

Context and Objectives

The new improved satellite altimetry-based products of coastal sea level, in particular along the coasts of Western Africa are essentially based on a dedicated reprocessing of altimetry data of the Jason -1, -2 and -3 missions to extract the relevant information close to the coast. Along the coasts of Western Africa, the sea level trends (over a 15-year long period) are significantly different within 5 km from the coast than open ocean sea level trends, with at some locations, rates of sea-level rise more than twice open ocean rates. Up to now, the processes causing such large trends are not yet well understood. My task was to investigate the causes of the observed sea level trends in the Western African region using some available observations from the LEGOS as well as Copernicus - Marine environment monitoring service (CMEMS) products

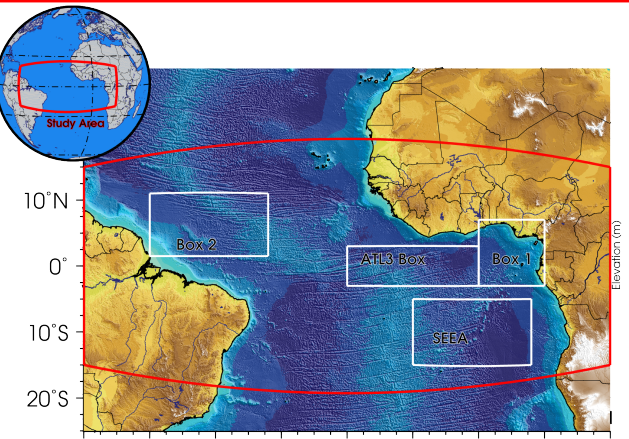


Figure 1: Study area for the analysis on interannual sea level variations in the tropical Atlantic Ocean. The main study area encompasses the entire tropical Atlantic between 15°S-15°N

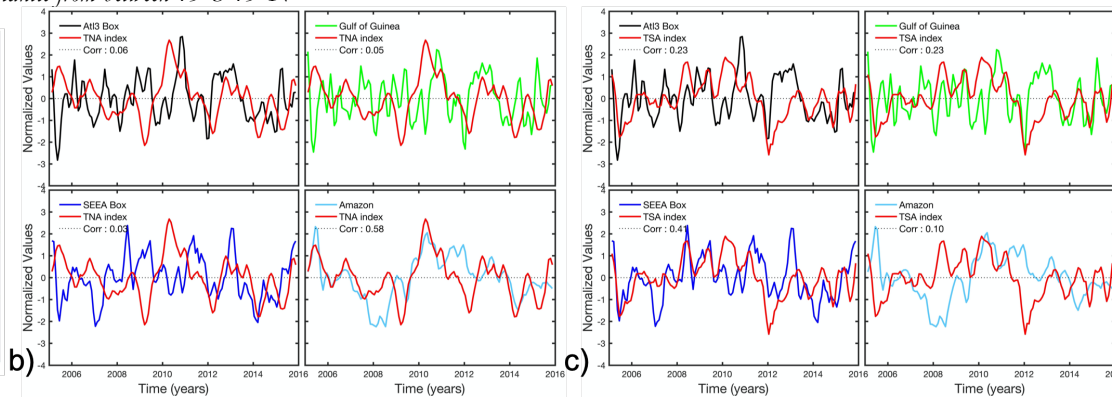
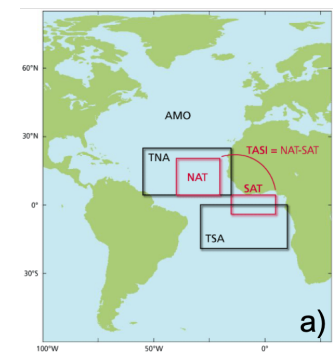


Figure 4: a) Overview on box areas used for the definition of Atlantic climate variability modes (<https://stateoftheocean.osmc.noaa.gov/sur/atll/>). The time series for the climate modes have been downloaded from <https://stateoftheocean.osmc.noaa.gov/>. AMO stands for Atlantic Multidecadal Oscillation, TNA stands for Tropical Northern Atlantic Index, TSA stands for Tropical Southern Atlantic Index, NAT stands for North Atlantic Tropical, SAT stands for South Atlantic Tropical, TASI stands for Tropical Atlantic South Index. b) Area averaged time series of sea level from remote sensing as compared to two climate modes, i.e. TNA and c) TSA.

