CHAPTER 6

CONCLUDING REMARKS

By combining P and S receiver functions from the Aegean and Greece, a joint P and S receiver function analysis is performed that allows sampling seismic boundaries at sea with data from nearby land stations. Using this joint P and S receiver function analysis, for 65 permanent and temporary stations covering the whole Aegean area, resulted in a direct, homogeneous and detailed Moho map for the continental Aegean and subducting oceanic African plates. Due to the wider distributions of the Sp conversions, the receiver function technique allows a better resolution in space than surface waves and a direct measurements contrary to gravity anomaly interpretation. Furthermore, applying the new technique of S receiver function led to imaging of the Lithosphere-Asthenosphere Boundary for the first time in this area and discussed further the reversed Moho contrast complication in the forearc area of the subduction.

6.1 Crust-mantle boundary of the Aegean plate

Strong variations of the crustal thickness are demonstrated by this study in the Aegean. A thickness of approximately 32-38 km was observed beneath western Greece along the Hellenides mountains showing the unstretched crust in this area, whereas northern Greece and eastern part of continental Greece were stretched by the extension that occured within the whole Aegean and therefore shows a crustal thickness of 28-30 km. The observed thicker crust in western Greece is reliably related

to the crustal thickening resulted from isostatic compensation of the mountain range in this part. A very thin crust (20-22 km) restricted to the southern Aegean clearly shows 40-45% crustal thinning caused by the extension tectonics of the Aegean back arc area, which has been started since early Miocene and was great in the southern Aegean. This extension also affected the Peleponnesus and the island of Crete. Crustal thicknesses of 25-28 and 25-30 km for Peleponnesus and Crete respectively reveal the stretched crust beneath this area. However, presence of thicker crust beneath the western block of the Crete shows the different reaction of this block to the extension relative to the eastern part of Crete. Moderate crustal thinning of about 20-25% observed in northern Aegean shows the second episode of the extension, which was significant in northern Aegean along the North Anatolian Fault and resulted in 25-28 km crustal thickness for this region. The thicker crust of the rigid block of Cyclades (~ 25-30 km) confirms that this part was not involved in the second episode of extension. The discrepancy between the present day strain rate deduced from GPS measurements located mostly in the North Aegean Sea and the variation in the crustal thickness obtained from this study shows that the present day kinematics is recent.

6.2 Crust-mantle boundary of the African plate

The high resolved African Moho deduced from over 5000 observations of P and S receiver functions led to a homogeneous and detailed map of the subducted slab beneath the whole area. The African Moho is followed from western Peleponnesus, southern Crete and southeast of Rhodes at a depth of 40 km down to the depth of 160 km beneath volcanic arc and to 220 km under northern Greece, while P receiver functions could map it only down to 100 km beneath volcanic arc. The observed seismicity located only in the shallower part of the slab (~ 180 km) shows that the northern part of the slab is aseismic. The resulted image of the Hellenic subducted slab shows the characteristics of the slab laterally as well as vertically within the region.

The geometry of the slab is relatively complex. The western part of the subduction is much shallower than the eastern part, it is horizontal beneath Peleponnesus and observed at depth of about 50-60 km, it shows a sudden dipping to a depth of 200 km beneath northern Greece, while the slab dips steeply in the eastern part beneath the Dodecanese islands. This rapid sinking of the eastern segment of the arc shows that subduction occurs easier in this part in comparison with the western part of the arc. The slab shows a more linear form at the beginning of subduction compared with the present-day form, which is almost bent. This could be related to the two episodes of extension, which affected the whole Aegean region.

6.3 LAB beneath the whole area

The lithsphere-asthenosphere boundary could be well resolved using the new technique of S receiver function. The obtained oceanic lithosphere of the subducting African plate is 100 km thick beneath the southern Crete and southern part of the Aegean, it thickens beneath the volcanic arc where it reaches about 225 km. However, the depth of the oceanic lithosphere could not be imaged under mainland Greece. Beneath western and northern Greece, the continental Aegean lithosphere (Eurasian lithosphere) lies above the downgoing oceanic plate and is observed at about 150 km depth, this thickness may be related to the crustal thickening reported in this area.