

Accurate Estimation of Regional Sea Level Changes with the ESA CCI Sea Level Essential Climate Variable

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Accurate monitoring of the sea level is required to better understand its variability and changes. In particular, this is of crucial importance in coastal zones regarding the societal impact of climate change in these regions. Sea level is one of the Essential Climate Variables (ECV) selected in the frame of the ESA Climate Change Initiative (CCI) program. It aims at providing a long-term homogeneous and accurate sea level record at global and regional scales. The needs and feedback of the climate research community have been collected so that the development of the products is adapted to the users. The range of applications of the dataset covers the analysis of the global and regional sea level changes, from the periodic and inter-annual signals to the long-term evolution.

A fully reprocessed time series of monthly sea level maps has been produced in 2016 and is now available for the users (see <http://www.esa-sealevel-cci.org/products>). About 70 cumulated years of satellite altimetry data from 9 different missions (TOPEX/Poseidon, Jason-1/2, ERS-1/2, Envisat, Geosat-FO, CryoSat-2 and SARAL/AltiKa) have been reprocessed and the dataset covers the period 1993-2015. Within the project, the 15-partner consortium has focused on the development, validation and selection of the best algorithms that contribute to increase the ECV homogeneity and reduce the errors. Among the selected algorithms, some have led to improved sea level estimation in coastal regions. These are the GPD+ wet troposphere correction (based on radiometer and GNSS measurements including inter calibration with respect to external sensors) and the new ocean tide model FES14. Other global algorithms also contribute to the improved quality of the time series such as the orbit solutions (POE-E and GFZ15), the ERA-Interim based atmospheric corrections and the Mean Sea Surface (MSS DTU15). In addition, a dedicated study has led to improved retracking of the altimeter radar echoes in coastal areas (2D waveform retracker) and specific validation activities have been carried out in these regions with in-situ and geodetic data, partly focusing on the estimation of the total relative sea level.

The presentation will focus on the description of the new Sea Level record and the impacts of the different altimeter standards. The associated uncertainties have been characterized at different spatial scales (global, regional, mesoscale) and temporal scales (long-term, inter-annual, periodic signals). The perspectives on improvement of the sea level estimation in coastal zones will be also highlighted.

Keywords: Sea Level, Climate Change, Coastal Regions, Altimetry, Essential Climate Variable