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Improved wet tropospheric corrections for eight altimetric missions

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In the scope of the ESA Climate Change Initiative (CCI) Sea Level project, a set of improved wet tropospheric corrections (WTC) is being derived for the eight main altimetric missions used in the computations of the sea level CCI products: TOPEX/Poseidon, Jason-1, Jason-2, ERS-1, ERS-2, Envisat, CryoSat-2 and SARAL AltiKa . The methodologies adopted in the WTC estimations have their roots in the GNSS-derived path delay (GPD) algorithm developed in the scope of the COASTALT and CCI projects and on the Data Combination (DComb) algorithm, developed in the scope of the CryoSat Plus for Oceans project. Both algorithms estimate the WTC by means of data combination, through objective analysis, of selected data sets: valid measurements from the microwave radiometer (MWR) on board each altimetric mission, wet path delays derived from Global Navigation Satellite Systems (GNSS) coastal stations, and those derived from an atmospheric model. The Dcomb algorithm is an upgrade of the GPD, allowing the incorporation of wet path delays from scanning imaging radiometers (SI-MWR), thus making possible the computation of improved WTC for missions such as CryoSat-2 which does not carry an on-board radiometer. According to pre-defined criteria, the algorithms estimate the WTC for all satellite track points or just for those on which the MWR WTC has been considered invalid. The cause for invalidity can be land, ice or rain contamination or instrument mal-function.

In phase 2 of the CCI project it is aimed to obtain homogenous WTC data sets for the eight altimetric missions using the above methodologies, with emphasis on the long-term stability of the corrections, in view to meet the Global Climate Observing System (GCOS) requirements of estimating the corrections with a trend uncertainty of less then 0.3mm/year.

This paper gives an overview of the GPD/DComb implementations for these eight altimetric missions. For each mission, whenever available, the state-of-the art correction from the onboard MWR has been used and the criteria for detecting the points at which the WTC is to be estimated have been revisited.

The WTC products have been validated by comparison with other wet tropospheric corrections, such as the base MWR WTC, the so-called composite (AVISO reference) correction and those from atmospheric models, by sea level anomaly (SLA) variance analysis both along-track and at crossovers, function of distance from the coast and function of latitude. The highlights of these results are presented and discussed. Future work will be focused on the long-term stability control of the corrections.