CP4O

CryoSat Plus for Oceans

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WP4000 - Technical Note on the Wet tropospheric Correction for CryoSat-2 over ocean

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Abbreviations and Acronyms

DComb	Data Combination (algorithm)
ECMWF	European Centre for Medium-Range Weather Forecasts
ESA	European Space Agency
LRM	Low Resolution Mode
MWR	Microwave Radiometer
RADS	Radar Altimeter Database System
SAR	Synthetic Aperture Radar
SI-MWR	Scanning Imaging MWR
U.Porto	University of Porto
WTC	wet tropospheric correction

1. Scope of the document

This document presents a brief description of the wet tropospheric correction (WTC) products computed by UPorto in the scope of the CP4O project, WP4000, using the Data Combination (DComb) algorithm.

2. Description of the products

Two sets of files are provided. Each set contains the WTC for Cryosat-2 sub- cycles 29 and 30 (July 2012) and sub- cycles 36 an 37 (January 2013).

Dataset 1 – Computed for CRyoSat-2 data points available in RADS. This includes all ocean points (Surface type=0) and the land points closest to the coast, up to a distance from coast of 50km. This includes all LRM data and most of SAR mode data.

Dataset 2 – Computed for files provided by ESA, containing points for all surface types and all instrument modes.

All fields contained in Dataset 1, except for those related with the DComb WTC, were extracted from RADS.

ESA files contained only time, latitude, longitude, surface type and instrument mode. These files had to be processed using the following steps:

- The sub-cycle and pass numbers according to RADS convention were introduced. These are required to run the DComb algorithm
- The WTC from ECMWF operational model grids at 0.125°x0.125°spacing and 6 h time interval was interpolated for the time and location of each measurement
- Duplicated points were removed
- Only 1-Hz points were extracted (those for which the surface type and instrument mode were defined).

All files are provided at 1-Hz.

The reason for providing the two datasets is the fact that the RADS dataset is easier to handle due to the points discussed below. Regarding the points for the LRM and SAR modes, the two datasets contain approximately the same points, although with different time and locations. The ESA dataset contains points for a few SAR mode regions which are not present in RADS, but there is also a very small number of track portions present in RADS which are not present in the ESA files.

The time interval between consecutive points in the ESA files is not constant. It can vary from 0.88 s to 0.94 s while in RADS the time interval is always ~0.94 s. To match the two data sets the time difference between TAI and UTC must be accounted for. Due to the fact that the time interval between the 1-Hz measurements is not the same, for a given epoch, the location of the corresponding points must be computed by interpolation. For a WTC comparison the closest point in time can be used, provided that the time difference between the matching points is small enough, e.g. < 0.60s.

The DComb WTC has been computed only for ocean points, therefore only these points should be used in the comparisons.

The correction is provided in NetCDF files with the fields listed in section3.

3. List of provided fields

Cycle - sub-cycle number according to RADS convention

Pass - pass number according to RADS convention

Tisec - time in seconds since 2000-01-01 00:00:00 (UTC) – on Dataset 1

Tisec - time in seconds since 2000-01-01 00:00:00 (TAI) – on Dataset 2, as in original ESA files

MJD - Modified Julian date (UTC)

Latitude - Latitude (degrees north)

Longitude - Longitude (degrees east)

wet_ECMWF - WTC from the ECMWF operational model (metres)

wet_DComb - WTC from the DComb algorithm (metres)

formal_error - formal error of the wet_DComb estimate (metres)

Surface_type - 0=open ocean, 1=enclosed seas and lakes, 2=continental ice, 3=land

N_obs – total number of observations used

flag_GNSS – 1 if GNSS observations were used

flag_ECMWF - 1 if ECMWF operational model was used

flag_SI-MWR – 1 if SI-MWR observations were used