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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 use of CryoSat-2 (CS-2) data for applications beyond the primary objectives of the mission, including studies over oceans, gained importance after the loss of Envisat in April 2012. Since CS-2 does not carry an onboard microwave radiometer (MWR), the wet tropospheric correction (WTC) is a model-based one, 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, of particular importance for ocean applications.
In the scope of the CryoSat Plus for Oceans (CP4O) project, encouraged 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.
The following 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, TMI and WindSat) aboard over ten different remote sensing 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 domains centred at each CS-2 measurement) will vary throughout the satellite repeat cycle (369-days); it will be shown that, 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.
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. The comparison between ERA Interim and the GNSS-derived wet path delays, at each GNSS station, will also be presented.