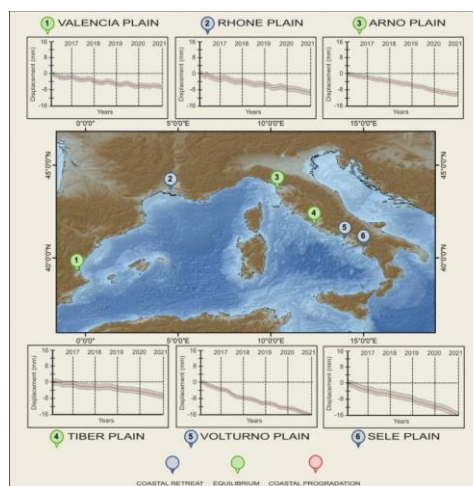


Past coastal evolution indicates low resilience of Mediterranean coastal plains to ongoing climate change

Summary

Global sea-level rise represents one of the most evident impacts of anthropogenic climate change. It is expected to trigger widespread environmental changes, such as major coastal erosion and progressive inundation of large portions of low-elevated coastal zones. Such impacts will be of remarkable importance in the most vulnerable coastal areas, such as large alluvial plains. However, is it possible to define a common response for this type of coastal environment to climate change? Furthermore, what are the drivers that mostly control their evolution? We evaluate the potential resilience of six major western Mediterranean coastal plains to future Relative Sea-Level Rise (RSLR— i.e., sea-level variation due to the combined effect of eustatic sea-level rise and local subsidence) by examining the Holocene coastal response to past sea-level variations. In each investigated coastal plain, we statistically reconstruct the past variability in the sea-level rise rates and analyze the geomorphic response (i.e., retreat, stability, or progradation) of the coastline to these changes. Then, we compare these data with the local RSLR rates expected for the next decades (up to the year 2100), calculated considering sea-level projections under three different climate scenarios (i.e., SSP2-4.5, SSP3-7, SSP5-8.5) and corrected for the local coastal subsidence trends characterizing each coastal plain. This allows us to predict the potential morphodynamic response of each plain to future RSLR by applying a newly developed coastal plain sensitivity index (CPSI), integrating the past and recent coastal trends. Results indicate that only under the SSP2-4.5 scenario, a low probability (< 13%) of natural resilience (intended as shoreline in equilibrium/stable shoreline) is observed. Under all the other scenarios, the investigated coastal plains are destined for an irreversible retreat trend.



How to cite and download publication:

Mattei, G., Vacchi, M., Rizzo, A., & Aucelli, P. P. C. (2025). Past coastal evolution indicates low resilience of Mediterranean coastal plains to ongoing climate change. *Climatic Change*, 178(9), 161.

DOI: <https://doi.org/10.1007/s10584-025-03985-6>