**Understanding sea-level trend variability in the Mediterranean Sea**

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The growing concern about climate change has raised attention on extreme events, including coastal erosion and flooding. Coastal communities and assets worldwide are increasingly threatened by damages, loss of land, and lives. Rising sea level contributes critically to this issue by modifying the base level, causing coastal processes, such as storm surges, to act at higher levels. Although sea-level rise has been slow but persistent over the last century and appears inexorable in the coming centuries, it exhibits complex variability in both space and time. This variability results from changes in several processes, recorded in time series as the integrated response of the sea surface to these modifications. Consequently, sea level observations, typically retrieved from satellite altimetry and tide gauges, can significantly differ across various regions worldwide, or even at sub-basin or local scales, as the processes governing sea level evolution are inherently variable in space.

These aspects are reflected in the Mediterranean Sea, where sea level can vary significantly compared to both the global ocean and the nearby Atlantic Ocean due to the geographical, climatic, and oceanographic conditions of the basin. Indeed, unlike the average global situation, the strong evaporative conditions within the Mediterranean basin lead to both a reduction in sea level rise due to a decrease in water mass and an increase in salinity, which results in an increase in density and a related sea level fall. The latter counterbalances the ongoing thermosteric expansion of seawater linked to global warming, which is otherwise dominant on a global scale. Moreover, oceanographic features within the Mediterranean contribute to variations in sea-level trends at the sub-basin to local scales. In some circumstances, however, a local variation can also propagate sea-level changes to adjacent sub-basins.

Despite the overall rising trend, albeit with smaller magnitude than the global scale, sea-level trends within the Mediterranean sub-basins exhibit distinct nonlinearity and specific inflections. Changes in trends can differ across sub-basins in terms of magnitude and polarity, but interestingly, they are generally coherent in terms of timing, suggesting a shared, common trigger. One hypothesis attributes these changes to the influence of the North Ionian Gyre (NIG), an oceanographic feature in the central Mediterranean. The NIG cyclically reverses its polarity on a quasi-decadal scale, from cyclonic to anticyclonic states and vice versa, leading to changes in thermohaline properties and water mass redistribution across surrounding sub-basins. Indeed, observed inflections in sea-level trends match the timing of known NIG reversals, which are also coherent with major changes in seawater temperature and salinity trends. Thus, the shifts in NIG states may be among the dominant drivers of non-stationarity in sea-level trends within large portions of the Mediterranean Sea, a signal inevitably recorded in sea level time series spanning decades or even centuries.