



CROSS-CALIBRATION between ENVISAT and JASON-1/2

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... After 10 years of very good availability and quality of data, Envisat mission was interrupted on april 8th of 2012:

- No more real time data
- But an historical dataset that ESA continues to improve ...

Recent improvements of the off line products giving a new dataset of external comparison to Jason1 and 2 missions.

Plan of this presentation:

1. Envisat official V2.1 reprocessing and additional upgrades
2. Improvement and data consistency with Jason-1/2 missions :
Performances : Mesoscale effects lower than 10 days
Climate applications: Mean Sea Level trends
3. Multimission comparisons without Envisat

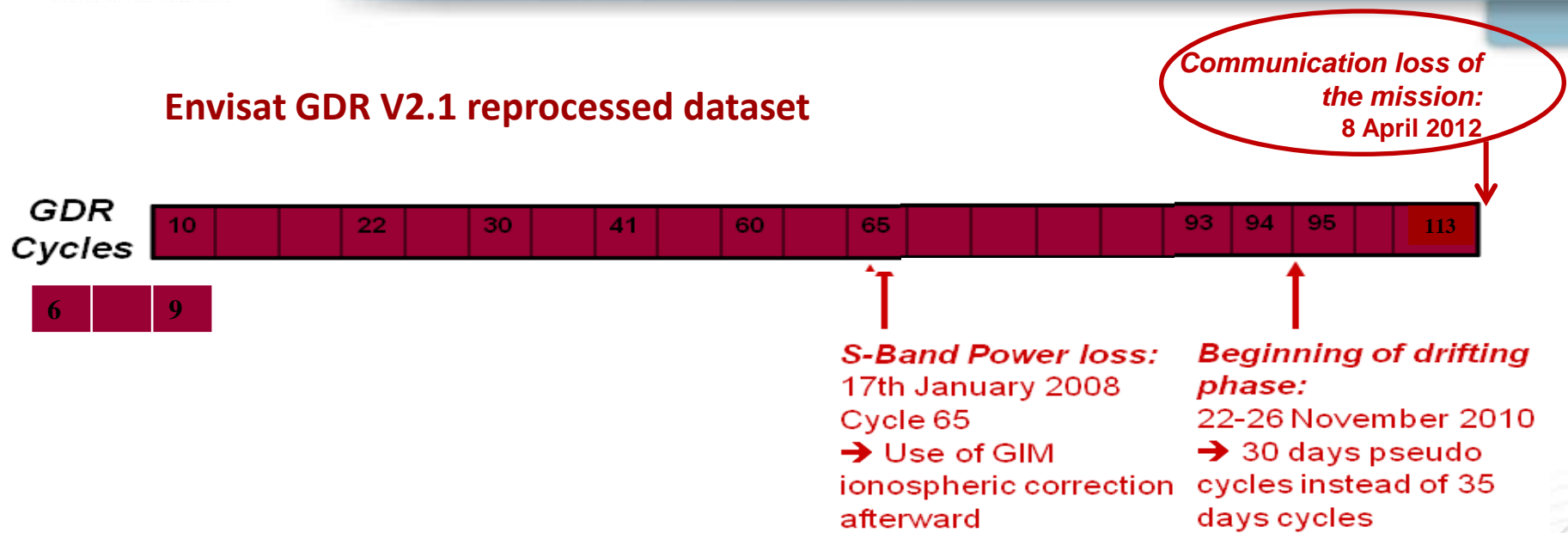


Envisat new data set

Major events on ENVISAT GDR/ Data used



Envisat GDR V2.1 reprocessed dataset



- For the first time the whole data set was reprocessed last year
- All GDR and SGDR data are available since January 2012 on the following ESA ftp server :

<ftp://diss-nas-fp.eo.esa.int>
 under the directory : `altimetry_dataset_v2.1.`

- Release notes and Cyclic reports are available at the same address



Orbit, SSB, instrumental corrections, Side Lobe correction of radiometer, tide, DAC...

