Geophysical Research Abstracts
Vol. 12, EGU2010-251, 2010
EGU General Assembly 2010

Magmatism and the active tectonics of the Turkish-Iranian plateau: a preliminary synthesis

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Magmatism is an important feature of the Turkish-Iranian orogenic plateau, with both composite volcanoes and lava fields present from Anatolia to eastern Iran. These volcanic rocks provide insights in to the evolution of the underlying mantle and the tectonics of the collision zone, although we are presently far from having a full picture of the compositional variation. Many centres within Iran are Plio-Quaternary in age (∼5-0 Ma) and so formed 10s of millions of years after initial plate collision. The reason for this upsurge in magmatism is not clear, although in places there is a close association between the volcanics and active fault systems – especially pull-apart basins, fault terminations or boundaries between different fault blocks. Either localised extension provides a trigger for melting directly underlying mantle – which has implications for the connectivity of upper crustal structures with much deeper levels of the lithosphere, or there is regional mantle melting that finds conduits to the surface via such fault systems. A wide range of compositions has already been identified. Rock types span the range from primitive basalts to rhyolites with rare potassic and ultrapotassic lavas. Many units possess supra-subduction zone chemistries, presumably inherited from sources influenced by the pre-collision Tethyan subduction, although the signature could be related to the Pan-African creation of juvenile lithosphere. Alkali basalts with within-plate, OIB-like are also present, especially along strike-slip fault zones, implying that local tapping of mantle with asthenopsheric characteristics can occur. The cause of the magmatism has been attributed to various processes, including slab-breakoff and detachment/delamination of the lower lithosphere. Neither of these is wholly satisfactory given the broad distribution of centres and the range of compositions. We observe that most magmatism occurs on the flanks of the recently-described thick lithospheric core to the collision zone, and speculate that the gradient in lithosphere thickness is an important factor in melt generation.
Keywords:Magmatism,Alkali basalts,slab-breakoff,within-plate,delamination.