Click to view poster panel 1 (3.8 MB)
Click to view poster panel 2 (3.3 MB)
Click to view poster panel 3 (3.2 MB)

ePS Fault Development and Syn-Rift Basin Structure Within the Corinth Rift, Greece*

Rebecca Bell[1], Lisa McNeill[2], Jon Bull[2], and Tim Henstock[2]

Search and Discovery Article #30163 (2011)
Posted July 19, 2011

*Adapted from ePoster presentation at AAPG Annual Convention and Exhibition, Houston, Texas, USA, April 10-13, 2011

Note: Update your computer's Adobe Reader to the most current version to access all audio features of this presentation. Activate audio control by clicking the icon in the upper left-hand corner of the page.

[1]Imperial College London, London, United Kingdom (rebecca.bell@imperial.ac.uk)
[2]National Oceanography Centre, Southampton, Southampton, United Kingdom

Abstract

Early syn-rift basin structure is often obscured by post-rift sediments in mature hydrocarbon bearing basins. Even with the aid of three-dimensional seismic reflection datasets, the geometry and facies of rift initiation deposits are still poorly understood due to their limited thickness, highly variable lateral extent and limited well penetrations. Examining fault development and syn-rift basin geometry at currently active rift zones could be key to the successful exploitation of syn-rift plays. The Corinth Rift in central Greece is an active continental rift zone, opening at a rate of up to ~15 mm/yr, with an extension history of < 5 myr. The Corinth Rift's relatively simple N-S extensional regime is yet to be overprinted by later tectonics and a fluctuation between marine and lacustrine conditions results in the syn-rift infill being clearly imaged seismically, revealing details of fault development and syn-rift basin geometry.

We synthesise seismic reflection data throughout the active offshore Gulf of Corinth basin to investigate fault activity history and the spatio-temporal evolution of the basin, producing for the first time basement depth and syn-rift isochron maps throughout the offshore rift. A major basin-wide unconformity surface with an age estimated from sea-level cycles at ca. 0.4 Ma separates distinct seismic

stratigraphic units, and highlights major structural changes in the orientation of dominant faults even over the Gulf of Corinth's short 1-2 myr history.

The Gulf of Corinth initiated as two separated depocentres with opposing polarity, each 20-50 km long. Since ca. 0.4 Ma the two originally isolated depocentres have coalesced, due to linkage of faults with a dominant dip direction. This has created a single 80 km long depocentre in the central Gulf of Corinth, with maximum subsidence focused between the two older depocentres. These results show that individual fault segments can persist for timescales ca.1Ma and form major isolated syn-rift half-graben before becoming linked. This style of syn-rift basin evolution is similar to observations from other young rifts (eg. the East African Rift) and numerical and laboratory models. The Corinth rift is a convenient analogue to investigate the likely geometry and facies distribution of syn-rift half-graben, providing a greater understanding of the location and scale of poorly-imaged, early syn-rift reservoirs in hydrocarbon-bearing basins.

References

Bell, R.E., L.C. McNeil, J.M. Bull, T.J. Henstock, R.E.L. Collier, and M.R. Leeder, 2009, Fault architecture, basin structure and evolution of the Gulf of Corinth Rift: Basin Research, v. 21, p. 824-55.

Bell, R.E., L.C. McNeill, J.M. Bull, and T.J. Henstock, 2008, Evolution of the offshore western Gulf of Corinth: GSA Bulletin, v. 120/1-2, p. 156-178, doi: 10.1130/B26212.1

Clément, C., M. Sachpazi, P. Charvis, D. Graindorge, M. Laigle, A. Hirn, and G. Zafiropoulos, 2004, Reflection–refraction seismics in the Gulf of Corinth: hints at deep structure and control of the deep marine basin: Tectonophysics, v. 391, p. 85-95.

Larsen, M., T. Rasmussen, and L. Hjelm, 2010, Cretaceous revisited: exploring the syn-rift play of the Faroe-Shetland Basin: Geological Society, London, Petroleum Geology Conference Series, v. 7, p. 953-962, doi:10.1144/0070953

