Cryosat LRM performances over ocean

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Cryosat-2 was planned for ice caps but has a great added value for ocean surfaces!

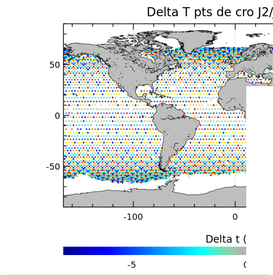
Cryosat-2 Data

A Cryosat-2 Processing Prototype (CPP) has been developed on CNES side to lay the ground for various SAR processing studies. These processing chains start from Level-0 telemetry files and generate 20 Hz Sea Level Anomalies (SLA) values.

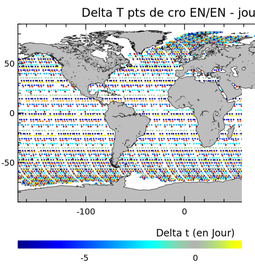
- This poster highlights different features regarding the data quality of the CPP data sets which also gives some clues on Cryosat-2 mission performance.
- In this presentation, we use CPP 1Hz LRM data set.
- Over SAR zones, 1Hz Pseudo LRM range is used = specific SAR processing to recover a LRM « like » information.
- CNES POD in GDR-D standards is also used
- The analysis proposed concerns the L2 products, operationally ingested in the DUACS/SALP system to provide L3 and L4 Sea Level products to the community. Therefore some of the effects highlighted here are post processed and not seen by users thanks to multimission processing, bias computation, applied to match the rest of the constellation…

Unique orbital choice

Drifting cycle of 35 days with particular patterns:

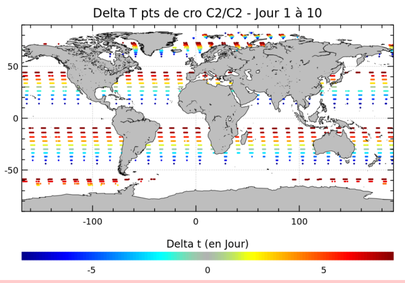


J2: Homogeneous coverage

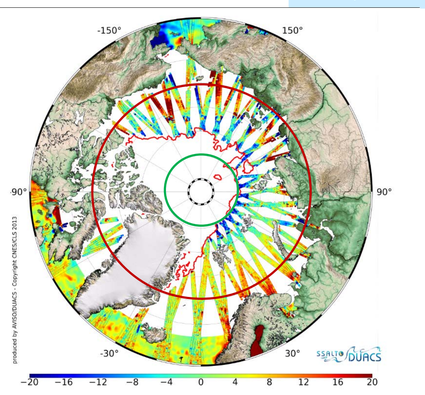


EN: striped coverage

Delta time Asc-Dsc at Crossover position for J2/ C2/EN , with 10days selection (current selection to limit the oceanic variability effect)



C2: sampled coverage with changing and stable blind zones

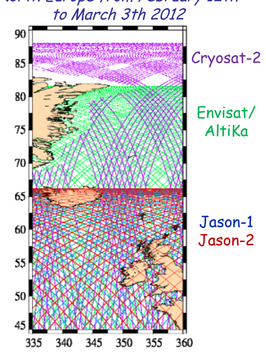


High latitude most complete coverage

DUACS map (A.Delepoulle), showing a record breaking ice melting that uncovers SLA for the first time!

Data never observed yet above 82° : Dedicated tunning and processing now needed above 82° : new need to define MSS, new editing… (see poster Labroue & Ollivier OSTST 2012) above this limit.

