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Spatial-temporal migration of the central-southern Apennine belt and foreland basin system (Italy) constrained by Sr-isotope stratigraphy

Monia Sabbatino[1], Stefano Tavani[1], Stefano Vitale[1], Amerigo Corradetti[2], Lorenzo Consorti[3], and Mariano Parente[1]

[1]University of Naples Federico II, Department of Earth, Environmental and Resources Sciences, Napoli, Italy (monia.sabbatino@unina.it)

[2]Texas A&M University at Qatar, Department of Petroleum Engineering, Doha, Qatar

[3]University of Trieste, Department of Mathematics and Geosciences, Trieste, Italy

The Apennines form an active fold and thrust belt that develops as part of the W-Mediterranean subduction zone. The evolution of the collisional system is driven by the retreating subduction of the alpine Tethys, which has caused the migration of compressive fronts and the opening of the Liguro-Provençal and Tyrrhenian back-arc basins, along with the rotation and translation of the Sardinia-Corsica and Calabria blocks. The Apennines make the northern limb of the Apennines-Calabria-Sicily orocline, developed due to the differential SE-ward retreat of the subduction system. In such a context, the central-southern Apennine system develops a foreland basin floored by a subaerial forebulge unconformity followed by a trinity of diachronous lithostratigraphic units: (i) shallow-water carbonates, (ii) hemipelagic marls, and (iii) siliciclastic turbidites. Previous studies have used the following datasets for reconstructing the evolution of the orogenic-foreland basin system: paleomagnetic data; the age of the siliciclastic syn-orogenic deposits filling the foredeep and wedge-top depozones; the age of the late-orogenic extensional basins. In this study, we highlight the importance of dating with high precision the onset of the Apennine orogenesis by means of Sr-isotope stratigraphy applied to the first carbonate sediments overlying the forebulge unconformity. In this regard, we have investigated a transect of the Apennine belt, extending from inner to outer sectors, in order to constrain the timing and style of migration of the belt and foreland basin. Our results show progressive rejuvenation of the forebulge unconformity toward the outer portions of the belt. More importantly, we highlight a time delay between the onset of syn-orogenic shallow-water carbonate deposition and the onset of siliciclastic turbidite deposition that ranges between 1 and 11 myr. In detail, the trends in the delay point at three main evolutive steps: 1) rapid evolution from forebulge to foredeep during the Burdigalian, 2) higher delays from the Serravallian until the latest Miocene, and 3) progressive decrease of the delay from the Zanclean. We associate the different velocity of migration with the differential slab retreat and spreading of the back-arc basins.