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On how climate variability influences regional sea level change

Sandra-Esther Brunnabend, Jürgen Kusche, Roelof Rietbroek, and Ehsan Forootan
University of Bonn, IGG, APMG, Bonn, Germany (brunnabend@geod.uni-bonn.de)

Regional trends in sea level change are strongly influenced by climate variations, such as ENSO (El-Nino Southern Oscillation), the IOD (Indian Ocean Dipole), or the PDO (Pacific Decadal Oscillation). Hence, before computing long term regional sea level change, these sea level variations need to be taken into account as they lead to strong dependencies of computed regional sea level trends on the time period of the investigation.
In this study, sea level change during the years 1993 to 2013 is analysed to identify the dominant modes of sea level change caused by climate variations. Here, two different gridded altimetry products are analysed, namely ESA's combined CCI SeaLevel v1.1 ECV product (doi: 10.5270/esa-sea_level_cci-1993_2013-v_1.1-201412), and absolute dynamic topography produced by Ssalto/Duacs and distributed by Aviso, with support from Cnes (http://www.aviso.altimetry.fr/duacs/). Reconstructions using the different decomposition techniques including the standard principle component analysis (PCA), rotated empirical orthogonal functions (REOF) and independent component analysis (ICA) method are analysed. They are compared with sea level change modelled with the global finite-element sea-ice ocean model (FESOM).
The results indicate that from the applied methods, ICA is most suitable to separate the individual climate variability signals in independent modes of sea level change. This especially holds for extracting the ENSO contribution in sea level changes, which was better separated by applying ICA, from both altimetry and modelled sea level products. In addition, it is presented how modelled sea level change reflects climate variations compared to that identified in the altimetry products.