AGU 100 FALL MEETING
Washington, D.C. | 10–14 Dec 2018

T23E-0420: Seismic structure of Triassic oceanic and stretched continental lithosphere in the eastern Mediterranean from surface wave tomography

Tuesday, 11 December 2018
13:40 - 18:00
Walter E Washington Convention Center - Hall A-C (Poster Hall)

The eastern Mediterranean basin system is tectonically complex. The present day stress field is controlled by the Africa-Eurasia convergence, subduction in the Hellenic, Cyprus, and Calabrian arcs, the collision between the Arabia and Eurasia and the displacement of the Anatolian-Aegean microplate. The early evolution of the Levant Basin and the Ionian Sea are closely related to the history of the Neo-Tethys. The tectonic nature of the lithosphere in the Levant Basin is debated. It may represent old oceanic or stretched continental lithosphere.

A surface wave tomography is performed. We calculated new high resolution Rayleigh wave phase velocity maps using an unprecedentedly large number (200.000) of fundamental mode dispersion curves. For the first time, broadband waveform data from the Egyptian National Seismological Network (ENSN) have been combined with data from IRIS and EIDA in order to ensure good path coverage especially for the southern part of the study area. We aim to determine what type of crust underlies the individual basins, how shear wave velocities vary in the lower crust and upper mantle through the region, and whether the Vp/Vs ratio is indicative for the nature of the crust. In order to examine the variability of the crust and the mantle lithospheric structure, we constructed broadband local phase-velocity dispersion curves for the Levant Basin (deformed continental) and the Ionian Sea (oceanic). Each local dispersion curve is inverted individually for 1D shear wave velocity model using a newly implemented Particle Swarm Optimization (PSO) algorithm. In order to minimize the trade-off between the crustal velocities, mantle velocities and the crustal thickness, we constrained our inversion with accurate local P-wave initial models. Beneath the Levant basin, a Vp/Vs ratio of < 1.8 is obtained pointing to stretched continental crust, whereas a value > 1.8 at the Ionian Sea indicates oceanic nature. A shallow asthenosphere is highly pronounced beneath the Levant Basin with ~70 km of LAB depth. Anomalously higher shear-velocities beneath the Ionian Sea indicate a very thick oceanic lithosphere (200 km). Based on our model for the upper mantle of the Ionian Sea we show that, on average, the Ionian oceanic lithosphere has continued to cool well beyond the 80 m.y. age, contrary to the "plate model" prediction.

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