EGU26-10259, updated on 18 Nov 2026
https://doi.org/10.5194/egusphere-egu26-10259
EGU General Assembly 2026
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Seismic Anisotropy in the Subducting Slab and Mantle Wedge of the Western Hellenic Subduction Zone from Receiver Functions

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The Western Hellenic Subduction Zone is characterized by a transition from oceanic to continental subduction. The change occurs at the Kephalonian transform fault. However, how this transition takes place at depth remains a topic of discussion. This setting thus provides us with an ideal natural laboratory to investigate how differences in subduction regimes affect the structure and dynamics of the system.
To this end, we compute receiver functions across two seismic arrays from the MEDUSA broadband network, one imaging the oceanic subduction and the other imaging the continental subduction. We computed teleseismic receiver functions and performed harmonic decomposition along both lines. We then inverted these results to image the overriding crust, mantle wedge and slab, in terms of their velocity and anisotropic properties. By comparing the seismic properties of the continental and oceanic slabs, we aim to identify key differences in slab structure, seismic anisotropy, dehydration, and metamorphism between the two subduction regimes.
Preliminary results confirm a dipping low velocity zone in both regimes, corresponding to the slab's crust. Its signal is lost below 60 km in the isotropic component but remains visible to greater depths in the anisotropic component. Furthermore, we identify a low velocity layer within the mantle wedge which could resemble the altered LAB of the overriding plate. What sets the two domains apart is the cutoff depth of the isotropic component of the slab – it can be traced 10 km deeper in the South than in the North – and a generally lower anisotropy in the southern mantle wedge.
Until now the LAB has rarely been observed through conventional receiver function analysis or tomography in subduction zones. We therefore suggest that anisotropic inversion may provide unique insight into the structure of the mantle wedge and the subducting slab.