Quality assessment of Cryosat-2 altimetric system over ocean

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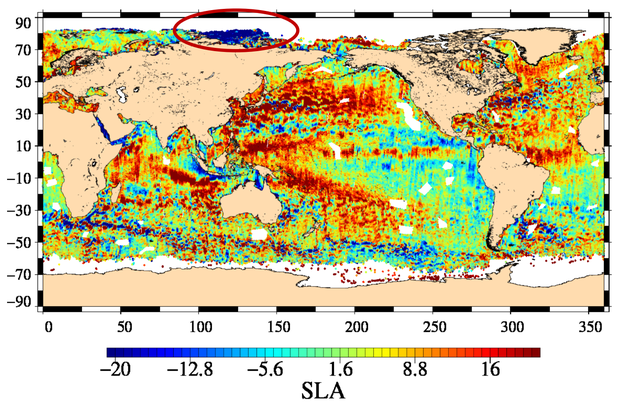
Cryosat-2 Data

A Cryosat-2 Processing Prototype (CPP) has been developed on CNES side to lay the ground for SAR processing studies in the frame of Sentinel3 project. These processing chains start from Level-0 telemetry files and generate 20 Hz Sea Level Anomalies (SLA) values. These data sets are operationally used in the SSALTO DUACS system for Near Real Time production since February 2012 and will be integrated to Delayed Time products mid 2012.The whole year 2011 has also been reprocessed for a deeper analysis of the data quality. This poster highlights different features regarding the CPP data quality which also gives some clues on Cryosat-2 mission performance.

Sea Level Anomaly for August/September 2011

Cryosat–2 Cycle 021 (18/08/2011 / 16/09/2011)

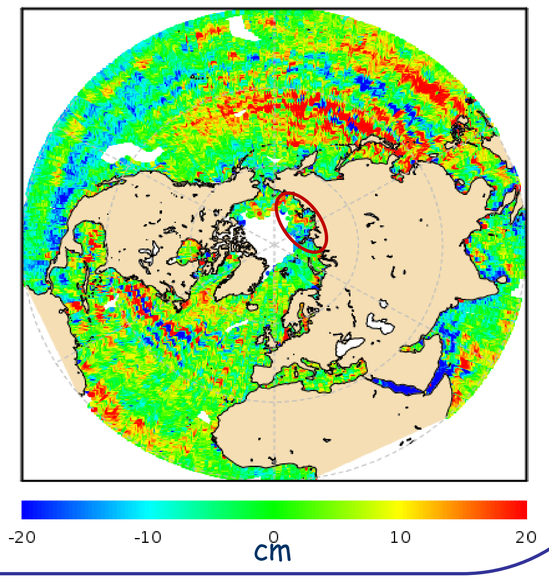


Maps of Sea Level Anomaly (SLA) relative to a mean sea surface shows that Cryosat-2 well captures all the main features of the oceanic variability. This map was obtained with data spanning August and September 2011, using the MSS model CNES-CLS-11. The negative SLA pattern shows that this MSS model is not accurate in the regions north of Siberia.

An improved SLA map is obtained over the Arctic region using the MSS DTU10 model. Compared to the previous ESA altimetric missions (ERS-1/2 and ENVISAT), Cryosat-2 slightly extends the limit of relevant ocean coverage above 80N.

