

Investigating Holocene relative sea-level changes and coastal dynamics in the mid-Tyrrhenian coast, Italy: An interdisciplinary study

Summary

Understanding millennial changes in relative sea level (RSL) and coastal responses in stable regions is crucial for deciphering the intricate relationship between natural dynamics and human adaptation. This interdisciplinary study explores the interplay between mid-to-Late Holocene sea-level fluctuations and tectonic along the mid- Tyrrhenian coast.

The study area, located between the Fondi and Garigliano coastal plains, held great significance in ancient times. In particular, the strategic role of Formia, a monitoring point for the Tyrrhenian Sea, made this city one of the most important commercial hub during Roman occupation, leading to a significant urbanization of the coastal stretch testified by well-preserved remains nowadays scattered along the submerged or semi-submerged coastal sectors.

This study reconstructs the mid-to-Late Holocene morpho-evolution and RSL changes in the study area by creating a geodatabase made of 52 sea-level markers (SLMs) derived from direct geoarchaeological measurements, stratigraphic and palaeoecological interpretations of new borehole data, and previously published stratigraphic data. Specifically, the radiocarbon dating of three peat samples provided new data ranging between 7.62 ± 47 and 1.00 ± 51 ka BP on the sea level history in the area. Based on our dataset, between 9.0 and 8.0 ka BP, the sea level rose from -19 m to -6.5 m at a rate of about 15.6 mm/y, slowing to 0.8 mm/y afterwards, stabilizing at its current position. Results suggest that during the 1st century BC, local sea level was no higher than -0.55 ± 0.29 m.

The collected RSL data support the hypothesis of tectonic stability of this sector during the last 2.0 ka, testified by the position of the SLMs in accordance with the glacio-hydro-isostatic adjustment (GIA) models and supported by the determination of average vertical ground movement rates of -0.017 ± 0.23 mm/y.

Finally, in terms of coastal changes the overlay between new data from geoarchaeological surveys, reinterpretation of previously-published stratigraphic data, and geomorphological analysis allowed us to deduce a general coastal progradation trend in the historical time for both low-lying and rocky sectors, due to natural and anthropogenic forcing factors.

How to cite and download publication:

Caporizzo, C., Gionta, A., Mattei, G., Vacchi, M., Aiello, G., Barra, D., ... & Aucelli, P. P. C. (2024). Investigating Holocene relative sea-level changes and coastal dynamics in the mid-Tyrrhenian coast, Italy: An interdisciplinary study. *Quaternary International*, 710, 49-65.

DOI: <https://doi.org/10.1016/j.quaint.2024.08.009>