Geophysical Research Abstracts, Vol. 8, 07592, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07592

Deep structure and evolution of the Cyprus Arc

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This study addresses the easternmost segment of the convergent plate boundary in the Mediterranean, encompassing the Cyprus arc and its connection to the Arabia-Eurasia collision zone. Seismic activity along the arc is limited (certainly relative to the adjacent Hellenic arc). Although marine geophysical surveys have elucidated many pertinent features of the region, the plate boundary configuration is not well understood. Therefore, we use seismic tomography results to study the deep structure of this plate boundary segment. We find that the deep structure of the eastern part of the Cyprus arc, exhibiting a broad zone of sinistral deformation at the surface, is very similar to the eastern segment of the Hellenic subduction zone. A slab related anomaly is missing here in the upper mantle, and this part can be identified as a STEP fault zone (Subduction-Transform Edge Propagator; see Govers and Wortel, EPSL, v. 236, 2005), allowing S-SW directed slab retreat. We propose that the inception of the STEP fault and the associated back-arc extension is triggered by the continental collision and subsequent slab detachment in the Bitlis suture to the east. From a quantitative analysis of tomographic anomalies in the mantle below the Bitlis suture zone (Hafkenscheid 2004) slab detachment is inferred to have taken place at 8-12 Ma, the younger end of this age range being more pertinent for the westernmost Bitlis segment. Slab detachment creates an edge to the subducting slab, which is a favourable condition for the inception of a STEP fault.

The slab in the central part of the Cypus arc has become detached possibly resulting from the collision with the Eratosthenes Seamount in the (Late) Pliocene. Only in the northwestern segment of the arc below the Antalya Basin and the Isparta Angle the slab appears to be continuous.

The short duration of the time window between inception of STEP faulting and collision with the Eratosthenes Seamoumt may explain the moderate development of the Cyprus (back-)arc relative to the Hellenic arc. The deep mantle anomalies below Ana-

tolia are very similar to those below the Aegean region, pointing to a largely common earlier (pre-Oligo-Miocene) convergence history.

Implications of the lateral and temporal variations in plate boundary configuration for the tectonics of Anatolia are addressed.