Before reprocessing, errors had been identified (SALP project, QWG community...) and were solved since the end of the reprocessing.

V2.1
reprocessed
GDR

- V2.1 reprocessing improved :
 - Coverage (near coats)
 - Performances at crossovers
 - Geographical biases
 - Global long term reliability
 - Regional long term reliability



Orbit, SSB, instrumental corrections, Side Lobe correction of radiometer, tide, DAC...

New Radiometer wet tropo (Picard et al.)

New Orbit Std: CNES GDR-D (Cerri et al.)

New (PTR) Instrumental correction (IsardSat Rocca et al.)

V2.1 reprocessed GDR

• V2.1 reprocessing improved :

Coverage (+near coats)

Performances at crossovers

Geographical biases

Global long term reliability

Regional long term reliability

V2.1+ Updated dataset

Available on ESA web site next to the GDR products

In synergy with the ESA CCI project, 3 additional upgrades were shown to improved significantly the data (notably for climate applications).



Envisat/Jason-1 and 2 improved consistency

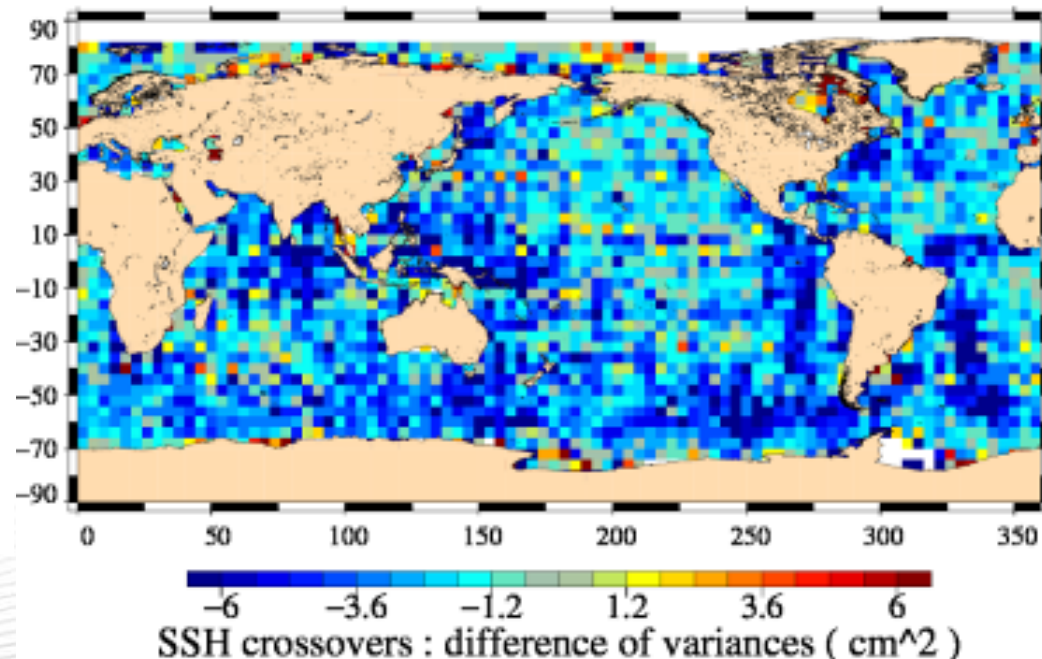
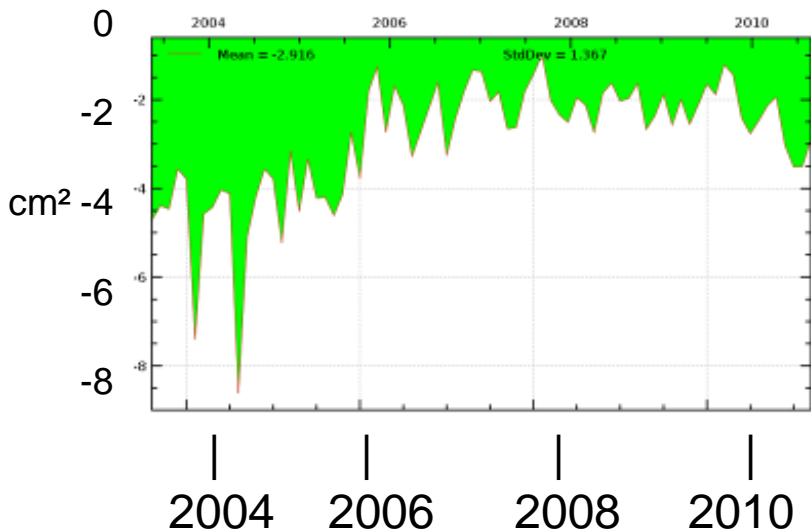
Improved performances of GDR