Mean of SLA (cm) - Cryosat2 - Centered

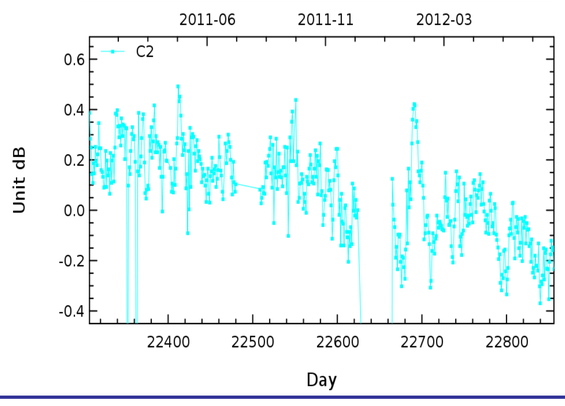
Cycle 21: 18/08-16/09 2011



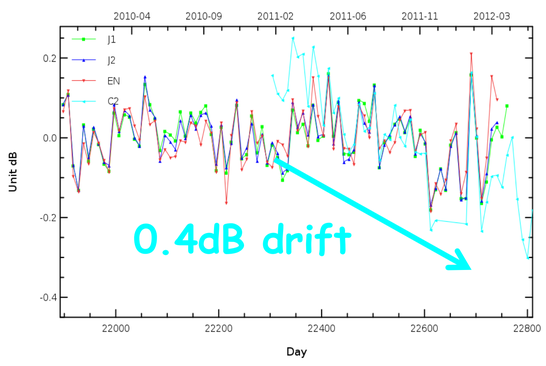
Drift of Sigma0 – 2011/2012

The monitoring of the daily mean of the Sigma0 shows a drift of about 0.4 dB between January 2011 and August 2012. This makes a drift of 0.25 dB/year which shall have an impact on the SLA stability through the wind speed and SSB correction (0.03 dB/year makes a drift of 10 cm/s/year on the wind speed and has an impact close to 0.05 mm/year on the Mean Sea Level trend). This drift is present on CPP data because there is no calibration applied to the Sigma0. Future ESA Cryosat-2 processing dedicated to ocean will hopefully take into account this calibration.

Centered Sigma0 average per day



Centered Sigma0 average per J2 subcycle, average per box and ponderated by lat

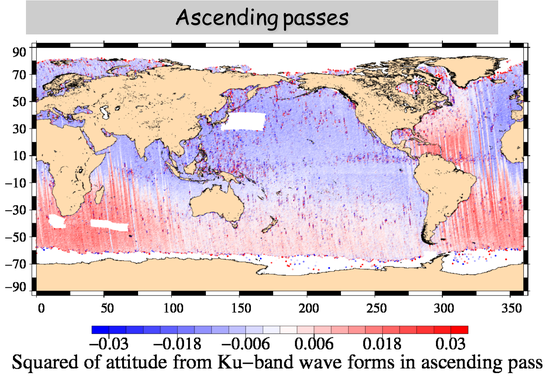


Waveform mispointing

The Cryosat-2 mission encounters platform mispointing due to star tracker behaviour. The mispointing is accounted for in the retracking processing thanks to MLE4 algorithm. The following maps show the mispointing retrieved by MLE4 algorithm. It presents long wavelength signal which have different geographic patterns between ascending and descending passes. Note that this parameter is not completely stable over the time.

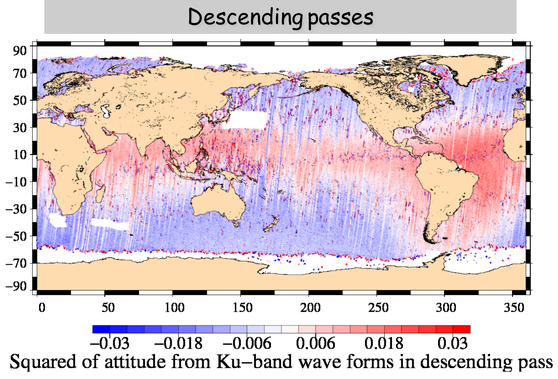
Cryosat–2 Cycle 032 (01/07/2012 / 30/07/2012)

Ascending passes



Cryosat–2 Cycle 032 (01/07/2012 / 30/07/2012)

