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Sea-level change along the South American Atlantic coastline

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In comparison with the number of tide gauges measuring in-situ sea-level change along the Northern Hermisphere coastlines, the Southern Hemisphere has a poor spatial distribution of stations. For example, along the South American Atlantic coastline, only 12 tide gauges are registered at the Permanent Service for Mean Sea-level (PSMSL), of which only two have been updated in the last three years. While satellite altimetry can be used to provide data in locations where there is no in-situ data, estimating coastal sea-level change using altimetry data is challenging due to the distortion of the satellite signal close to the land. Consequently, sea-level change along the South American Atlantic coastline is still poorly understood. Here, we fill this gap by using coastal altimetry products together with a new network of tide gauges deployed along the coast of Brazil (by the SIMCosta project). Via a sea-level budget analysis, we look at the regional drivers of sea-level change along the coast.

Recently, a large effort has been put towards developing algorithms that improve the accuracy of standard radar altimetry in coastal regions. Here, we compare both a coastal altimetry product (XTRACT/ALES) and a standard altimetry product (from CMEMS) to the local tide gauges. Previous studies have shown that, for some regions, coastal sea level is driven by open ocean sea-level change (e.g., Dangendorf et al, 2021). Following this approach, we use clusters of coherent sea-level variability (Camargo et al., 2022), extracted with a network detection algorithm (delta-Maps), that extend to the open ocean, as proxies of the drivers of sea-level change along the coast. The northern part of the study region, covering the Amazon Plateau, has a good match between the coastal altimetry-observed sea-level change and the sum of the drivers. The sum of the drivers and coastal altimetry trends also match, considering the uncertainty bars, for the most southern part, covering the Patagonian Shelf. For the other regions, we find a large difference between the coastal altimetry-observed sea-level change and the sum of the drivers. Thus, it is possible that these regions cover large-scale features, which are not strongly correlated with coastal sea level.

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