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# 2D modelling of wave propagation in the Hellenic subduction zone: Influence of Moho topography on receiver functions

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The Hellenic subduction zone is part of the active convergent margin between the African and Eurasian plates in the Mediterranean region. It is dominated by the north-northeasterly subduction of the oceanic African plate beneath the continental Aegean plate. Information about the present-state structural properties of the Aegean is necessary to help understand the spatial and temporal evolution and the dynamics of subduction. An important part of this information is provided by various receiver function studies in the Hellenic forearc and volcanic arc (Knapmeyer & Harjes, 2000; Li et al., 2003; Endrun et al., 2004).

In receiver function data from western Crete, prominent negative phases around the expected Moho arrival time have been observed. Interpretations range from remnants of a subducted accretionary wedge (Knapmeyer & Harjes, 2000) to a reversed velocity contrast caused by mantle serpentinization (Li et al., 2003) or return flow of a melange of rocks in a subduction channel (Endrun et al., 2004). As shown by Endrun et al. (2004), the negative phase in receiver functions from Crete is a localized phenomenon pointing to strong crustal heterogeneity. Data from other sites in the Hellenic forearc indicate that the occurence of this phase is not limited to Crete, but neither a continuous feature of the forearc. This is also evident in a receiver function profile across Gavdos and central Crete, where a clear positive Moho conversion is observed at the southern stations, but a negative phase instead at the northern ones.

Receiver function data from the volcanic arc have been limited to two broad-band stations until now. As is evident from the work of Li et al. (2003), station SANT at the southern border of the Cyclades shows much more complex RF waveforms than the more northerly station APE. This includes an apparent doubeling of the Moho conversion with two positive onsets at 2.5 s and 4 s and a conspicuous positive arrival near 7 s not linked to any geological structure so far. Additional data from the southern volcanic arc collected with the CYC-NET (Bohnhoff et al., 2004) allow to link these features to several SN-dipping structures visible in the receiver functions. Data from both parts of the Hellenic subduction are rather limited in azimuthal coverage, meaning that events suited for receiver function analysis are overwhelmingly located to the north-east of the stations.

Pseudospectral 2D modelling of wave propagation in a laterally heterogeneous model (Ceranna, 2002) provides a new, important tool to interprete receiver function data from the Hellenic subduction zone. We propose a model along a SSW-NNE profile crossing central Crete parallelto the slab that includes distinct Moho topography, which is suggested for this complex subduction environment by various geophysical data sets. It is shown thatthese Moho variations can provide a conclusive explanation for some of the previously observed ”inverted” Moho phases in the forearc as well as for the complex sequence of apparently dipping conversions in the volcanic arc. As such, these observations do neither demand a low-velocity region beneath Crete nor additional lithospheric structure beneath the southern volcanic arc. Prominent effects of strongly dipping discontinuities include the change of sign in phases reflected past the vertical and multiple P reflections that cannot be separated from Ps conversions during receiver function processing. Unambiguous identification ofthese phenomena can be hampered by poor azimuthal coverage of the data. Still, in regions where discontinuity topography can reasonably be expected, its effectsshould be taken into account when interpreting receiver functions, as results might be spurious otherwise.

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