V2.1+ data set (Including MWR and GDR-D orbit update) performances / routine GDRs
 SSH crossovers variance gain (<10 days consistency of data):

→ Geographical behavior

→ Temporal behavior (*)



→ Clear Improvement of New GDR compared to previous versions

(*) using a selection: Lat<50, far from coasts, low ocean activity, radiometers

Multimission consistency: mutual benefits of cross-comparison between missions

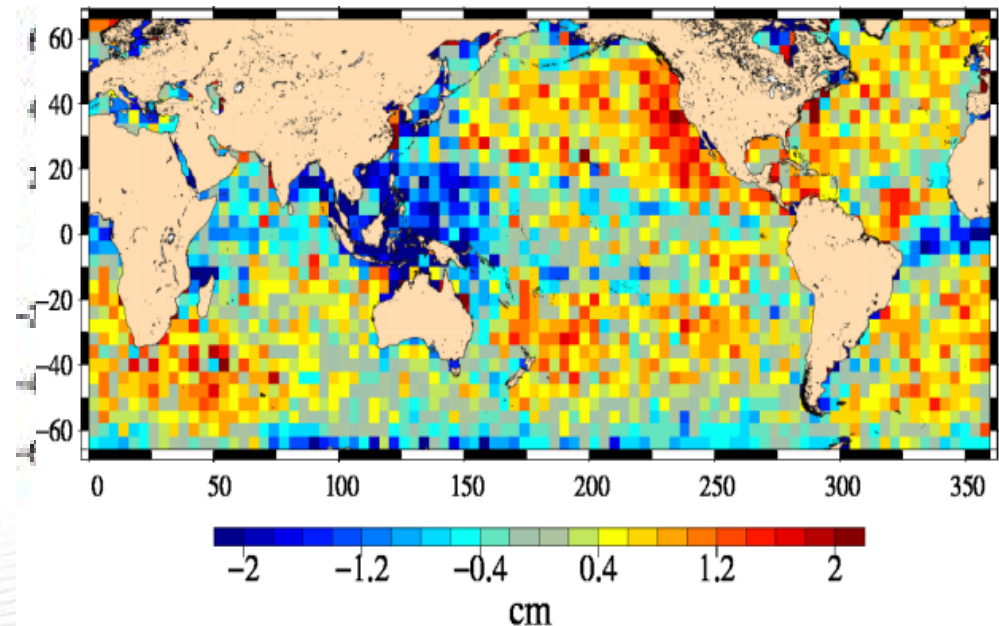


Mean difference Envisat (V2.1) - Jason-1 at crossovers over 2011 (with model wet tropo)

EN Gdr-D POE/ J1 GDR-D POE

-East/west patterns observed with GDR-C orbit solution removed with GDR-D orbits (Ollivier&Philipps et al. Calval POD session)

- Stronger impact of Envisat (lower altitude) but impact on all missions (Legeais et al. prev oral)

