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Shear Velocity and Intrinsic Attenuation Variations within the Aegean Lithosphere Deduced from Surface Waves

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Towards contributing to the better knowledge of the Aegean lithosphere we introduce experimental elastic and anelastic parameters by analyzing more than 1100 long period Rayleigh waves seismograms. The wavetrains were recorded at the broadband stations installed some years ago in the Aegean region for the SEISFAULTGREECE project. Path-average phase velocities and attenuation coefficients of fundamental Rayleigh waves crossing the Aegean were extracted over the period range 10-100 s. This is the first time that anelastic parameters of the long period wavefield are determined for the region. By stochastic inversion 36 path-average models of shear velocity and 19 path-average models of inverse shear Q were derived down to 200 km. Furthermore, the 1-D path-average models were combined in a continuous regionalization tomographic scheme and a 3-D model of shear velocity variation and a 3-D model of inverse shear Q variation down to 120 km were developed. In the tomograms prominent is a low shear velocity/high attenuation zone in the back-arc region, especially in the central and north Aegean. This zone is associated with an area with high extensional strain rates due to the westward propagation of the NAF system within the Aegean, slab roll back and back arc basin development. The observed pattern suggests a hot or perhaps partially molten uppermost asthenospheric mantle or distributed deformation of the upper mantle beneath this region, or a combination of both, that is an uppermost mantle with high-stress deformation zones associated with faulting and fluid induced magma generation. A high velocity/low attenuation zone is evident in South Aegean and continental Greece indicating the subducted African lithosphere beneath the Aegean. The precise shape and position of the slab cannot be resolved by the data used in the present study because of insufficient lateral resolution in the specific areas.