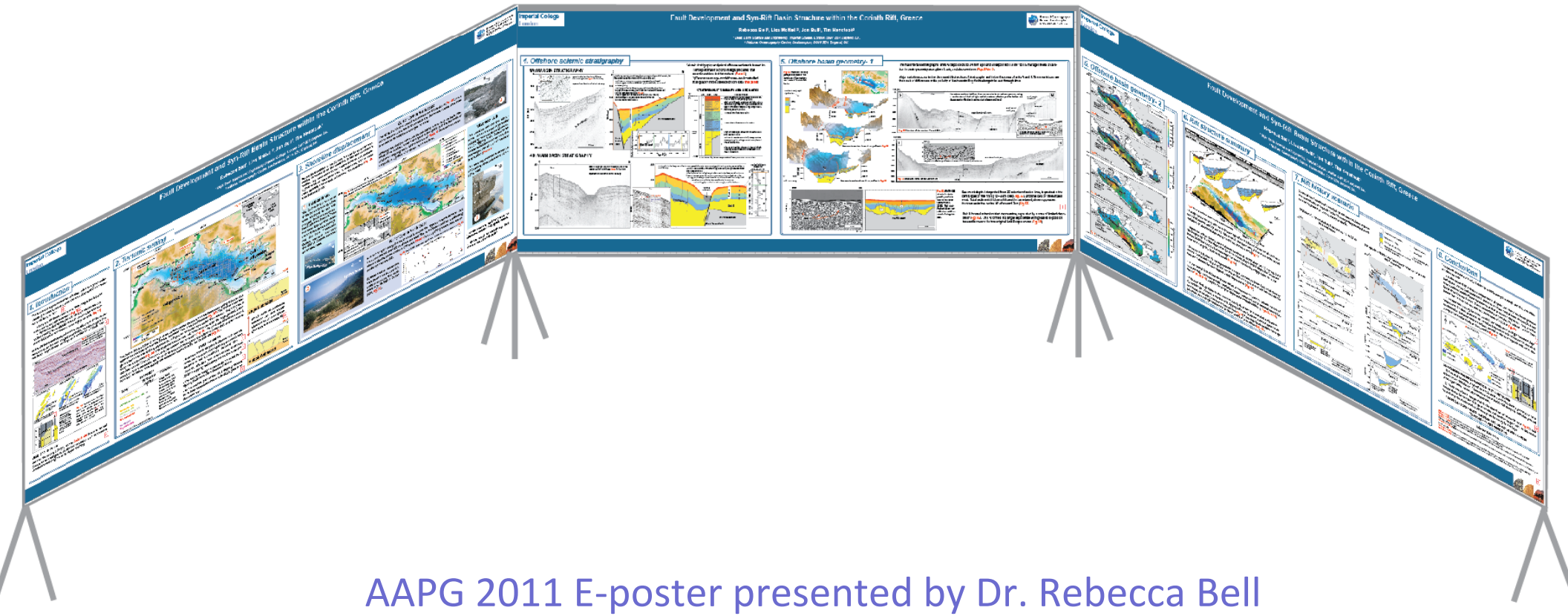
McNeill, L.C., C.J. Cotterill, T.J. Henstock, J.M. Bull, A. Stefatos, R.E.L. Collier, G. Papatheoderou, G. Ferentinos, and S.E. Hicks, 2005, Active faulting within the offshore western Gulf of Corinth, Greece: Implications for models of continental rift deformation: Geology, v. 33/4, p. 241-244, doi: 10.1130/G21127.1

click for audio

Fault Development and Syn-Rift Basin Structure within the Corinth Rift, Greece

Rebecca Bell[1], Lisa McNeill[2], Jon Bull[2], Tim Henstock[2]

[1] Dept. Earth Science and Engineering, Imperial College, London, SW7 2BP, England, UK.
[2] National Oceanography Centre, Southampton, SO14 3ZH, England, UK.



AAPG 2011 E-poster presented by Dr. Rebecca Bell

Imperial College London

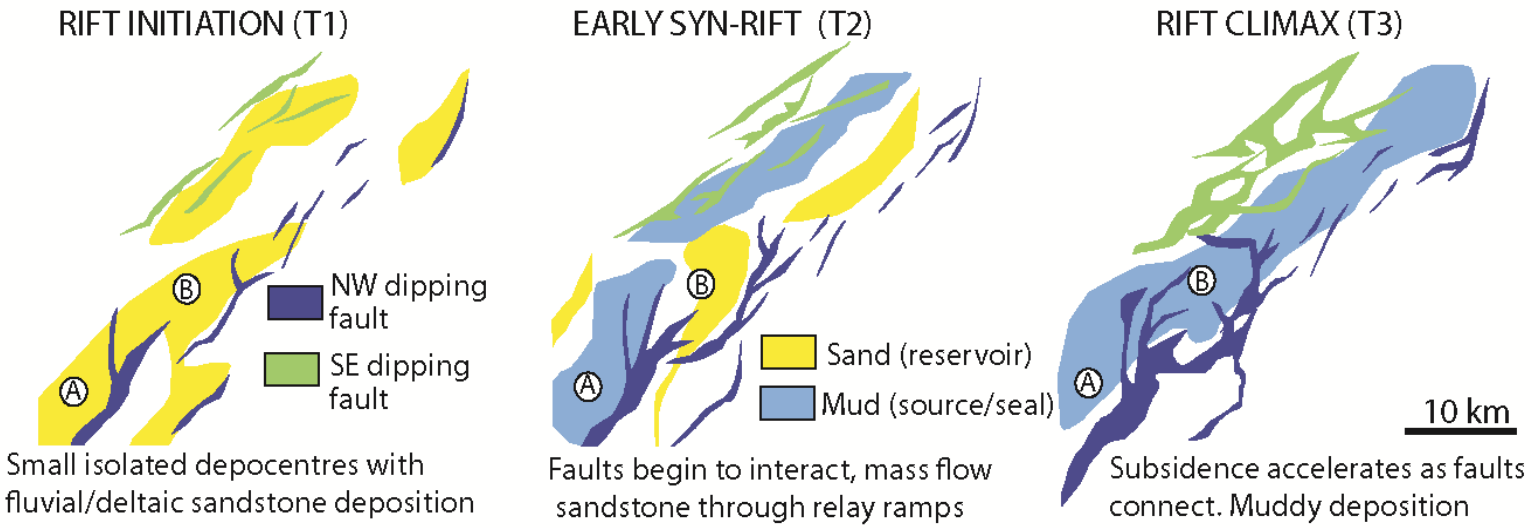
National Oceanography Centre, Southampton
UNIVERSITY OF SOUTHAMPTON AND NATURAL ENVIRONMENT RESEARCH COUNCIL

