



Introduction to the thematic collection ‘Apennines-Tyrrhenian system’

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Thematic collection: This article is part of the ‘Apennines and Tyrrhenian system’ collection available at: <https://www.lyellcollection.org/cc/the-apennines-tyrrhenian-system>

Received 2 October 2019; revised 6 October 2019; accepted 6 October 2019

The geodynamic evolution of the Apennines and Tyrrhenian Sea is the object of controversial interpretations and scientific discussion, with important consequences for the overall tectonic evolution of the Mediterranean area from Tertiary to Recent times. Different interpretations stem from the geological complexity of this region, where recent and still active extensional tectonics strongly overprint previous pre- and syn-orogenic structural features that are connected to the early evolution of the area. In the last decades, contributions towards a better understanding of this subject derived from geophysical, petrologic, geochemical, magmatic, tectonic and sedimentary studies, which addressed the reconstruction of geological processes leading to the pre-, syn- and post-orogenic evolution of the Apennine belt and surrounding areas.

This thematic collection collates papers presenting results from recent research on the evolution and structure of the Apennines that was presented in the thematic session ‘TS 7.13/GD 8.7/GMPV 9.2/SSP 2.16 - The Apennines-Tyrrhenian system: Multidisciplinary contributions to the understanding of the tectonic setting, magmatism and geodynamic evolution’ at the EGU 2018 meeting.

The paper by Spina *et al.* (2019) is aimed at reviewing the paleogeographic setting of the late Palaeozoic sediments, deposited before the opening of the Neo-Tethys Ocean. They highlight how some Palaeozoic units, discontinuously exposed in the inner Northern Apennines (i.e. southern Tuscany) and Tuscan Archipelago (i.e. Elba Island), and attributed to different ages (Pre-carboniferous, Carboniferous or Permian), are all middle and late Permian in age (Guadalupian - Lopingian), showing Gondwana affinity in regards to the sedimentary environments and the provenance of the organic matter. This has significant implications for the provenance of the Tuscan ‘basement’ and paleogeographic reconstruction of the Northern Apennines orogen.

The paper by Pierantoni *et al.* (2019) documents the influence of crustal structure on sedimentation of the Neogene-Quaternary deposits in the external sector of the Northern Apennines, onshore and offshore of the Adriatic sea. They document shallow transpressional structures, which are possibly still active. Their results contribute to a new interpretation of the deformational style of the outer Northern Apennines, underlining the occurrence of relevant transpressional structures, with important implications for the present-day seismotectonic setting.

The paper by Savastano & Piana Agostinetti (2019) illuminates the deep structure of the southern Apennine, at depths greater than 25 km. This consists of a crustal seismic line (CROP04) that

delineates the shape of the lower crust and upper mantle structure. The authors provide support for inactive subduction underneath the southern Apennines, as outlined by the complete eclogitization of the subducted slab and the total regeneration of the Tyrrhenian Moho. In this setting, fluids were able to completely migrate out of the mantle wedge, something never previously observed from other sections of the Apennine subduction.

Finally, the paper by Mantovani *et al.* (2019) is aimed at reviewing the development of the Tyrrhenian Sea and the Apennine chain within the Neogene-Quaternary geodynamic framework of the western Mediterranean. The main result is that the whole geodynamic puzzle of the Tyrrhenian area is mainly controlled by the north-northwestwards motion of Adria, since the Neogene. This produced (and still produces) extrusion wedges that are separated from an almost stable sector (Corsica-Sardinia), therefore generating a series of extensional or transtensional fault systems along the axial part of the Apennines, now corresponding to the main seismogenic sources.

Funding This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author contributions AB: Data curation (Lead), Methodology (Lead), Project administration (Lead), Resources (Lead), Software (Lead), Supervision (Lead), Validation (Lead), Visualization (Lead), Writing - Original Draft (Lead), Writing - Review & Editing (Lead); GP: Conceptualization (Supporting), Investigation (Supporting), Methodology (Supporting), Project administration (Supporting), Resources (Supporting), Software (Supporting), Supervision (Supporting), Validation (Supporting), Visualization (Supporting), Writing - Original Draft (Supporting), Writing - Review & Editing (Supporting).

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