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Crustal Thickness for North Africa and the Mediterranean from Gravity Anomaly Inversion

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Gravity inversion, incorporating a lithosphere thermal gravity anomaly correction, has been used to map Moho depth, crustal thickness and continental lithosphere thinning factor for North Africa and the Mediterranean in order to determine the distribution of oceanic and continental lithosphere, continental rifting and the location of the ocean-continent transition. Data used in the gravity inversion are bathymetry, free-air gravity and sediment thickness data from Smith and Sandwell (1997), Sandwell and Smith (2009) and Laske and Masters (1997) respectively. Moho depths from the gravity inversion are dependent, because of the lithosphere thermal gravity anomaly correction, on the age of rifting, continental breakup and sea floor spreading. Gravity inversion sensitivities to break-up ages of 225Ma (late Triassic) and 100Ma (early Cretaceous) have been examined. Gravity inversion results show thin crust (5 – 10km thickness) for the Ionian Sea and the Herodotus Basin of the eastern Mediterranean consistent with these basins being underlain by oceanic or highly thinned continental crust. Predicted Moho depths from the gravity inversion are in agreement with published Ionian Sea ESP results (Voogd et al, 1992) and suggest a gravity inversion reference Moho depth increasing to the north, which we attribute to Hellenic subduction dynamic subsidence. The predicted basement crustal thickness at the north African coast has values of less than 30km, substantially less than in the continental interior to the south, possibly corresponding to the relict Tethyan margin. Continental lithosphere thinning factor maps from gravity inversion for Africa do not show continuity between the Cretaceous African rift system (Benue Trough, Chad, CASZ and Sudan basins) and the eastern Mediterranean basins. If the Ionian Sea is of Cretaceous age then it more probably links to Cretaceous rifting and sea-floor spreading to its north and north-west.