

Chiarabba C., Piana Agostinetti N., Bianchi I., Giacomuzzi G. - The Southern Tyrrhenian subduction zone: an upgraded view from seismological studies.

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ABSTRACT:

The Southern Tyrrhenian subduction zone: an upgraded view from seismological studies

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The southern Tyrrhenian subduction is known since more than thirty years.

A Benioff plane defined by intermediate depth and deep earthquakes was early proposed in 1970. From the first intuition to the current representation of the Ionian slab subduction several decades were passed and numerous contributions published. In this review, we present our knowledge of the system obtained by integrating earthquakes distributions within the Ionian slab, tomography (Vp, Vs, Qp models) and receiver function (RF) results.

The joint analysis of RF and tomography allow to reconstruct both the elastic properties and the geometry of the components of the subduction zone. The first method clearly delineates the geometry of the shallow structures from the bottom of the Tyrrhenian crust to the upper portion of the downgoing ionian plate. Tomographic models from local earthquakes and teleseismic events show almost consistently the regions of high to low speeds associable to oceanic portion of the slab and to the asthenosphere flowing through tears of the slab.

In particular, RF images clearly depict the discontinuity of the subduction interface between the Southern Apennines and the Calabrian arc, supporting the hypothesis of the segmentation of the Ionian slab during its subduction beneath the Tyrrhenian sea. Such discontinuity can be related to the transition between the oceanic slab, still subducting beneath the southern Calabria, and the continental margin, which entered the subduction trench XX? Myr ago, promoting the slow decrease of the subduction rate in Southern Apennines. Harmonic decomposition of the RF data-set points out both the isotropic and the anisotropic structure of the subducted crust and allow to recognize the different elastic properties of the materials subducted beneath Southern Apennines and the Calabrian Arc. Such differences could be related both to the different origin of the subducted crust (Continental vs Oceanic) and to the different "style" of their metamorphisms.

Our data show that the subduction of the Ionian slab was a rather discontinuous event. The progressive incoming of continental margins and complexity of the oceanic plate account for a complex scenario during which accelerating phase of subduction, back arc opening, slab tearing and detachments took place over the past 16 Myr. Presently the oceanic slab is narrow and restricted to southern Calabria.