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Eocene to Oligocene upper plate tectonic response to Apennine subduction

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Phases and patterns of uplift and subsidence characterise the tectonic evolution over subduction zones at the Myr time scale. The dynamics of the subducting plate influences upper plate deformation at crustal level. Crustal deformation, in turn, causes vertical motion through isostatic response of thinned or thickened crust. Consequently, the influence of mantle-driven processes needs to be discriminated from the influence of more local isostatic adjustment.

In this work we investigate the upper plate tectonic response to changing subduction dynamics in the western Mediterranean from Mid Eocene to end Oligocene. The surface effects of the push-to-pull mode switch of the subduction system are shown on palinspastically restored paleogeographic maps. Regional distribution of uplift and subsidence and compression-extension at the Apennine-Alps-Pyrenees intersection are integrated in a plate kinematic framework using the free software GPlates. A new restoration at crustal scale of the Corsica-Sardinian block from Eocene to present is proposed using published geophysical and geological data, onshore and offshore. The main result is that the Corsica-Sardinia block needs to be divided in three blocks to restore the crustal thickness to 30 km at 35 Ma. The position of these blocks during the Pyrenean orogeny is then clarified. New structural and stratigraphic data from Sardinia, coupled with available thermochronological data from basement and Tertiary sediments are in agreement with this restoration and shed light on the Eocene to Oligocene poorly constrained period for Sardinia. The rheological role of Triassic layers during compression and extension, the onset of the Pyrenean foreland subsidence at Lower Eocene and the Late Eocene-Oligocene stratigraphic response to the onset of back-arc extension are elucidated with field data.

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