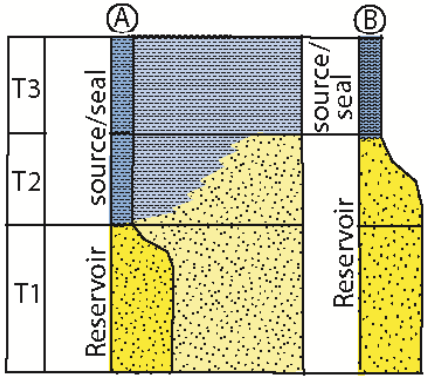
click for audio

1. Introduction

The successful exploration of syn-rift plays relies on a good understanding of source, seal and reservoir rock distribution and reservoir architecture. But:

- Deposition during this period is highly structurally controlled causing facies distributions to be complex and sediment thicknesses and extents to be highly variable.

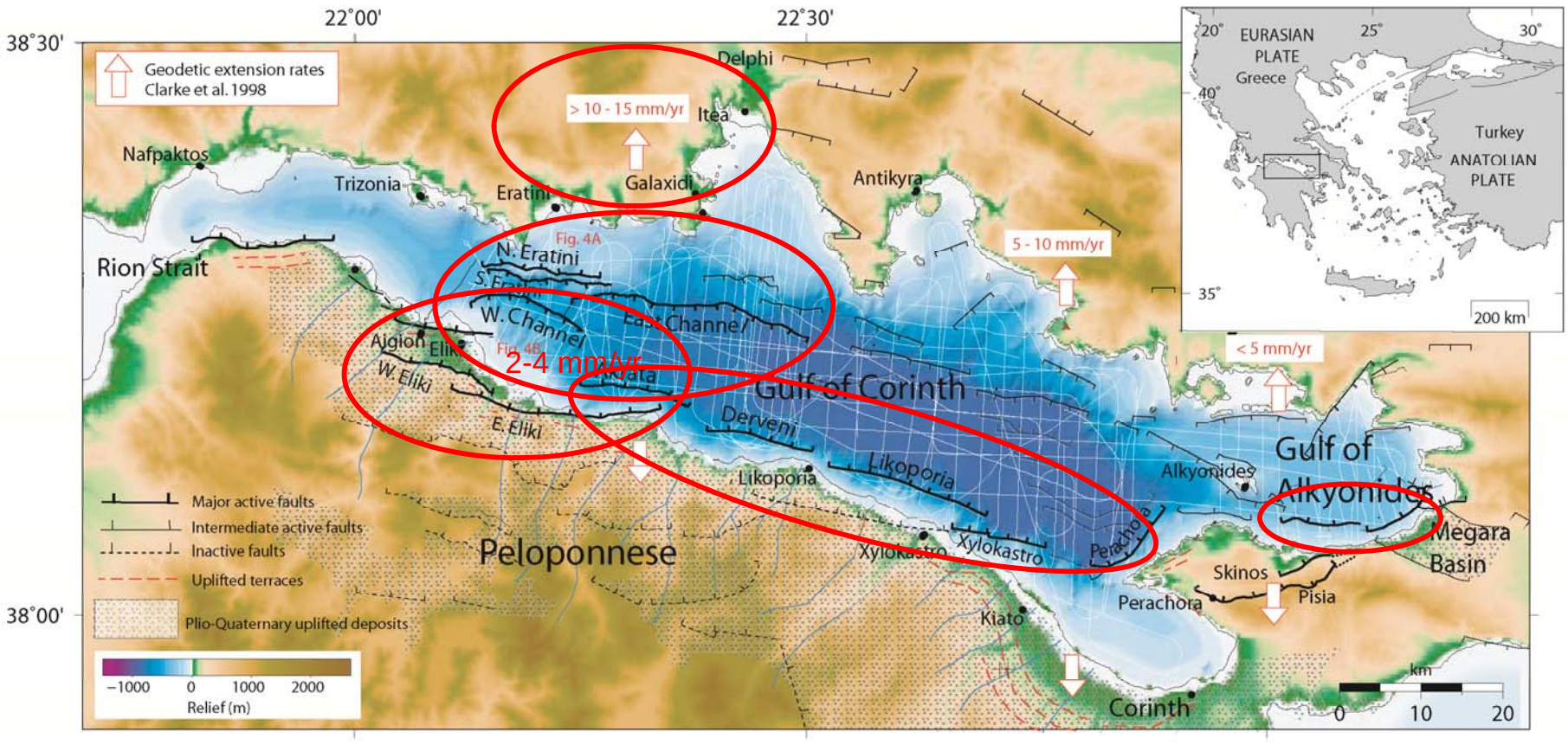


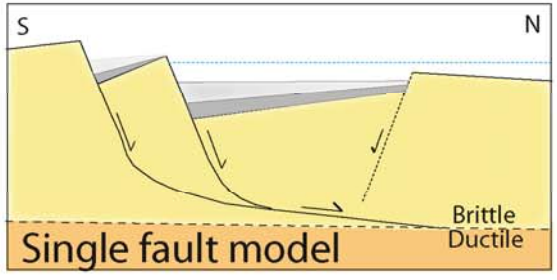


After Larsen et al. 2010

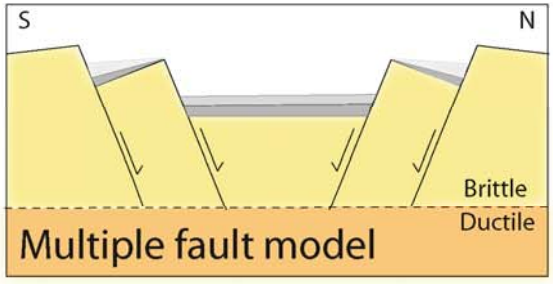
click for audio

2. Tectonic setting





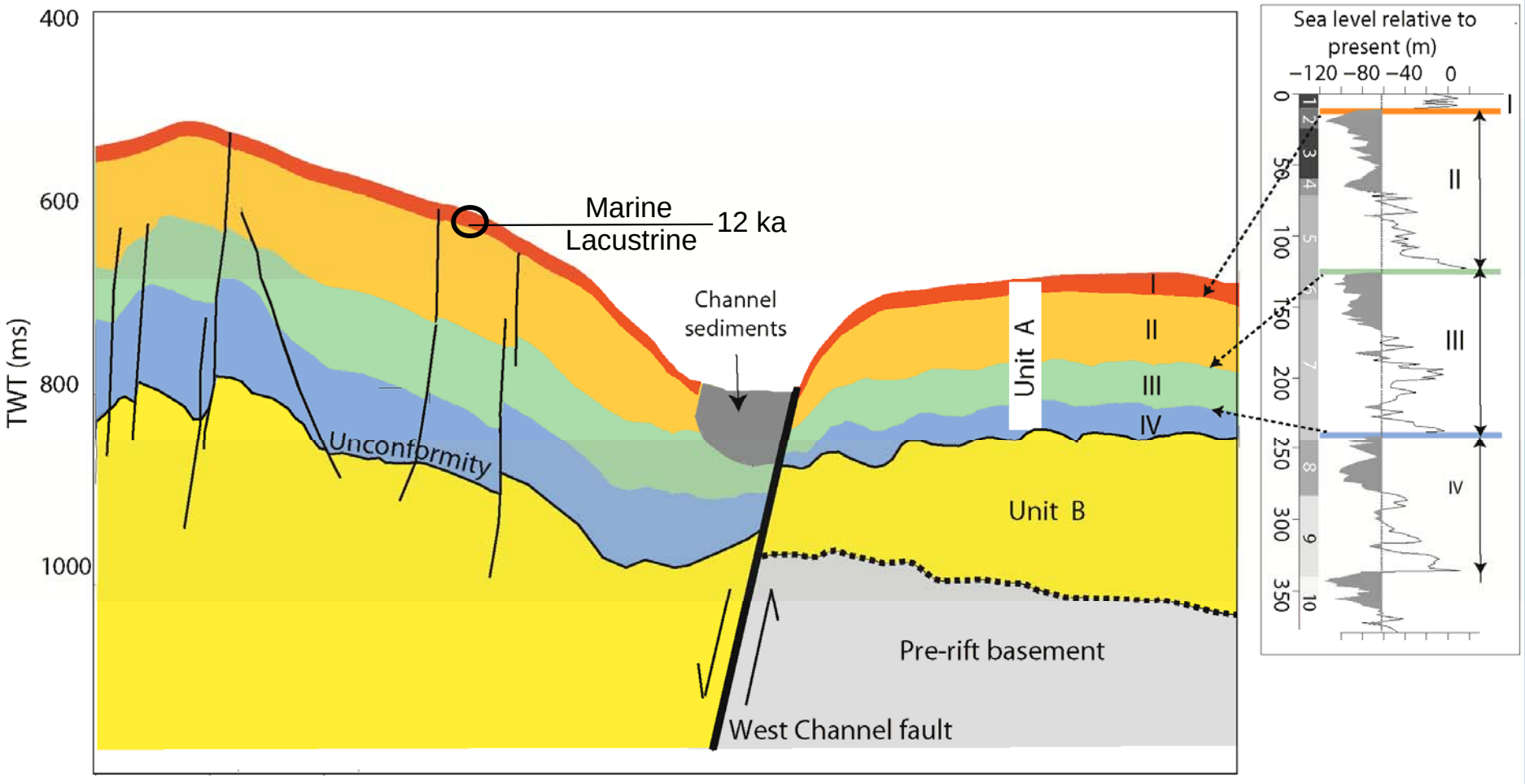
Which model of continental extension can best explain observations of syn-rift basin geometry in the Corinth Rift?



