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Upper Carboniferous-Permian tectonics in Central Mediterranean: an updated revision

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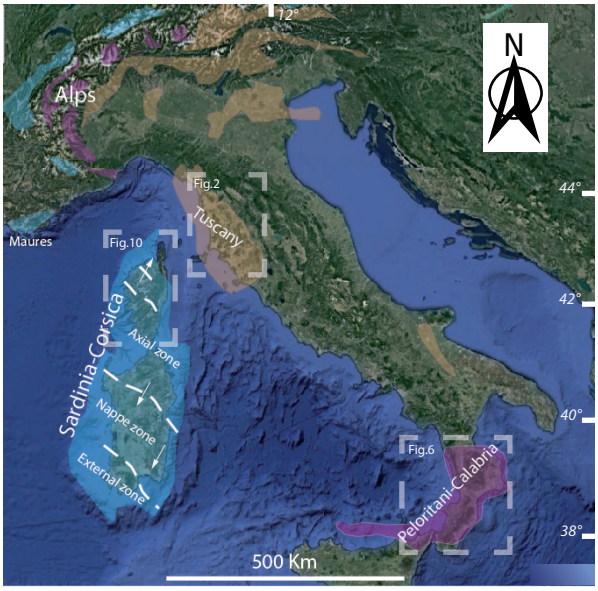
We present an updated revision of the upper Carboniferous-Permian tectonics recorded in Tuscany, Calabria and Corsica.

We show that in Tuscany, upper Carboniferous/Permian shallow-marine to continental sedimentary basins, characterized by unconformities and abrupt changes in sedimentary facies, coal-measures, red fanglomerate deposits and felsic magmatism, fit well a transtensional setting characterized by a mid-crustal shear zone, whose remnants can be found in deep-well log in Pontremoli and Larderello, linked with a system of upper-crustal splay faults

In Calabria (Sila, Serre and Aspromonte), a continuous pre-Mesozoic crustal section is exposed. Here, the lower crust portion of this section, mainly includes granulites and migmatitic paragneisses, together with subordinate marbles and metabasites. The mid-crustal section, up to 13 km-thick, includes granitoids, tonalitic to granitic in composition, emplaced between 306 and 295 Ma. They were progressively deformed during retrograde extensional shearing, with a final magmatic activity, between 295±1 and 277±1 Ma, in which shallower dykes emplaced in a transtensional regime. The section is completed by an upper crustal portion, mainly formed by a Palaeozoic sedimentary succession deformed as a low-grade fold and thrust belt, and locally overlaying medium-grade paragneiss units. As a whole, these features are reminiscent of the external/nappe zone domains of Sardinia Variscan orogen.

In Corsica, besides the well-known effusive and intrusive Permian magmatism of the "autochtonous" domain, the alpine S.Lucia nappe exposes a kilometer-scale portion of the Permian lower to mid-crust, exhibiting many similarities to the Ivrea-Verbano zone. The two distinct Mafic and Leucogranitic complexes characterizing this crustal domain are juxtposed by an oblique-slip shear zone named as the Santa Lucia Shear Zone. Structural and petrological data witness the interaction between magmatism, metamorphism and retrograde shearing during Permian, in the c. 800-400 °C temperature range.



We frame the outlined paleotectonic domains in a regional-scale, strain–partitioned, (Fig2) tectonic setting controlled by first-order transcurrent fault network which includes a westernmost fault (Santa Lucia Fault) and an easternmost one (East Tuscan Fault), with intervening crustal domains affected by extensional to transtensional deformation.

Figure 1: Exposure or shallow subsurface (minor than 6 Km) occurences of pre-Mesozoic cover and basements in Central Mediterranean. The colors in the map are related to their Alpine Tethys framework and respectively referred to the European/Iberian, Briançonnais and AlKaPeCa and Adria domains (Handy et al., 2010). Google image.

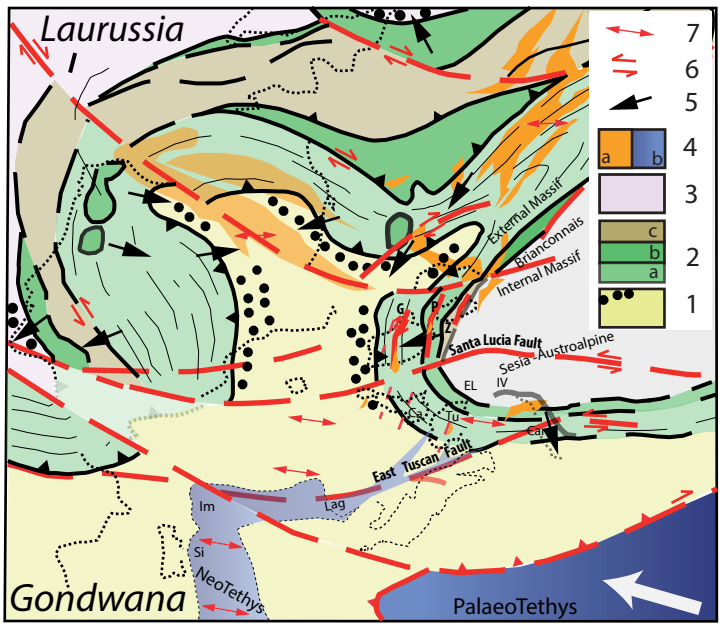


Figure 12: Interpretative configuration of the post-Variscan setting (at c. 270 Ma), based on a modified version of Fig.2 in Matte (2001). The scheme show a possible frame of the Variscan belt of western Europe and north Africa, with the main Upper Carboniferous-Permian regional fault systems and related continental basins (after Burg et al., 1994). The scheme in Matte (2001) is modified taking into account the data and interpretations proposed in our work. The Santa Lucia Fault (whose remnants are documented in the lower to mid-crust shear zone in the alpine S.Lucia nappe), and the East Tuscan Fault (remnants in subsurface of Pontremoli and Larderello deep well) in the Apennines are represented. The East Tuscan Fault is prolonged toward south into the Lagonegro-Imerese-Sicani marine rifted domains (Catalano et al., 1995) westernmost extension of the Permian Neo-Tethys (Zigler, Stampfli, 2001; Stampfli et al., 2002; Garfunkel, 2004; Xyapolis et al. 2006; Schettino and Turco, 2011). 1) Gondwana and Gondwana-derived crust blocks (Apulia and Adria figured); 2) Southern Europe Variscan belt: a) low-grade external and nappe zone dots foreland domains, b) axial zone medium to high grade units, suture/s and Ordovician arcs, c) hinterland and Variscan retrowedge (Armorica, Hun or Brunia terranes); 3) Laurussia-derived blocks of the northern continent; (4) Permian sedimentary basins: a) continental, b) marine; 5); main vergence of the nappes; 6) kinematics of late Paleozoic regional faults; 7) extension direction during Upper Carboniferous-Permian. The possible positions of the Briançonnais, South-Alpine and Austro-Alpine domains are also reported (see also Festa et al., 2018; Ballevre et al., 2018 and references).