Abstract title

SEISMIC ATTENUATION TOMOGRAPHY AND ANISOTROPY BENEATH A RETREATING SUBDUCTION SYSTEM: THE SOUTHERN TYRRHENIAN SEA CASE STUDY

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Abstract

The Southern Tyrrhenian subduction system shows a complex interaction among asthenospheric flow, subducting slab and overriding plate. To shed light on the deformations and mechanical properties of the slab and surrounding mantle, we investigated the attenuation and the anisotropic structure through the subduction region. The 3D attenuation results show high-attenuation shallow regions corresponding to the crustal layers, while the slab is imaged as a low-attenuation body bounded by high-attenuation regions located beneath the Aeolian magmatic arc. Between 100-200 km depth, in correspondence of high concentration of earthquakes, the slab is characterized by a spot of high attenuation. Such a feature could be related to the dehydration processes associated to the slab metamorphism. A high-attenuation anomaly is present in the mantle wedge beneath the Aeolian volcanic arc and could indicate mantle melting and slab dehydration and also to the large-scale serpentinization. We also investigated the anisotropic structure of the subduction zone by analyzing shear-wave splitting of the slab earthquakes. Seismic anisotropy reveals a complex pattern of anisotropy across the subduction zone. S-rays sample mainly the slab, showing variable fast directions and delay times. Comparison of S splitting measurements to P-wave velocity anomaly at 100-200 km depth shows that where the rays primarily sample the slab the delay times are small. In contrast, where S rays sample the mantle wedge, the delay times are quite high. This across-subduction variation of delay time depicts the slab as a weakly anisotropic region relative to the mantle above and below and suggests that the main source of anisotropy in the subduction zone is the deformation of the mantle above and below the slab induced by the retrograde motion of the slab.

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