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High resolution images of the Lithosphere-Asthenosphere Boundary obtained from S receiver functions

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Detailed knowledge of the lithospheric thickness is one of the most essential issues to understand geodynamic processes and is an important key to unravel the tectonic history. Seismic observations of the lithosphere are only restricted to the images obtained from low-resolution surface waves because the lower boundary of the lithosphere is considered to be not sharp enough to be detected by seismic body waves. The recently developed S receiver function technique achieves this problem, since it concentrates on S-to-P conversions at seismic discontinuities beneath a seismological station. This method enables observations of the Lithosphere-Asthenosphere boundary (LAB) with a resolution so far only known for the Moho discontinuity. High-resolution images of the base of the lithosphere from S-to-P converted waves are obtained in different tectonically areas including the Hellenic subduction zone and the Dabie Shan collision zone. Our results in the Aegean significantly reveal the subduction of the oceanic African lithosphere beneath the continental Eurasian lithosphere and image a deepening of the African LAB from about 100 km in the southern Aegean to about 225 km in the central Aegean Sea. They also imply a thickness of 60-65 km for the subducted African lithosphere. Furthermore, observed S-to-P conversions from the Moho boundary at stations located in the forearc of the subduction confirm the presence of a large amount of serpentinite in the forearc mantle wedge. Our observations beneath the Dabie Shan imply in small scale the existence of two lithospheric blocks. However, the presence of a thin lithosphere (60-70 km) beneath the main accreted fragments including the Yangtze and the Sino-Korean cratons in central eastern China suggests a significant thinning of the lithosphere associated with the probable extension and volcanism occurred in this area.