Descending passes

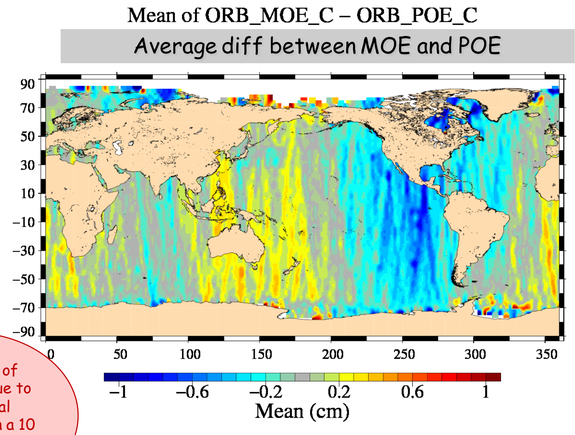


MOE/ POE orbit quality

The orbit quality on C2 (in GDR-D standards) is very good, with geographically correlated bias below 2cm at crossovers. The difference between POE and MOE presents East West patches lower than the cm. In terms of ascending/descending consistency, the degradation of MOE compared to POE is small, below 4cm² regionally.

Mean of ORB_MOE_C – ORB_POE_C

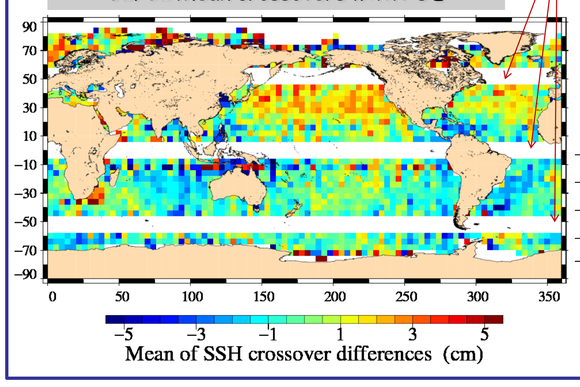
Average diff between MOE and POE



Blind bands of crossovers due to geometrical behavior when a 10 day-selection is applied

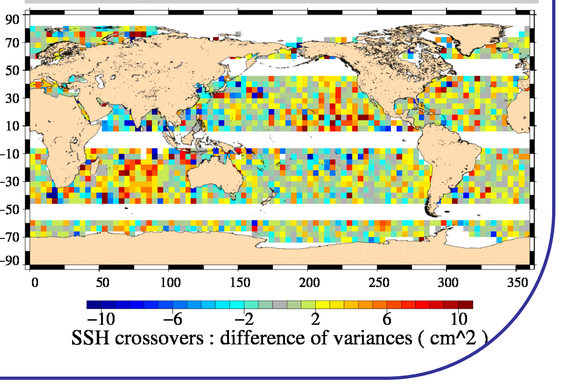
Cryosat–2 Cycle 14 to 32

C2/C2 Mean crossovers with POE



VAR(SSH with ORB_MOE_C) – VAR(SSH with ORB_POE_C)

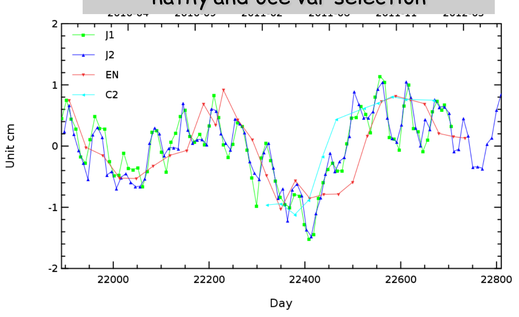
Variance gain atXovers between MOE and POE



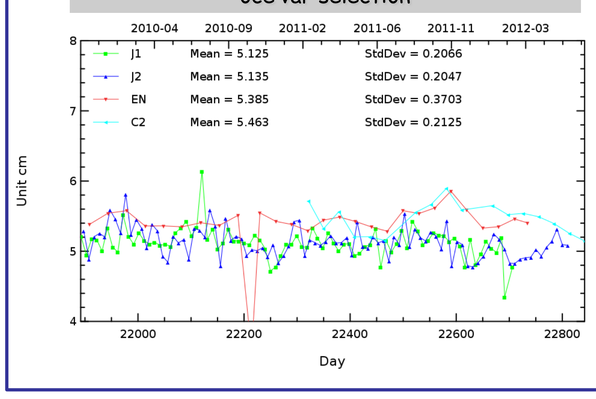
Multi-mission comparison to other missions

Cryosat-2 has good performances at cross overs, similar to Envisat's (which has no S-Band on this period) after reprocessing, and using GDR-D orbits. The global monitoring of SLA is also close to other altimeters. In terms of geographical biases compared to Jason-2, two patches lower than 2cm are observed on the average at crossover over a period spanning January 2011-August 2012.