Data coverage over 10 days in North Europe from February 12th to March 3th 2012



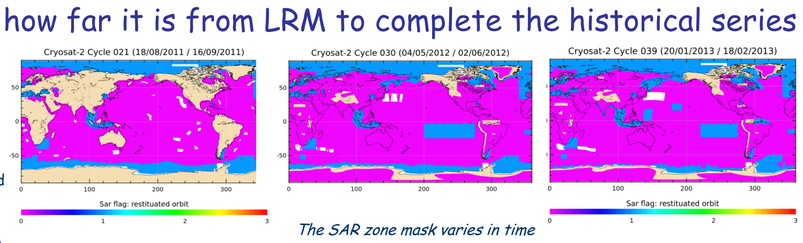
Bias detection

- Cryosat-2 = Experimental altimetric mission, unique opportunity to have a preview of quality of SAR (future techniques for altimetry S3, Jason-CS…)
- SAR mode is extensively analysed, (see dedicated presentations about SAR, Jason CS, S3…) with respect to LRM mode

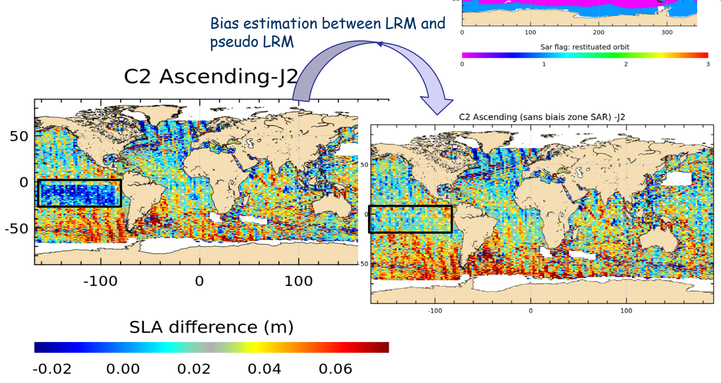
➔Need to accurately validate this reference mode for this mission

➔Pseudo LRM: need to check how far it is from LRM to complete the historical series

Synthetic Aperture Radar (SAR)
Low Resolution Mode (LRM)
White: Interferometer SAR (SRA-IN)



The SAR zone mask varies in time



➔…To compute fine biaises between LRM and SAR exploratory zones

Thanks to a precise comparison with Jason-2 and separating Asc/Dsc passes over a period of homogeneous mask, we could estimate and correct from a bias between LRM and Pseudo LRM mode (1.3cm). After correction, the transition is seemless and cannot be misinterpreted anymore in mesoscale content. This exercise can be done by comparison with Pseudo LRM, Tracker or SAR data.

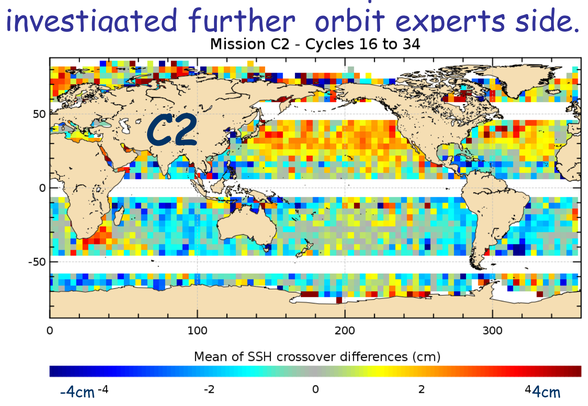
Multimission fine Calval comparisons are precious …

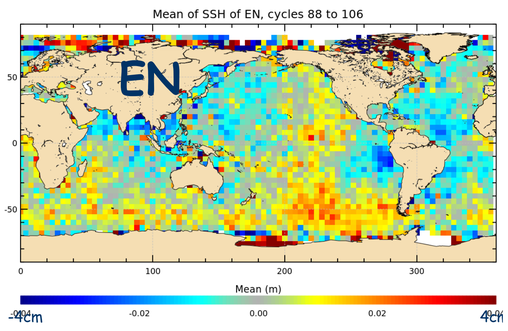
Regionally correlated patterns

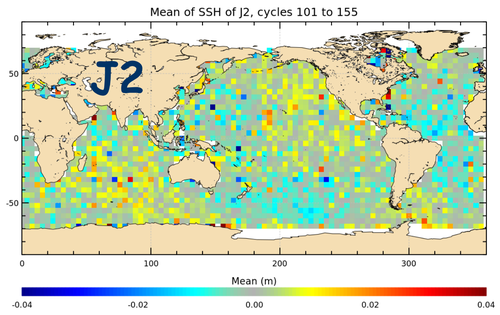
Consistency between Asc/Dsc tracks:

Mean difference at crossovers:

Cryosat-2 presents a large scale effect (see A.Ollivier's talk at POD session) compared to the Jason-2 (over the same period), not localised at the same place as Envisat mission. Could be investigated further orbit experts side.





