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Lithospheric cooling as a basin forming mechanism within accretionary crust.

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Widely accepted basin forming mechanisms are limited to flexure of the lithosphere, lithospheric stretching, lithospheric cooling following rifting and, possibly, dynamic topography. In this work forward models have been used to investigate lithospheric growth due to cooling beneath accretionary crust, as a new basin forming mechanism. Accretionary crust is formed from collision of island arcs, accretionary complexes and fragments of reworked older crust at subduction zones, and therefore has thin lithosphere due to melting and increased convection. This is modeled using a 1D infinite half space cooling model similar to lithospheric cooling models for the oceans. The crustal composition and structure used in the models has been varied around average values of accretionary crust to represent the heterogeneity of accretionary crust. The initial mantle lithosphere thickness used in the model was 20 km. The model then allows the lithosphere to thicken as it cools and calculates the subsidence isostatically. The model produces sediment loaded basins of 2-7 km for the various crustal structures over 250 Myrs. Water-loaded tectonic subsidence curves from the forward models were compared to tectonic subsidence curves produced from backstripping wells from the Kufrah and Ghadames basins, located on the accretionary crust of North Africa. A good match between the subsidence curves for the forward model and backstripping is produced when the best estimates for the crustal structure, composition and the present day thickness of the lithosphere for North Africa are used as inputs for the forward model. This shows that lithospheric cooling provides a good method for producing large basins with prolonged subsidence in accretionary crust without the need for initial extension.