

## Sea level evaluation in northern Australian coast

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Sea surface heights (SSH) are observed by satellite ocean altimetry, and it changes by two major causes. They are barystatic changes e.g. inflow of melt water from land ice, and thermal expansion of sea water, and they can be observed by GRACE and Argo floats, respectively. The three quantities behave differently from region to region, and their mutual link is important to understand regional characteristic of oceans. Here we study sea level changes in northern Australian coast (consisting of the Arafura, Timor, and Solomon Seas and the Gulf of Carpentaria). This region is characterized by large seasonal changes in SSH and gravity, and influenced by multiple climate changes such as ENSO (El Nino and Southern Oscillation) and IOD (Indian Ocean Dipole). First, we compare three changes (altimetric, thermosteric and gravity) to evaluate sea level budget. We found that SSH changes mainly come from steric changes excluding Gulf of Carpentaria where barystatic changes prevail. Next, we use the Empirical Orthogonal Functions (EOF) approach to identify the major modes of the seasonal and interannual variability. Seasonal changes in SSH are strong in Gulf of Carpentaria. The 1<sup>st</sup> EOF of gravity indicates that main seasonal change occur in phase in the land and the sea. We also found that long-term precipitation variability appears as the 2nd EOF. The EOF analysis further showed that non-seasonal altimetric and gravity changes are driven mainly by climate changes, mainly ENSO in SSH and PDO in gravity.

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