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WHAT EARTHQUAKES SAY ABOUT RESIDUAL SUBDUCTION SLAB AND SHALLOW DYNAMICS IN THE CALABRIAN ARC REGION

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The Calabrian Arc region appears to be the only site of residual active subduction in the framework of a larger scale subduction process that has involved the western Mediterranean in the last tens Myrs (Wortel and Spakman, 2000; Faccenna et al., 2004). Although some investigators have suggested that subduction may have definitely ceased over the whole original subduction system, e.g. also in the Calabrian region (see e.g. Monaco et al., 1996), the most recent analyses have concluded that the Ionian subducting slab is still in-depth continuous along a quite short segment of Calabrian Arc (see e.g. Neri et al., 2009, 2012) that also shows according to GPS measurements (e.g. Hollenstein et al. 2003; Devoti et al., 2008; D'Agostino et al., 2011) a residual, very slow trench retreat of ca. 2 mm/yr. By relocation of earthquakes occurring at shallow and intermediate depths from January 1997 to May 2011 we investigate the location of the residual Ionian subducting slab in the Calabrian Arc region. In agreement with high P-wave velocity anomaly found at intermediate depths by previous local earthquake tomography, our shallow-to-intermediate earthquake hypocenter distribution shows that the Ionian subducting slab is still in-depth continuous only in a small internal segment of the Arc (approximately corresponding to southern Calabria), while detachment or break-off processes have already developed elsewhere along the Arc. At the same time, the space distribution and the waveform inversion focal mechanisms of the earthquakes occurring at shallow depth (< 70 km) do not furnish convincing evidence of a Subduction-Trasform Edge Propagator (STEP; Govers and Wortel, 2005) fault activity at the edges of the descending slab. In particular, no trace is found of dip-slip faulting along near vertical planes parallel to the slab edges, e.g. no seismic evidence is available of vertical motion between the subducting segment of the plate and the adjacent portion of it. Also, controversial information comes from the seismicity distribution and mechanisms found at crustal depths near the lateral borders of the overriding plate. Our seismic data together with GPS information available from the literature seem to evidence the close-to-ending state of the subduction process. This is now characterized by a residual, very thin subducting slab showing quasi-nil velocity of trench retreat but it also appears to be still capable of causing strong normal-faulting earthquakes in the trench area through its gravity-induced shallow deformation in a weak-coupling scenario.

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