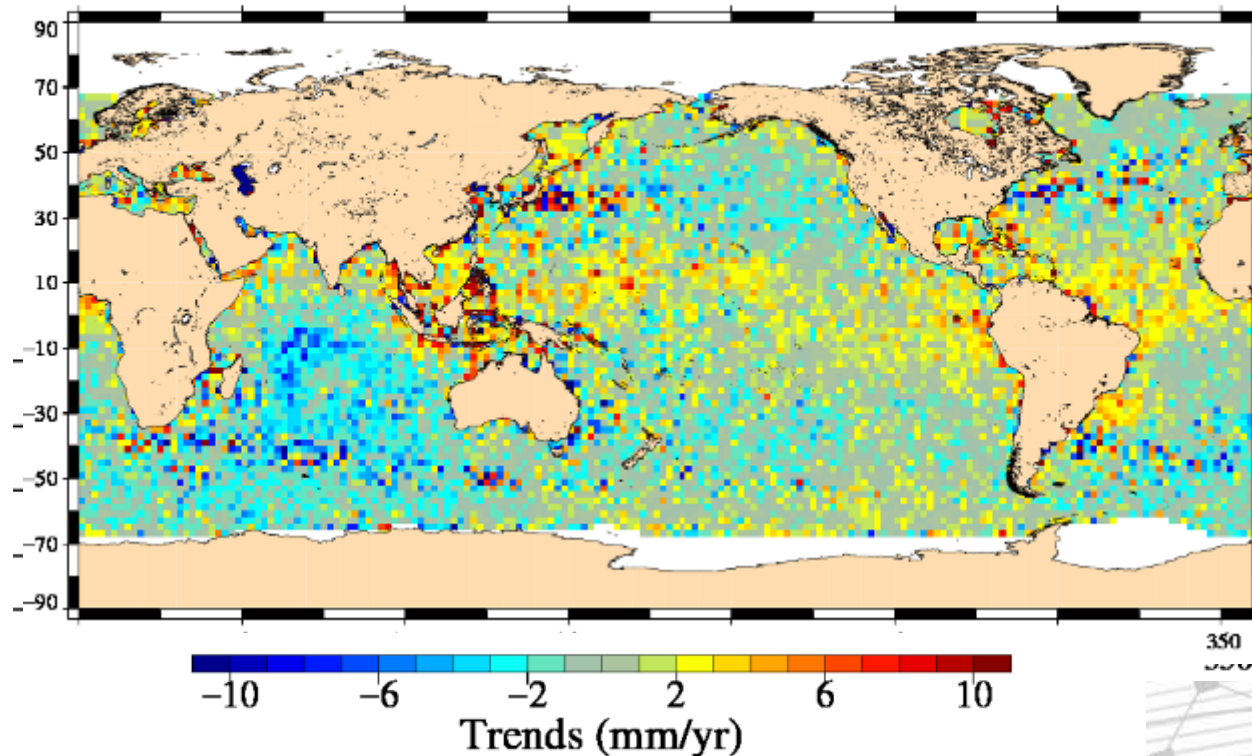


- ➔ After Envisat reprocessing and updates, better consistency + Jason-1 at crossovers
- ➔ Multimission comparisons: evidence discrepancies and improve all missions

Regional Mean Sea Level



Jason-1 – Envisat V2.1+ data set Mean Sea Level Trend difference (radiom wet tropo)



GDR After V2.1
Reproc and
Updates

- ➔ Data reprocessing + orbit upgrade = Envisat and Jason-1 MSL trend are also much closer now than before the reprocessing
- ➔ Here as well, we mention that the impact is more sensitive on EN than on J1 but that both missions are impacted (respectively 3 and 1mm/yr at basin scale)

