SERVICE ALTIMETRIE & LOCALISATION PRECISE

Assessment of Jason-2 orbit quality using SSH cross-calibration with Jason-1 and Envisat

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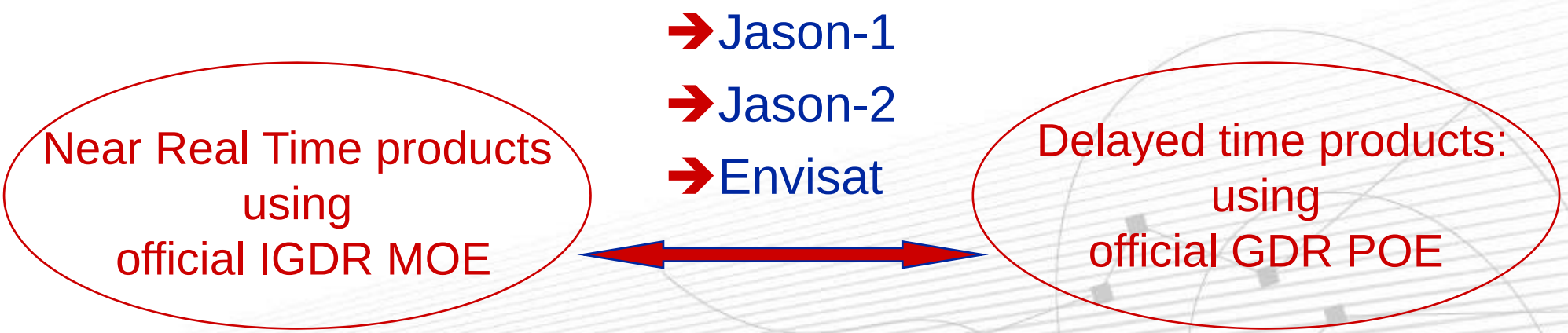
Introduction

- CalVal exercise performed on the Sea Level Height (SSH) is a complementary way of enlighting geographically related patterns or particular behaviors signing on the ocean altimetric observations.

- For this purpose, monomision SSH cross-over analysis are analysed for the three precise altimetric missions:



Overview

In this presentation, results are analyzed in terms of :

1. Geographically correlated mean biases
   - ➔ Average maps of SSH cross-over differences over Jason-2 life time
   - ➔ Cyclic monitoring of bias statistics at cross-over.

2. Time Variability of those biases
   - ➔ Standard deviation of SSH cross over differences maps over Jason-2 life time
   - ➔ Cyclic monomission statistics monitoring at cross-over

1. *Geographically correlated biases*

Orbit POE – MOE for the 3 missions over 220 days

Along track average over 22 J2 cycles:

J1: +/- 2 cm geographic biases

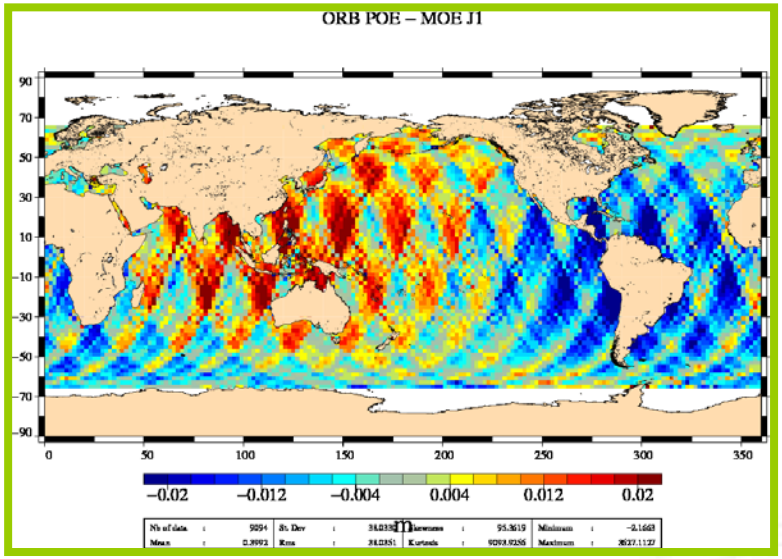
➔Centimetric discrepancies

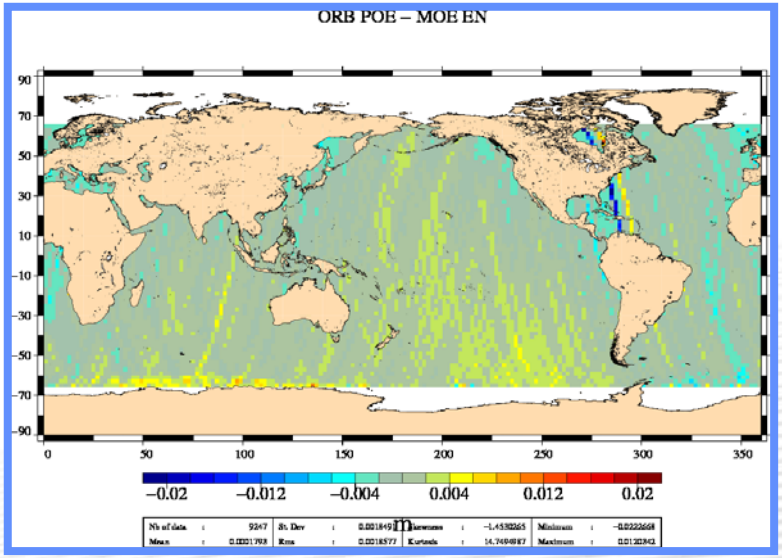
EN: +/- 1mm geographic biases

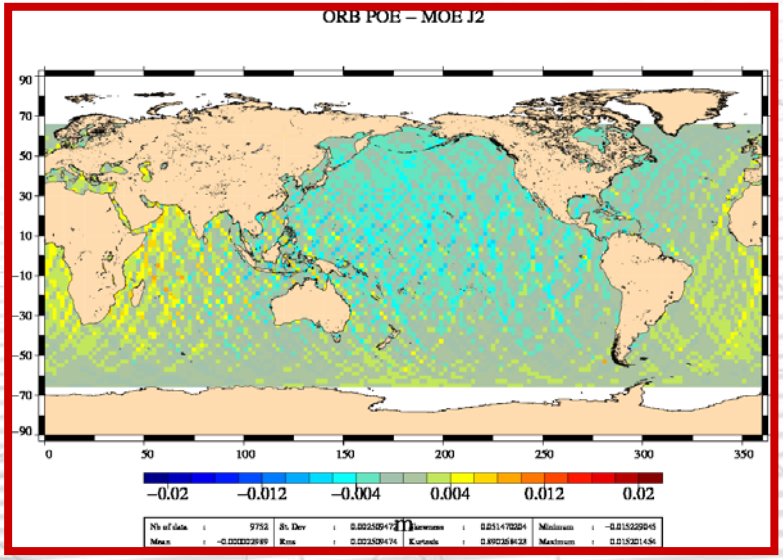
➔ Very similar

J2: +/- 2.5 mm geographic biases

➔ Good consistency

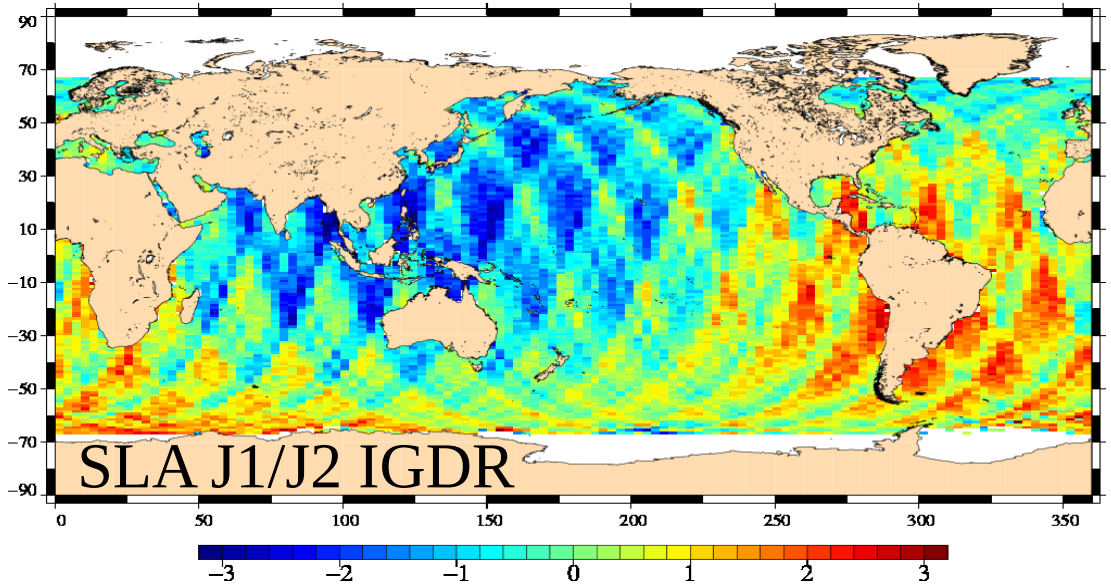






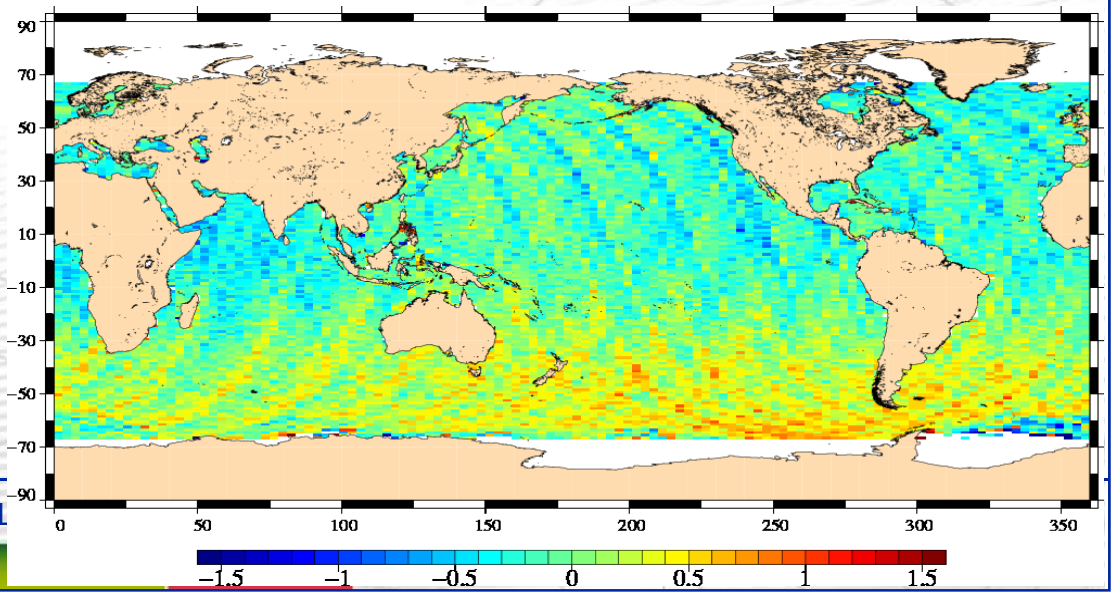
SLA Performances and Consistency

From S.Philipps presentation J2 System Performances



Map of mean JA1/JA2 SLA (orbit – range - mss) differences over cycles 1 to 20

- For IGDR: Geographically correlated patterns (+/- 3cm amplitude)
- For GDR: very good consistency, though
- Small hemispheric bias (+/- 1 cm) is visible -> likely due to slight orbit calculation differences