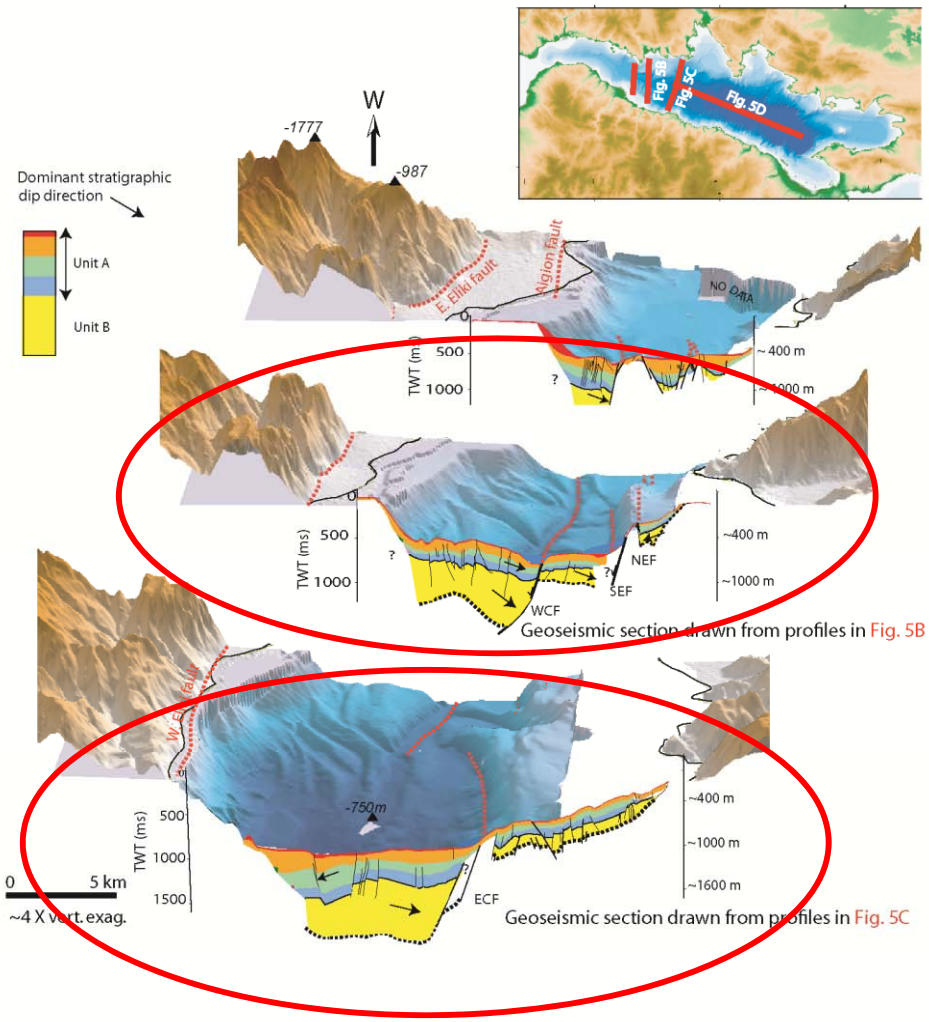
click for audio

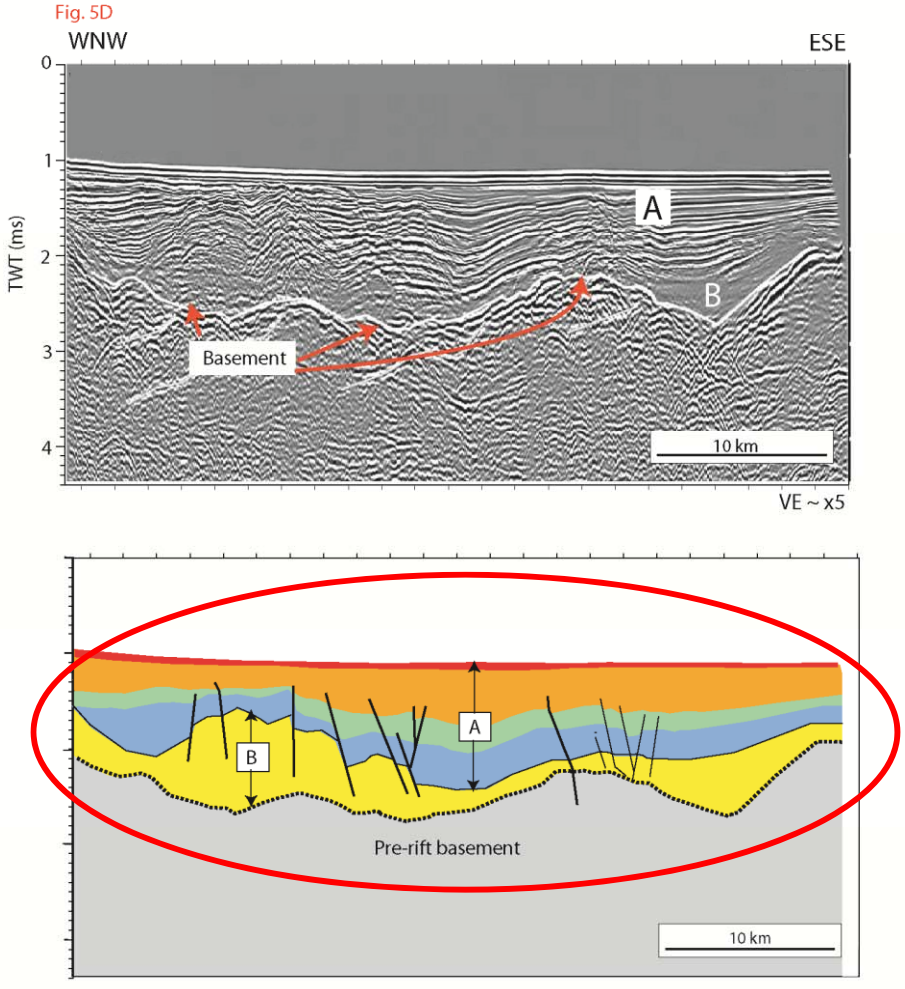
4. Offshore seismic stratigraphy

MAIN BASIN STRATIGRAPHY



5. Offshore basin geometry- 1





Clement et al. 2004

click for audio