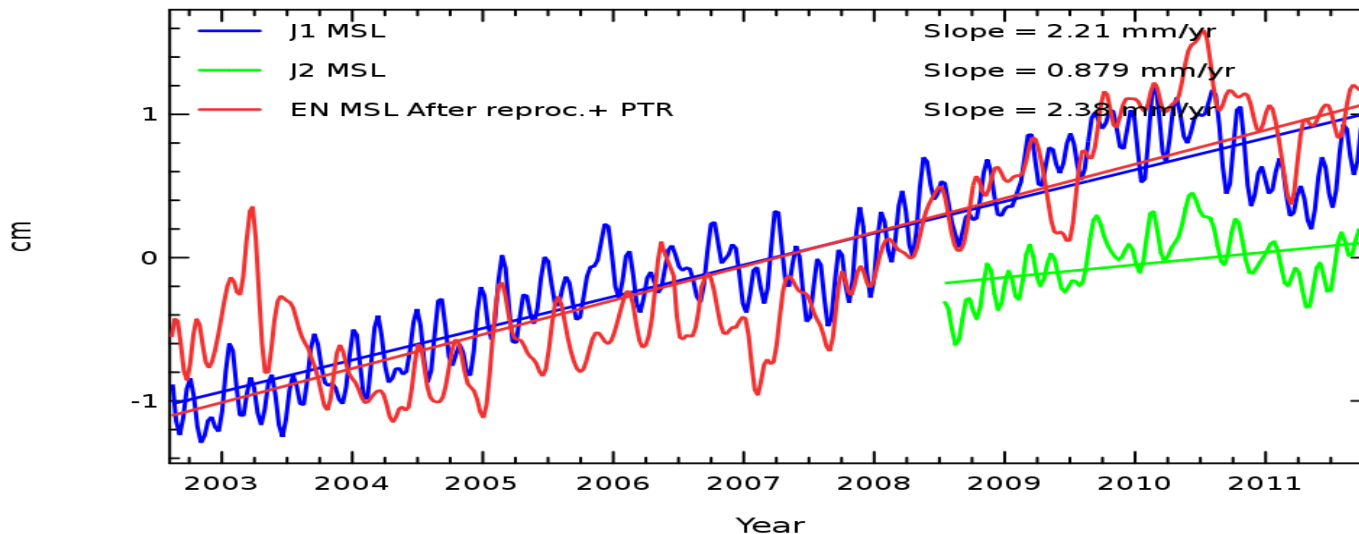
Global Mean Sea Level



- The reprocessing exercise enables to homogenize the GDR data set. Essential step for MSL studies.
- + correcting for the PTR instrumental correction, the consistency is also very much improved

Jason-1 and Envisat V2.1+ data set Mean Sea Level Trend (Radiom wet tropo)

Mean Sea Level, centered, 2 Month filtered



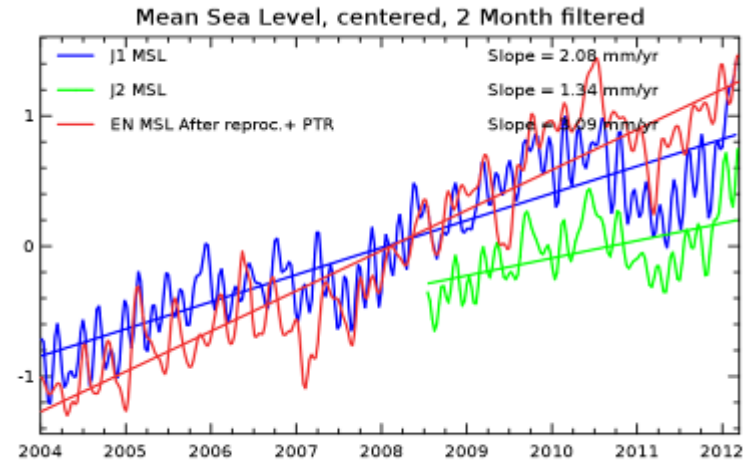
GDR After V2.1
Reproc and
Updates

➔ Better consistency with other missions and with in situ data: Envisat MSL is now getting more relevant for long term studies... (Ollivier et al. Marine Geodesy 2012)

Global Mean Sea Level



Yes... But...
 Great recent improvements but still
 some margin of improvements in the
 data sets... (see Legeais previous talk)



