Geophysical Research Abstracts
Vol. 13, EGU2011-3860, 2011
EGU General Assembly 2011

The TopoMed broad band magnetotelluric experiment: crustal images of the Atlas mountains of Morocco.

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The Atlas Mountains in Morocco are considered as type examples of intracontinental mountain chains, with high topography that contrasts with moderate crustal shortening and thickening. Whereas recent geological studies and geodynamic modelling suggest the existence of dynamic topography to explain this apparent contradiction, there is a lack of modern geophysical data at the crustal scale to corroborate this hypothesis. To address this deficiency, magnetotelluric data were recently acquired that image the electrical resistivity distribution of the crust from the Middle Atlas to the Anti-Atlas. All tectonic units show different, distinct and unique electrical signatures throughout the crust reflecting the tectonic history of development of each one. In the upper crust, electrical resistivity values and geometries can be associated to sediment sequences and to crustal scale fault systems in the High Atlas developed likely during Cenozoic times. In the lower crust, the low resistivity anomaly found below the Mouluya plain, together with other geophysical (low velocity anomaly, lack of earthquakes and minimum Bouguer anomaly) and geochemical (Neogene-Quaternary intraplate alkaline volcanic fields) evidence, infer the existence of a small degree of partial melt at the base of the crust. Resistivity values suggest a partial melt fraction of the order of 2% to 8%. The low resistivity anomaly found below the Anti-Atlas may be associated with a relict subduction of Precambrian oceanic sediments, or to precipitated minerals during the release of fluids from the mantle during the accretion of the Anti-Atlas to the West African Supercontinent during the Panafrican orogeny (ca. 685 Ma).