Abstract for OSTST2015

Impact of loss of the 35-day repeat tracks on estimates of the mean sea level evolution

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The 18-year time series of altimetry on the ERS-1/2 and Envisat 35-day orbit repeat tracks were discontinued in October 2010 when Envisat orbit changed into a 30-day repeat cycle. 18 months later, on 8th April 2012, Envisat ceased operations. This investigation, carried out within the ESA Sea Level Climate Change Initative (SL_cci), addresses the impact of the loss of sea surface height (SSH) measurements on the 35-day tracks with respect to the mean sea level (MSL) Essential Climate Variables (ECV) indicators. The ECV indicators that we explored are the trend and the annual and semiannual signals for MSL on both global and regional scales. SL_cci ECV indicators have been compared with different resampling satellite tracks scenarios using the TOPEX-Jason-1/2 (10-day) and 35-day orbits. To reproduce the real scenario, after the missing data period between November 2010 to February 2013 (28 months) the 35-day orbits have been reinstated to coincide with the start of the sampling by the AltiKa mission in March 2013.

In detail, we assessed the impact of the temporal gap in the 35-day orbit by flying a satellite along the 10-day reference mission and 35-day tracks, over real altimetric gridded SSH anomaly field for the period between 1993 and 2013, to obtain the SSH observations. The input fields were the daily gridded 'two-satellite' SSH anomalies (SSHA) from Aviso. Four monthly-gridded SSHA datasets with a spatial resolution of 1° were created corresponding to the following scenarios:

1) Resampled along 10-day orbital track only.
2) Resampled along 35-day orbital track only.
3) Resampled along 10-day + 35-day orbital tracks
4) Resampled along 10-day and 35-day orbital tracks, with the 35-day orbits missing for the period between November 2010 and February 2013.

The first three scenarios were designed to provide a validation check and to assess the sensitivity of the ECV indicators with respect to the SL_cci ECVs indicators. The results show no statistically significant impact of the missing 35-day data (i.e. Nov 2010 to Feb 2013) on the global and regional ECV indicators and therefore the impact of the loss of data are minimal. However the 35-day mission remain most useful as it's the only one that allows to study the regional trends in the polar regions.

Finally we report the results of a sensitivity study to estimate to what extent does the sea level trend need to increase within the polar region (where only the 35-day orbit observations are available) in order for the global trend to be statistically different at the 95 % confident interval.