1D crustal structure from quality seismological data for the Cyprus subduction zone

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The eastern Mediterranean is a tectonically complex region, where long-term subduction and accretion processes have shaped the overall evolution. Recently, many seismic tomography studies have shown subducted slabs of the Neo-Tethyan lithosphere, continuing its subduction in the Hellenic trench, stalled in the Cyprus trench and being torn near the intersection between them. Antalya bay is a key region located on the western flank of the Cyprus Subduction Zone (CSZ), close to the junction between the Hellenic and Cyprus Arcs. Here deep earthquakes are nucleated, which otherwise cannot be seen anywhere else along the CSZ. For this reason, we focus our attention specifically to the Antalya Bay area but also the remaining parts of the CSZ. Several regional studies have been carried out to define the velocity structure beneath the region but none have been able to locate the CSZ. One of the main reasons for this was the lack of incorporation of a wide seismic network in those regional studies. We compile a large catalog of seismicity and relocate earthquakes to infer 1D local crustal structure using the clusters of seismicity.

We used seismic data between 2005 – 2011 which are recorded at more than 335 seismic stations operated by several agencies and portable deployments. The data-set is composed of over 10,000 events and earthquakes can be grouped in several distinct clusters. We defined five of these clusters, where the total number of events is more than 4500, among which we selected over 2000 events with the highest data quality. 1-D local P-wave velocity models are developed using this high quality data-set and the earthquakes are relocated using the local velocity models.

The compiled and reanalyzed data will contribute to perform local earthquake tomography. Moreover, obtained local velocity models represent a fundamental step towards an improved seismic tomography studies in a very crucial region in the eastern Mediterranean.