Variation of Aegean crustal extension during Hellenic slab rollback revealed by receiver function analysis

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Résumé

Southward Hellenic subduction slab rollback leads to Aegean upper plate extension; hence the continental crust's thinning. The progressive curvature of the trench could trigger a heterogeneous amount of extension in the Aegean upper plate that may imply varying amounts of crustal thinning. The topographic difference between the emerged Central Greece and the submerged Cyclades and Sporades may reflect a significant difference in crustal thickness. We use here receiver functions (RF) analysis to estimate the Moho geometry in the Central Aegean (West Cyclades, Central Greece and Sporades) and characterize the degree of heterogeneity in Aegean crustal thinning related to the extension. More precisely, we investigate the role of three major faults that mark the transition between Central Greece, the Cyclades and the Sporades: the Pelagonian, the South-Evvia, and the North Cycladic Detachment. Our analysis of the MEDUSA seismic stations located in Attica, Evvia, the Sporades and the Cyclades shows that the Moho is deeper beneath Central Greece (_˜26.4 km) than beneath the Cyclades (_˜25,0km) and the Sporades (_˜24.2km). A detailed azimuthal study and a dip-strike analysis show a flat Moho underneath Central Greece, the Sporades and the Cyclades, suggesting Moho steps in between Central Greece and the Sporades occurs in a very narrow zone and indicates the existence of a high angle NE-trending normal fault north of Evvia. The transition between Central Greece and the Cyclades occurs in a narrow zone (_˜75 km) encompassed by the Pelagonian and the South-Evvia faults. Moho dip and strike variations on both sides suggest the existence of a crustal signature of these faults. Our results advocate for an isostatic compensation of the region and support a larger amount of crustal thinning in the Cyclades than in Central Greece. Within these two crustal blocks, the flat Moho suggests a broad rift extension process associated with the formation of numerous Miocene and Plio-Quaternary basins/rifts. We propose that the Pelagonian and South-Evvia faults accommodated the inferred variations in the amount of crustal thinning. These faults likely act as a major continental transfer zone at the crustal scale during Miocene to Plio-Quaternary Aegean Extension.

Mots-Clés: Aegean dynamics, geophysics, crustal thinning, strike, slip faults

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