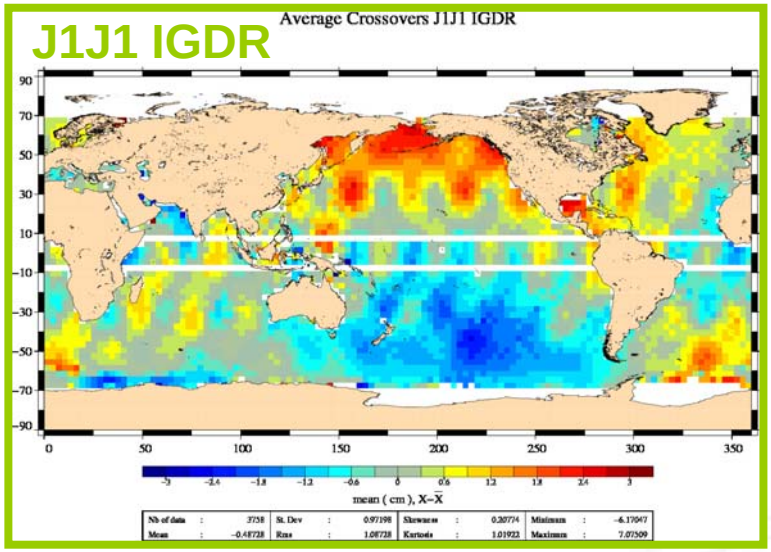


Average at cross-overs using IGDR SSH (with MOE)

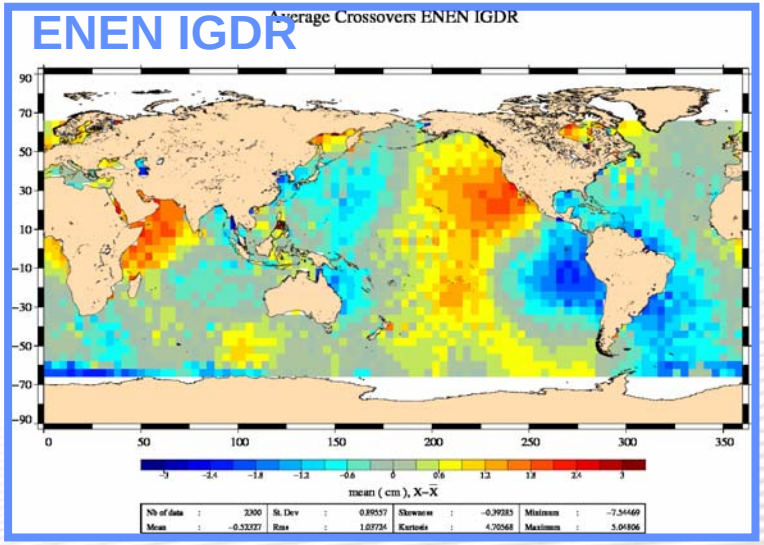
Maps display the asc/dsc SSH differences for IGDR → include the orbit error impact on the SSH.

- → J1: +/- 3 cm geographic biases
- → EN: +/- 1cm weak geographic biases
- → J2: +/- <1cm very weak geographic biases