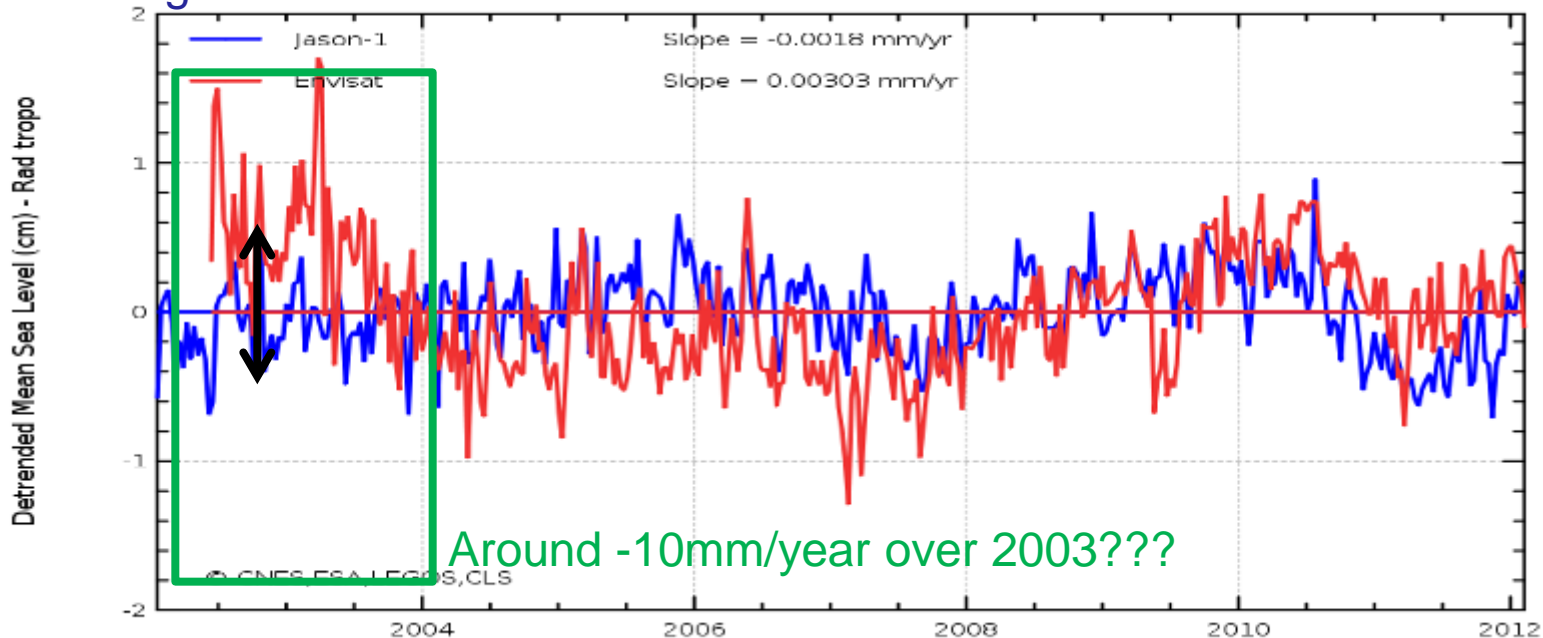
| MSL trend differences (mm/yr) | Altimeter MSL on 2003-2012 | Altimeter MSL without 2003 | MSL differences with tide gauges 2003-2012 | MSL differences with tide gauges without 2003 | MSL differences with TS profiles without 2003 |
|-------------------------------|----------------------------|----------------------------|--|---|---|
| Jason-1 | 2.2 | 2.1 | 0.4 | -0.3 | 0.8 |
| Envisat | 2.3 | 1.1 | -0.2 | 0.5 | -0.1 |
| Slope Difference | 0.1 | 1.0 | 0.6 | 0.8 | 0.9 |

→ In situ comparison and cross calibration are complementary: They both show an improvement of Envisat Mean Sea Level trend but also point out that it is still questionable...

Global Mean Sea Level



Unfiltered detrended MSL signal and annual signal removed (Annual, semi annual and 60 day) highlights the remaining discrepancies between EN and J1: The beginning of the mission remains particularly suspicious and under investigations...