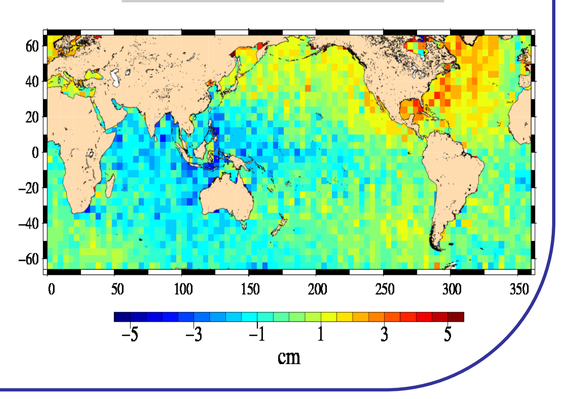
Mean Sea Level Anomaly with Lat, nathy and oce var selection



Std at cross overs per cycle with Lat, bathy and oce var selection



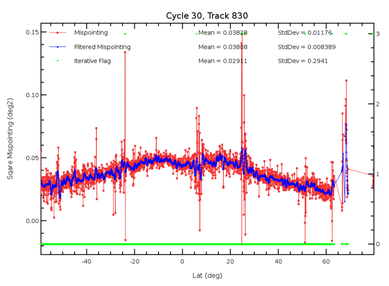
Average of C2/J2 crossovers over 2011-2012 (1.5yr)



Removing ice polluted data on Cryosat 2

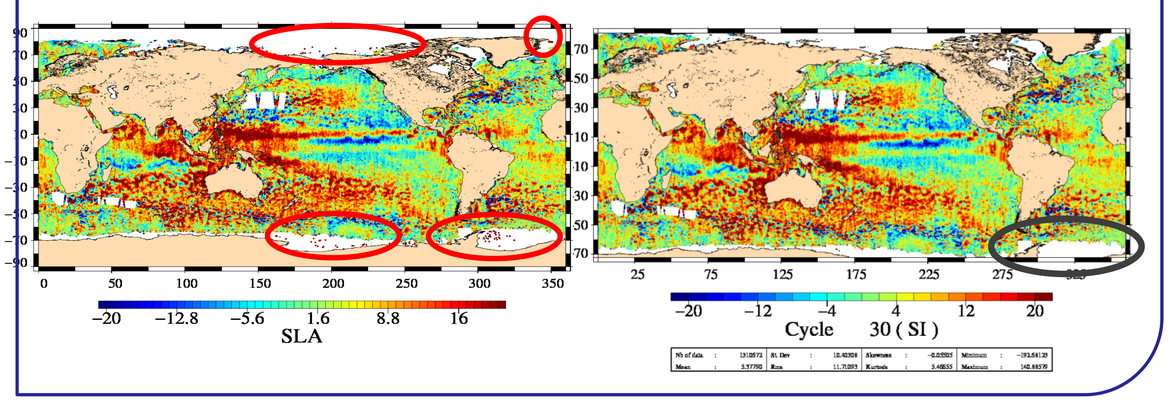
The lack of radiometer on Cryosat 2 does not ease the ice detection in the data selection process over ocean. Furthermore, the unstability of mispointing prevents from doing any average threshold on this parameter. To cope with this, we developped an iterative editing, based on robust statistics applied to the along track mispointing angle: the data are filtered and the values out of statistics limits are rejected. The new editing process allows to detect spurious values of SLA particularly at high latitudes.

Along track mispointing used for the iterative editing



Cryosat-2 Cycle 30 -BEFORE iterative editing

Cryosat-2 Cycle 30 -AFTER iterative editing



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