5. Offshore basin geometry- 2

Fig. 5E Depth to the basement - sediment contact

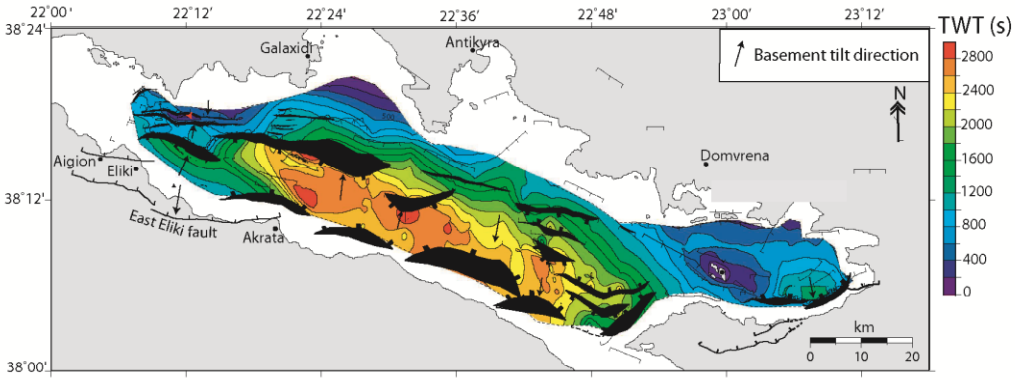


Fig. 5F Total sediment thickness

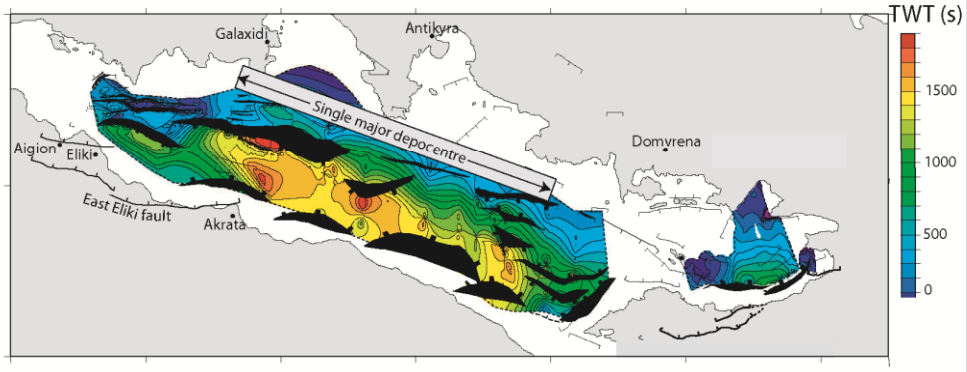


Fig. 5G Unit B sediment thickness (pre ca. 0.4Ma)

