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The mode of rifting of the Tyrrhenian Sea

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The back-arc evolution of the Tyrrhenian Sea has mainly been attributed to the roll-back towards the south-east of the subducting Ionian plate that could have provided the bulk of the space required for this extension. The Tyrrhenian Sea is a triangular basin characterized by two large bathyal basins (Vavilov and Marsili basins) that are covered by some hundred meters of sediments, and a number of peri- Tyrrhenian basins filled by thousands of meters of clastic and/or volcaniclastic sediments. The stratigraphic record of these basins offers an opportunity to study the timing and kinematics of the basin-forming faults that are relevant for the creation of a model on the opening of the Tyrrhenian Sea.

Basin analysis was performed using interpretation of seismic reflection profiles and well logs. The interpretation of these data was made using seismic and sequence stratigraphy and structural geology in a GIS-dedicated environment. The sequence stratigraphy interpretation of the deepest wells were performed using discontinuities and trends in wireline log pattern. Systems tracts and transgressive-regressive cycles were identified in well log succession and seismic profiles. The sequence stratigraphy approach allows the identification of 4th-order depositional sequences (100 ka). The geologic evolution, in terms of age of basin formation, style of deformation, timing of activity of the fault bounding basins, tectonic subsidence, post-rift infill and volcanic activity, was analyzed for several peri-Tyrrhenian basins.

The study reconstructed the three-dimensional architecture of the peri-Tyrrhenian basins and illustrated the link between the bathyal basin and the Tyrrhenian margin.

We document that during the evolution of the Tyrrhenian region several basins opened contemporaneously with different direction of extension and a progressive change in rifting direction occurred along the Campania Margin. The mode of rifting of the Tyrrhenian Sea was characterized by different styles of the extensional basins and detachment faulting. Taking into account the published geological data, we propose a kinematic evolution of the Tyrrhenian basin over the last 12 Ma.