension Discrepancy. Petroleum Geoscience, Vol. 16, pp. 199–206, DOI 10.1144/1354-079309-907.

Reston T.J. 2009 The extension discrepancy and synrift subsidence deficit at rifted margins. **Petroleum Geoscience**, 15, 217-237

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