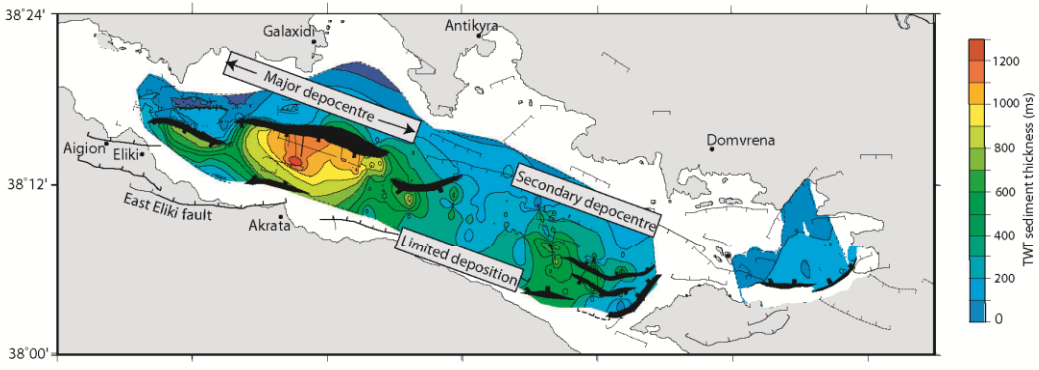
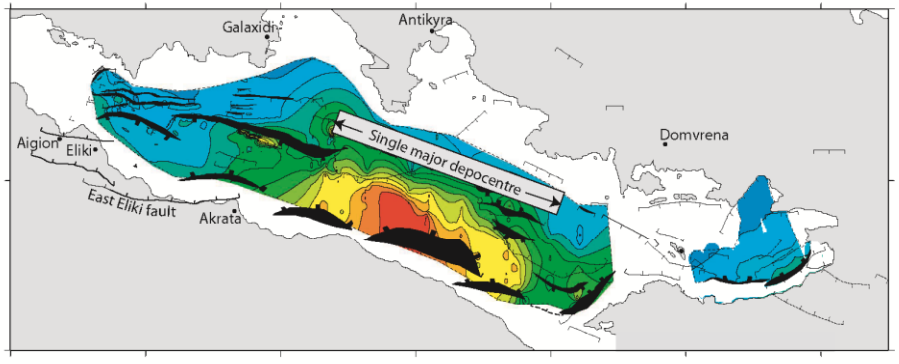
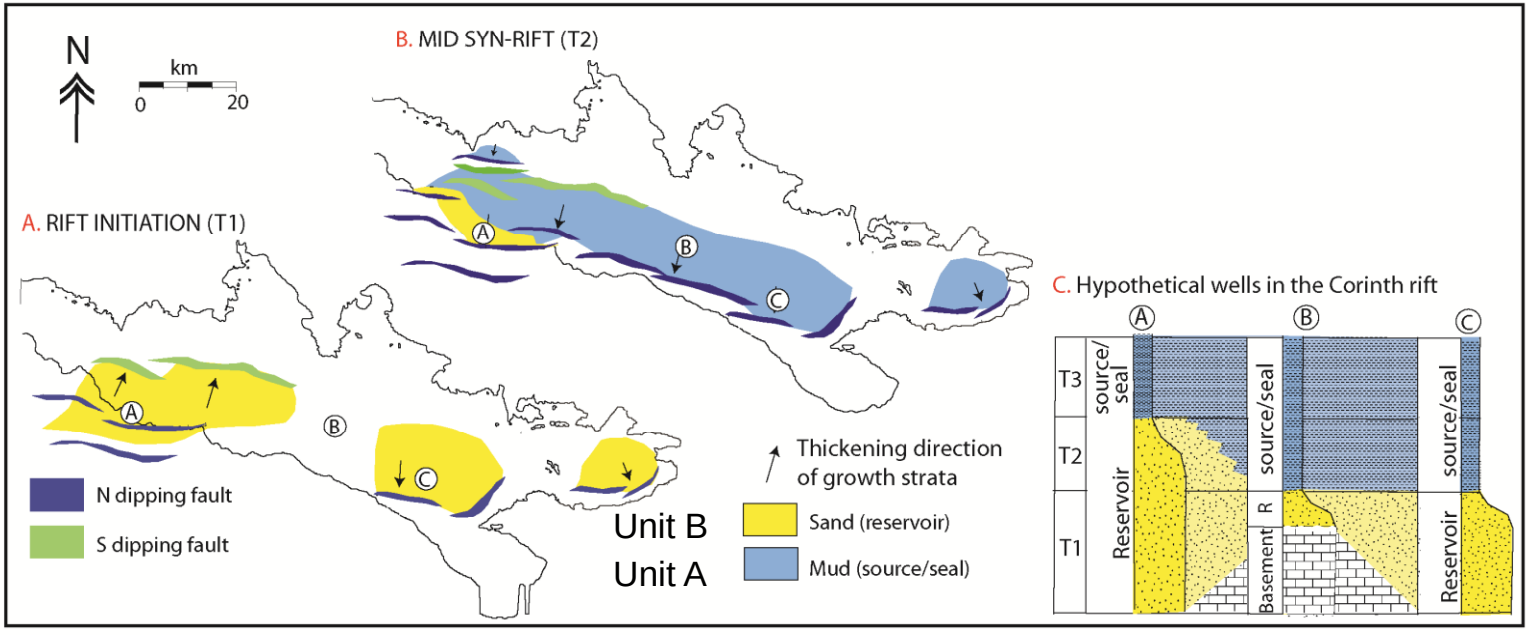