Results

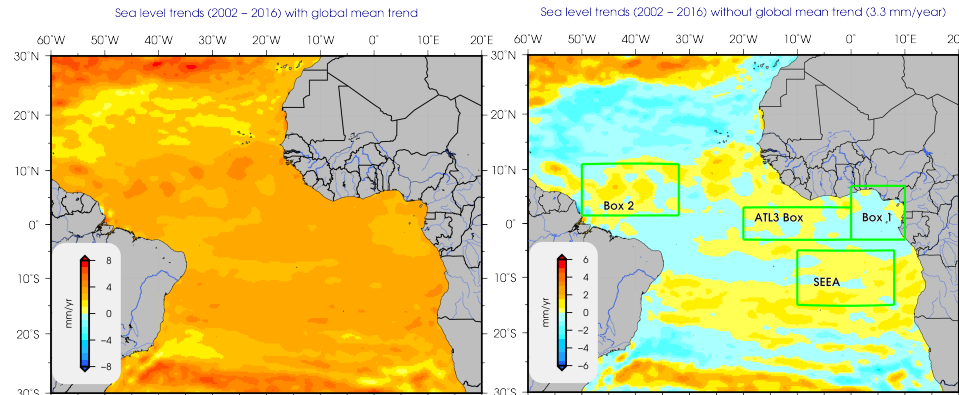


Figure 2: (a) Map of TASL trend over 2005–2015. (b) Map of Tropical Atlantic sea level trend over 2005 - 2015 with the global mean trend of 3.3 mm/yr removed.

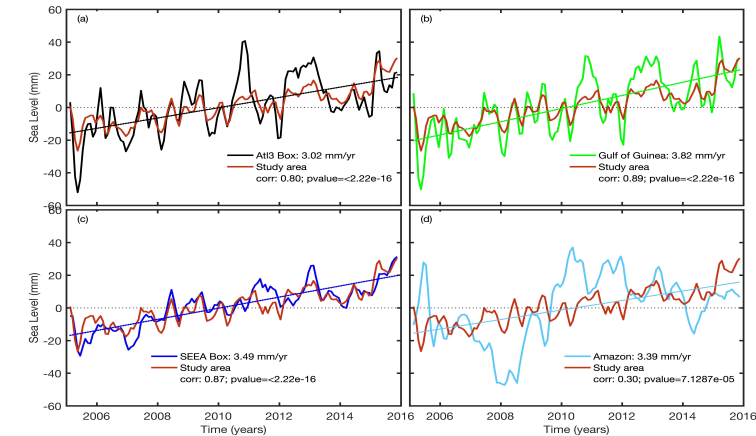


Figure 3: Tropical Atlantic sea level trends correlation between a) Atl3, b) Gulf of Guinea, c) SEEA and d) Amazon boxes (2005 – 2015)

Conclusion

Among the physical mechanisms able to explain the coastal trend increase in the study region, we have investigated the different components of the sea-level trends variations both in term of local (in boxes) variability and regional mean over the recent years (2005 - 2016). A slight increase of sea level has been observed in the Atl3 (3.02 mm/yr), the Gulf of Guinea (3.82 mm/yr), and the SEEA (3.49 mm/yr) regions with an overall sea level trend in the tropical Atlantic is 2.95 mm/year. Without a representative slope (positive or negative), the Amazon basin has a trend of 3.39 mm/yr, thus highlighting a possible air-sea related to a basin-wide mode, mainly the Atlantic Nino mode and suggesting, therefore, the impact of the Amazon, which also plays a role in the western part of the basin. This observation seems to be contradictory in both cases, but in one case (the east), we have an increase in density, and in the west, we have a compensation of density.

References

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