



## **The contribution of internal climate variability and anthropogenic forcing to Pacific Ocean regional sea level variability over altimetry era and 21st century.**

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From recently published studies, it is not yet clear whether the sea level spatial trend patterns of the Pacific Ocean observed by satellite altimetry over 20 years are mostly due to internal climate variability or if some anthropogenic fingerprint is already detectable. A number of recent studies have shown that the removal of the signal corresponding to the Pacific Decadal Oscillation (PDO)/ Interdecadal Pacific Oscillation (IPO) from the observed altimetry sea level data over 1993-2010/12 results in some significant residual trend pattern in the western tropical Pacific. It has thus been suggested that the PDO/IPO-related internal climate variability alone cannot account for all of the observed trend patterns in the western tropical Pacific and that the residual signal could be the fingerprint of the anthropogenic forcing. In this study, we investigate if there is any other internal climate variability signal still present in the residual trend pattern after the removal of IPO contribution. We show that subtraction of the IPO contribution to sea level trends does not totally remove the internal variability, leaving significant non-linear internal climatic modes like El Niño Southern Oscillation (ENSO). In addition, by making use of 21 CMIP5 coupled climate models, we study the contribution of anthropogenic forcing and internal climate variability to the Pacific Ocean regional sea level variability over 1993- 2012, and show that the anthropogenic sea level fingerprint in the tropical Pacific is yet not detectable. Over the 21st century, the anthropogenic signal does not dominate the internal variability in the tropical Pacific.