Fig. 5H Unit A sediment thickness (post ca. 0.4Ma)



click for audio

8. Conclusions



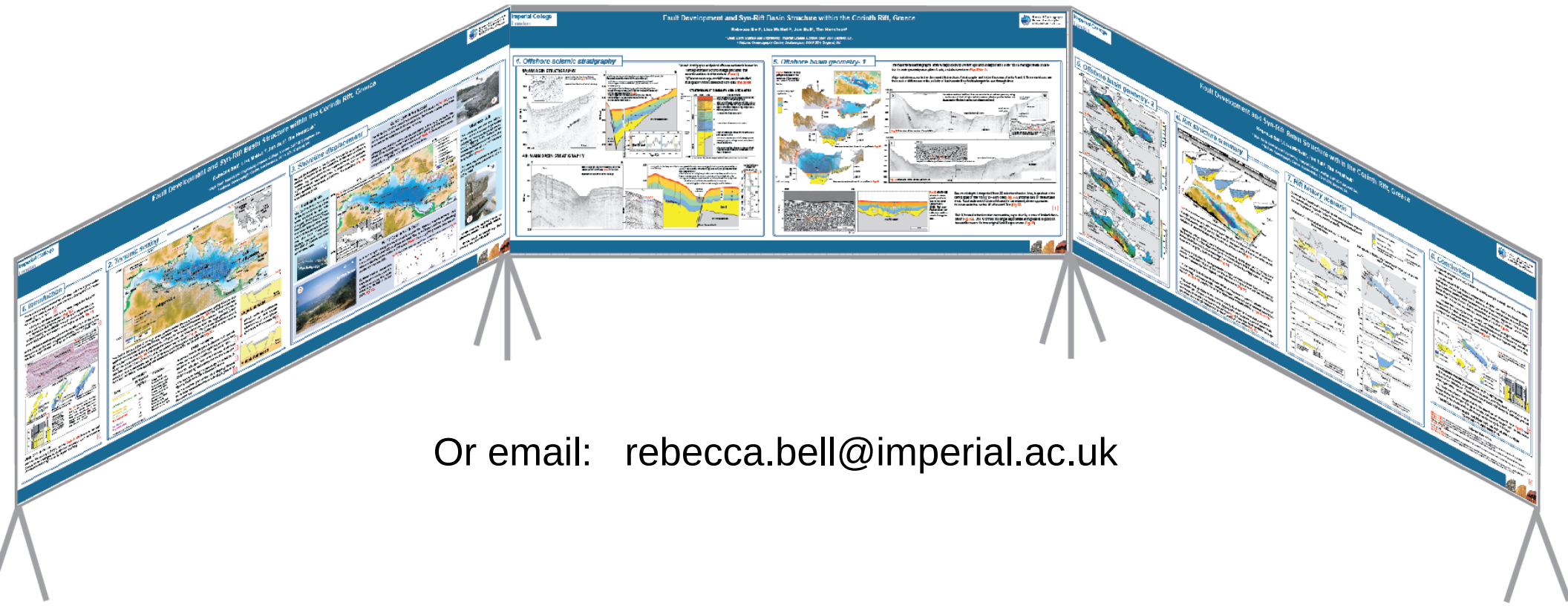
THE PRESENT DAY STRUCTURAL TEMPLATE SHOULD NOT BE USED TO ASSESS SYN-RIFT STRUCTURE

For more information-

Visit the poster: **Click to view Poster 1**

Key references:

Bell et al. 2009, Basin Research, v. 21, p 824-855
Bell et al. 2008, GSA Bulletin, v. 120, p 156 - 178
McNeill et al. 2005, Geology, v. 33, p. 241 - 244



Or email: rebecca.bell@imperial.ac.uk