Role of dextral strike slip faulting in the distribution of Aegean extension since Miocene times inferred from receiver function analysis

Agathe Faucher\(^1\), Christel Tiberi\(^1\), Frédéric Gueydan\(^1\), and Alexandrine Gesret\(^2\)

\(^1\)Géosciences Montpellier, UMR 5243 CNRS, Université de Montpellier, Rue Eugène Bataillon, 34095 Montpellier, France. (agathe.faucher@umontpellier.fr)
\(^2\)Mines ParisTech, PSL - Research University, Centre de Géosciences, 35 Rue St Honoré, F-77300 Fontainebleau, France.

Aegean plate is marked since Eocene by widespread NE-SW extension induced by the African slab roll-back. In Miocene times, E-W shortening created by the westward Anatolian extrusion overlays the extension, with the formation of Miocene dextral strike slip faults in addition to normal faults. We propose to quantify the role of large dextral strike slip faults in accommodating Aegean extension, using receiver functions to image Moho geometry.

Aegean extension is particularly evidenced by a topographic difference between the emerged continental Greece and the submerged Cyclades. In this study we characterize the associated Moho geometry with a particular focus on the transition between these two domains. From a geological point of view, the transition between continental Greece and the Cyclades is marked by two dextral strike slip faults: the Pelagonian fault (onshore) and the South Evvia fault (offshore). Our objective is also to show a potential Moho signature of these strike slip faults. We processed receiver functions (RF) from the MEDUSA stations located in Attic and Evvia.

Our results show that the Moho is deeper beneath continental Greece (~27km) than beneath the Cyclades (~25km). A detailed azimuthal study of RF distribution shows a flat Moho underneath Continental Greece. The crustal thickness is also almost constant inside the Cyclades, as already suggested by previous studies. However, the transition between the Cyclades and Continental Greece is not continuous. These two crustal blocks are separated by the Pelagonian and the South Evvia strike slip faults in a narrow transition zone (~75km). In this zone (South Evvia/Attica), dip and strike of the Moho vary and suggest a crustal signature of the strike slip structures observed at the surface. These strike slip faults therefore accommodate in a narrow zone the inferred variations in crustal thicknesses between the Cyclades and Continental Greece.

Our data show that differences in topography between Continental Greece and the Cyclades are isostatically compensated, reflecting various amount of crustal thinning larger in the Cyclades than in Continental Greece. Inside these two crustal blocks, we imaged a flat Moho, suggesting a wide rift extension process associated with the formation of numerous Miocene and Plio-Quaternary basins. The dextral strike slip faults at the edges of the continental blocks (Continental Greece and
Cyclades) accommodated the inferred variations in the amount of crustal thinning, suggesting that they act as continental transfer zones at crustal-scale during Miocene Aegean Extension.