On the analysis and inter-calibration of wet path delay datasets for the computation of the wet tropospheric correction for CryoSat-2 over ocean

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The loss of Envisat in April 2012 increased the use of CryoSat-2 (CS-2) data for applications beyond the primary objectives of the mission, including studies over oceans. Since CS-2 does not carry an onboard microwave radiometer (MWR), the wet tropospheric correction (WTC is a model-based one, currently provided by the European Centre for Medium-Range Weather Forecasts (ECMWF). Due to its high spatial and temporal variability, the WTC is still one of the major error sources in satellite altimetry, thus driving a need to develop an improved wet path delay correction for CS-2, particularly important for ocean applications.

In the scope of the CryoSat Plus for Oceans (CP4O) project, funded by the European Space Agency, a data combination (DComb) algorithm is being developed, based on the objective analysis of all available data sources (e.g. from MWR on board remote sensing (RS) satellites, Global Navigation Satellite Systems (GNSS) and the ECMWF ReAnalysis (ERA) Interim model). The scope of this study is the analysis and inter-calibration of all available datasets for the computation of the wet path delay of altimeter measurements over ocean, in preparation for their use in the DComb algorithm.

Two main data types are analysed: wet path delays derived from water vapour products of scanning microwave radiometers of various sensors (e.g. AMSU-A, SSMI/S, AMSR-E and TMI) on board over ten different RS missions and GNSS-derived path delays from coastal and island stations. Except for TMI, all MWR imaging sensors are on board near-polar sun-synchronous satellites possessing different local times of the ascending node (LTAN), thus allowing an almost uniform data coverage throughout the day. Since CS-2 orbit is not sun-synchronous, the number of MWR images available for the WTC computation (within pre-defined time and space interval around the CS-2 ground track point) will vary throughout the satellite repeat cycle (369-days); for most cases, 2 to 4 images are available at mid-latitudes, these numbers increasing with latitude. All MWR are inter-calibrated with respect to the Advanced Microwave Radiometer (AMR) on board Jason-2, using the recent Geophysical Data Records version D (GDR-D) and the ERA Interim model. Special attention is given to the identification and removal of ice and land contaminated pixels in the MWR images.

The GNSS-derived path delays shall play a major role in the coastal zones, of particular relevance for the exploitation of CryoSat-2 Synthetic Aperture Radar (SAR) measurement mode in these regions. A brief summary of the major steps involved in the processing of these data to derive wet path delays for coastal altimetry will also be presented.