A view of the central-eastern Mediterranean mantle

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In the central-eastern Mediterranean, the Tyrrhenian and Hellenic subduction zones are marked by, respectively, deep (down to about 450 km depth) and intermediate (down to 200 km) seismicity [i.e. Selvaggi and Chiarabba, 1995; Papazachos et al., 2000]. They share a common Neogene tectonic evolution dominated by trench retreat and back arc extension, which started contemporaneously, around 30 Myr ago, and caused the formation of the Liguro-Provencal and Tyrrhenian basins (central Mediterranean) and the Aegean basin (eastern Mediterranean) [Dercourt et al., 1986; Malinverno and Ryan, 1986; Jolivet and Faccenna, 2000]. Yet, the affinities of the two subduction systems are only apparent [Faccenna et al. 2003]. In the eastern region, the Aegean basin opened slowly (about 1 cm/yr) behind a shallow dipping slab. The slab-like, continuous, high seismic velocity anomaly detected by tomographic studies below the Aegean extends in the whole upper mantle and can be

followed in the lower mantle down to a depth of at least 1500 km [i.e. Karason and van der Hilst, 2000].

Its descent into the midmantle initiated most probably during the Late Cretaceous, and the trench advanced northeastward, following the Eurasian upper plate, subject to the persistent push of the African plate. Conversely, in the central Mediterranean region subduction initiated later, during the Tertiary, and there is no trace from tomography of present or past large-scale mid-mantle slab penetration: the Tyrrhenian slab dips steeply in the upper

mantle and bends lying over the 660-km discontinuity [Piromallo and Morelli, 2003]. The slab motion has been confined to the upper mantle, causing punctuated and rapid (up to 5 cm/yr) episodes of back arc extension (Provencal and Tyrrhenian basins). We show how the large scale mantle

signatures derived from seismological constraints, combined with geological data and plate kinematics, depict remarkably different evolutionary trends in terms of age, geometry, style of subduction and depth of slab penetration into the mantle [Faccenna et al., 2003]. We discuss as well some insights from recent numerical models and laboratory experiments.

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