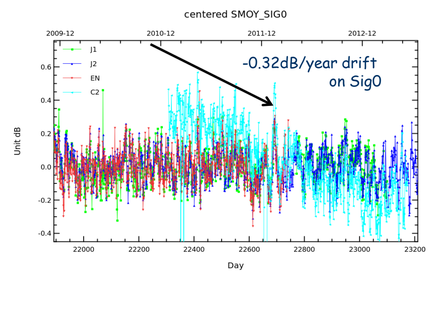


➔…To analyse geophysical large scale content and refine altimetry error budget

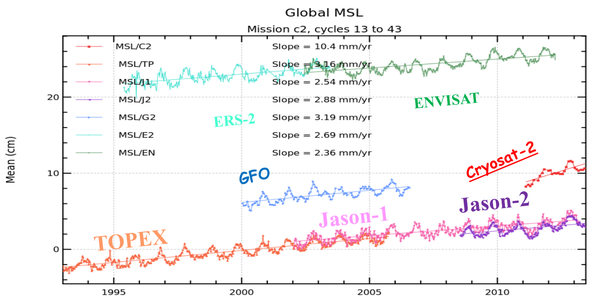
Potential role of C2 in MSL monitoring

Cryosat-2 products are more dedicated to mesoscale analysis and not to MSL monitoring (several limitations due to the onboard payload – no radiometer, single frequency, …).

Therefore, in this best effort product, some instrumental corrections (notably the PTR drift) are not taken into account (will be properly managed in IOP/GOP products)… For instance, this explains a drift detected on Sigma0 (impact on MSL via SSB)



➔…To insure the continuity between past and future missions

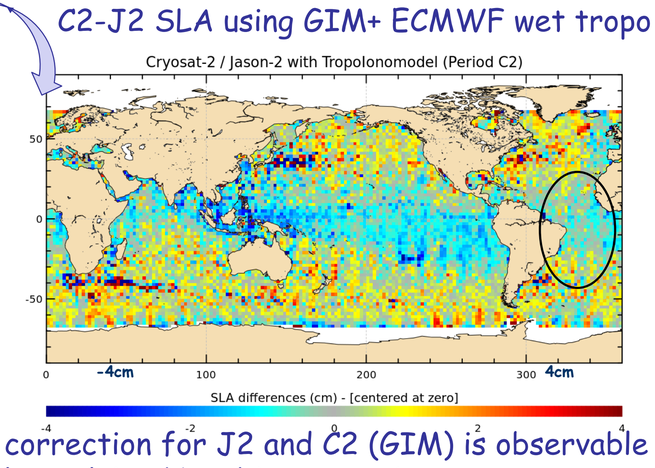


For the moment the MSL analysis was not our focus (also because of the rather short period) … BUT…

When IOP/GOP will be available, a strong effort should be made to join the CPP and IOP/GOP time series ➔ global and geographic bias correction studies will be needed… Reprocessed GOP not planned by now: 3 years missing ➔ of interest for the community!!!

C2-J2 SLA using iono bifr + AMR wet tropo

C2-J2 SLA using GIM+ ECMWF wet tropo



Cryosat/ Jason-2:
The effect of using the same ionospheric correction for J2 and C2 (GIM) is observable
➔ Differences between missions are partly explained by this correction

Precise Calval including multimisison comparison = Precise knowing ofthe LRM to:
➔Insure the seamless transition between past and future missions
➔Insure a reliable reference to SAR exploratory studies
This should be done with the future ESA official products (IOP/GOP expected by end 2013)

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