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Basin evolution and the distribution of strain within the Gulf of Corinth rift

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The Gulf of Corinth is a classic young active continental rift initiating <5 Ma and with current extension rates up to 15 mm/yr. The modern rift (ca. 1-2 Myr old) has been studied extensively both onshore and offshore. In this paper we bring together the results of study of the offshore rift with existing onshore data to generate a model for how the modern rift has tectonically evolved, how strain is distributed across and along the rift, how slip on individual major faults controlling rift basin subsidence has changed over relatively short timescales (e.g. <0.5 Myr) and how extension in the upper crust through fault displacement compares with whole crustal extension over the history of the rift.

The results indicate that the rift stratigraphy is divided into two units (pre- and post- ca. 0.5Ma). The two units indicate markedly different rift basin geometry during these two time periods. Two separated depocentres 20-50 km long were created controlled by N- and S-dipping faults before ca. 0.5 Ma, while since ca. 0.5 Ma a single depocentre (80 km long) has been controlled by several connected N-dipping faults, with maximum subsidence focused between the two older depocentres. Thus isolated but nearby faults can persist for timescales ca. 1 Ma and form major basins before becoming linked. There is a general evolution towards a dominance of N-dipping faults; however, in the western Gulf strain is distributed across several active N- and S-dipping faults throughout rift history, producing a more complex basin geometry. Examination of extension at a larger spatial and temporal scale suggests that uniform pure shear extension without the need for a significant N-S dipping detachment fault is a viable extension mechanism for at least the western rift where constraints are greater. These results also indicate that the present day strain distribution indicated by GPS data cannot have persisted over the lifetime of the modern rift.

We are now building on these studies by performing a major data integration exercise of all available seismic reflection (both conventional and high resolution, digital and analogue) and bathymetric data within the Gulf. This integrated dataset will allow us to refine and improve the syn-rift chronostratigraphic model (based on sequence stratigraphic interpretation) for the Gulf, to correlate this stratigraphic interpretation throughout the Gulf, and to interpret the rift fault network at a much great level of detail than before. We will use these results to refine locations of proposed ocean drilling boreholes which may ultimately provide critical absolute chronological and environmental information. In addition the results will allow us to develop models of rift fault activity, growth and interaction, a detailed history of rift evolution in time and space, and identify the roles of tectonics and climate on sediment flux into the rift and landscape development.