- Envisat's MSL is more reliable after reproc and updates
- Still some questions regarding the first year of Envisat mission
- After 2004: Very consistent interannual behavior

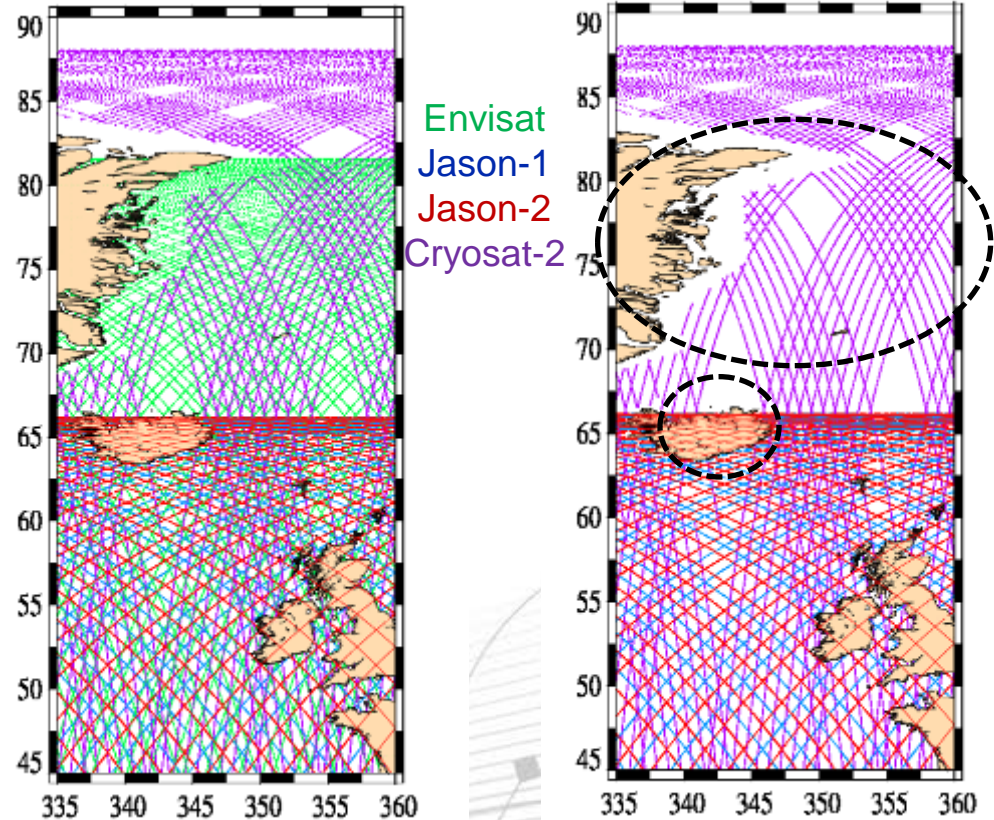


Multimission comparisons without Envisat...

Multimission without Envisat



- We'll miss ENVISAT...
 - ➔ As one of the missions of a global altimetric network (see Duacs Y. Faugère's talk)
 - At high latitudes, in the interleaves of Jason-1 and 2
 - But replaced by Cryosat 2 (See S. Labroue & A. Ollivier poster session) and AltiKa (soon)



