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Shear wave splitting in southern Tyrrhenian subduction zone (Italy) from CESIS and CAT/SCAN projects

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In the years 2003 -2006 several broad band stations were installed in Southern Italy: 15 permanent ones (CESIS project), improved the INGV Italian national network and 40 temporary ones were installed in the frame of CAT/SCAN NSF project. We present shear wave splitting measurements obtained analyzing SKS phases and local S phases from slab earthquakes. We used the method of Silver & Chan to obtain shear wave splitting parameters: fast direction and delay time. Shear wave splitting measurements reveals strong seismic anisotropy in the mantle beneath Southern Tyrrhenian subduction system. The SKS splitting results show fast polarization directions varying from NNW-SSE in the Southern Apennines to N-S and to NE-SW in Calabria, following the strike of the mountain chain. Moving toward the Adriatic sea the fast directions rotate from N-S to NE-SW. Fast directions could indicate the mantle flow below the slab, due to its retrograde motion but also the lithospheric fabric of the subducting plate. In the Tyrrhenian domain, above the slab, from Sardinia to the Italian and Sicilian coasts the dominant fast direction is E-W and could be related to the opening of the Tyrrhenian basin and to the corner flow in the asthenospheric wedge. In Sicily fast directions depict a ring around the slab edge supporting the existence of a slab tear and of a return flow from the back to the front of the slab. Measurements obtained with intermediate and deep earthquakes slab S phases show an extremely complex pattern of fast directions. They are mostly distributed in front of the Tyrrhenian Calabrian coast in correspondence of the fast velocity anomaly imaged at 150 km depth by tomography. We can relate this fast directions variability to the complex structure of the slab itself. The complex pattern of SKS and S splitting measurements suggests the presence of local scale mantle flow controled by the motion of an anisotropic slab.