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The TROODOS Experiment: Tomography and Receiver function Observations of an Ophiolite using Data Obtained from Seismology

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Cyprus lies on the Anatolian Plate to the north of the subducting African Plate. The Troodos Ophiolite is an example of a complete ophiolite sequence from mantle harzburgites to pillow lavas. A central question concerns the depth to the base of the ophiolite and its lateral extent at depth. Deeper in the mantle, the process of slab-breakoff may be underway as African plate subduction nears completion, but our picture of mantle seismic structure beneath Cyprus is incomplete due to sparse teleseismic coverage on the island. To address these issues, we have built a new network of broadband seismograph stations across Cyprus (Bastow et al., 2017), which complements stations operated by the Cyprus Seismological Survey. Analysis of teleseismic receiver functions and surface wave dispersion are used concurrently to provide insight into Cyprus' crustal architecture. At mantle depths, we are using body-wave relative arrival-time tomography to image the subducting African plate. The latter study also utilises regional seismograph deploymets in the eastern Mediterranean. At crustal depths, the Troodos ophiolite is identified as a high shear velocity anomaly, confined to the top 6-10km of the upper-crust. Below this high velocity anomaly, relatively homogeneous group velocities across the island are interpreted as the continental crust onto which the Troodos Ophiolite was obducted. Joint inversion of surface waves and receiver functions are underway to better-constrain interface depths. The mantle tomographic imaging study reveals a fast wavespeed anomaly associated with the African plate. The anomaly extends to the 660km mantle discontinuity, but is segmented along its length, confirming that slab-breakup is underway.

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