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

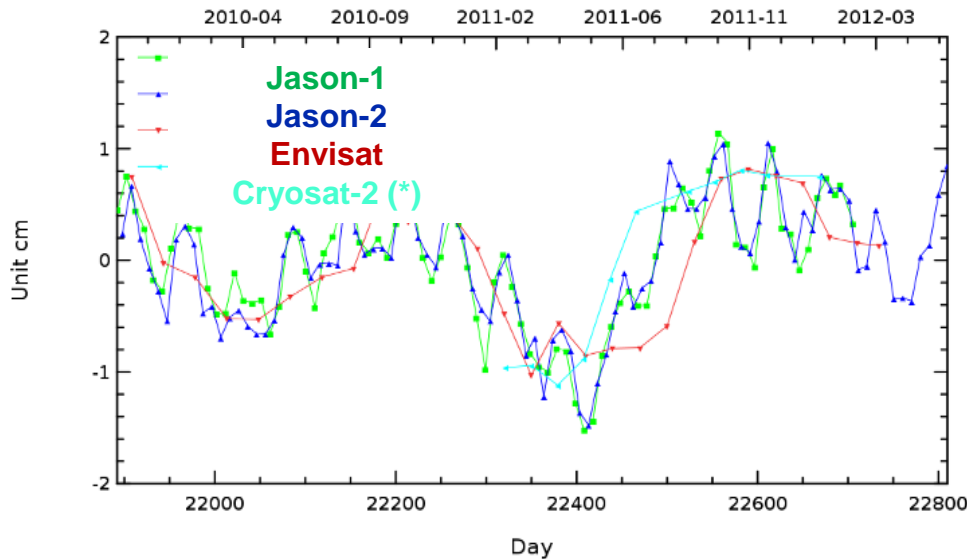
Multimission without Envisat



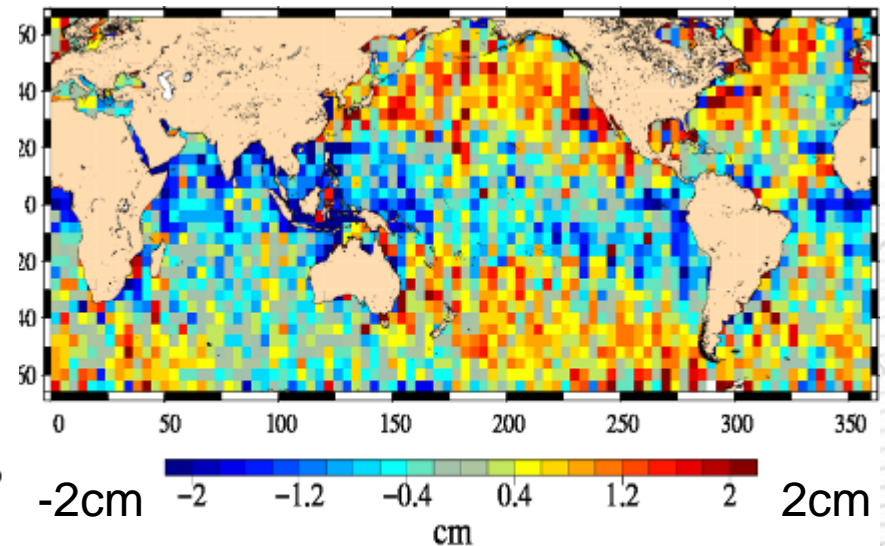
Comparison of all missions (with Lat, bathy oce var selection over ocean):

- Mean differences at multimission crossovers (over 2011, using GDR-D orbit standards for all missions → similar patterns

SMOY_SLA1_SL



C2(*)/J2 crossover (2011)



→ Promising order of magnitudes in the differences

(*) Cryosat data consist in CNES CPP delayed time reprocessing , in LRM mode

Conclusion



- We will miss ENVISAT...
 - As one of the missions of a global altimetric **network**
 - As an **external reference** for other missions: Cross calibration of Jason-1 and 2 with another precise mission as ENVISAT is useful to improve/characterise (see Error budget session) the global quality of altimetric system.
- But..
 - The **new generation** is coming! Cryosat-2 already demonstrates a good potential for such studies. and AltiKa (soon).
 - Comparisons with Envisat mission will remain precious, as the Delayed Time data series keeps improving all the time...
 - Envisat GDR new dataset improves data quality and consistency with Jason-1/2 missions.
 - **Finer residuals discrepancies** should enable to focus now on more accurate differences between independant missions (interannual MSL behavior, regional MSL, small shorter scales biases...)

Thank you!

14:52:03



14:59:07



14:59:57