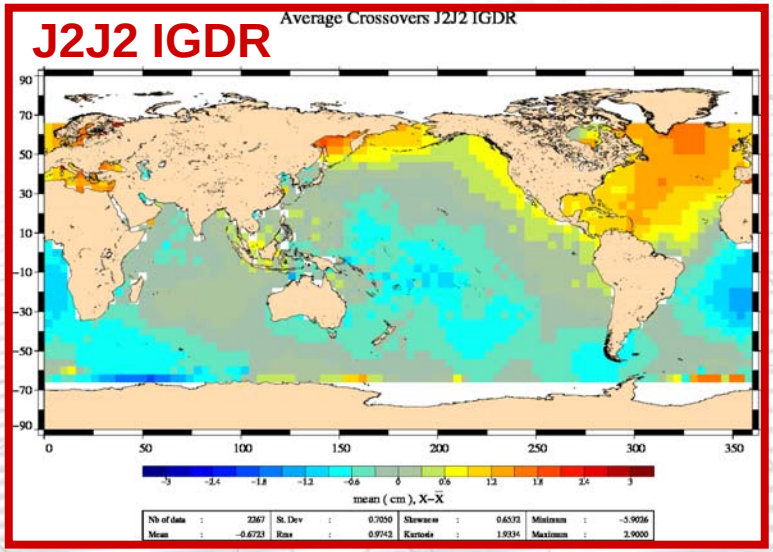
J1J1 IGDR



ENEN IGDR



J2J2 IGDR



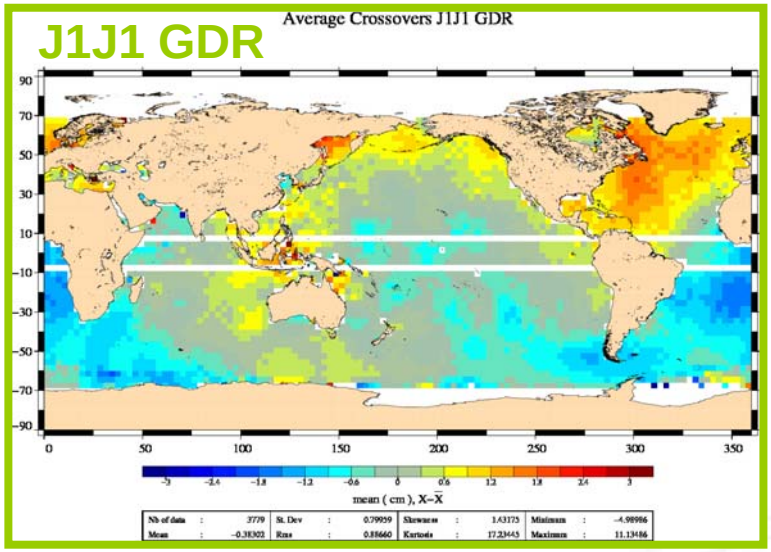
Average at cross-overs using GDR SSH (with POE)

➔Jason-1 Strong improvement in terms of geographical biases: weaker biases than with MOE

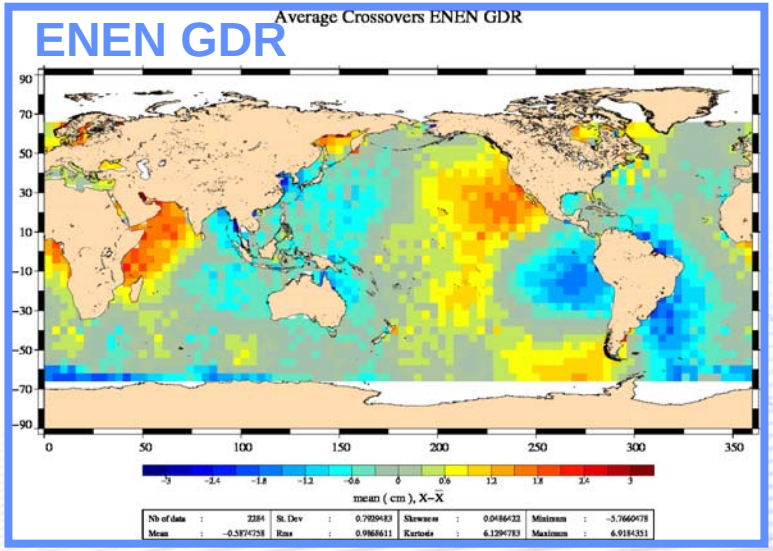
➔Jason-2 and Envisat weak impact

All missions present very weak geographically correlated biases (below 1cm)

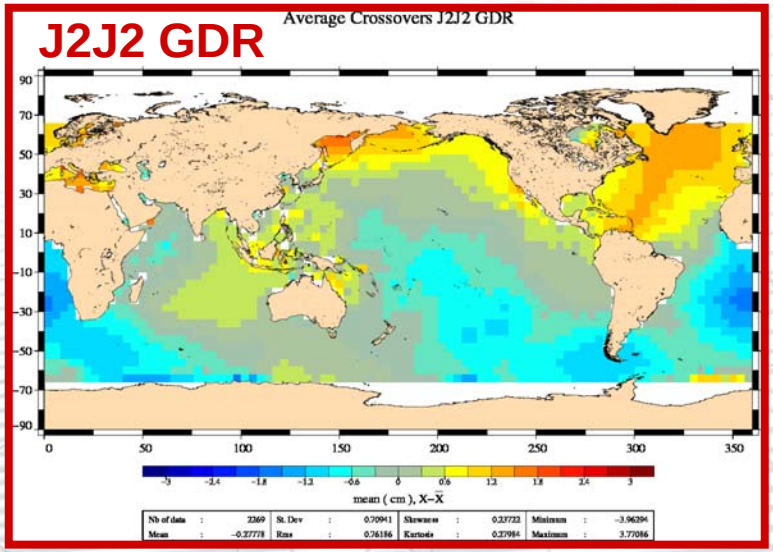
J1J1 GDR



ENEN GDR



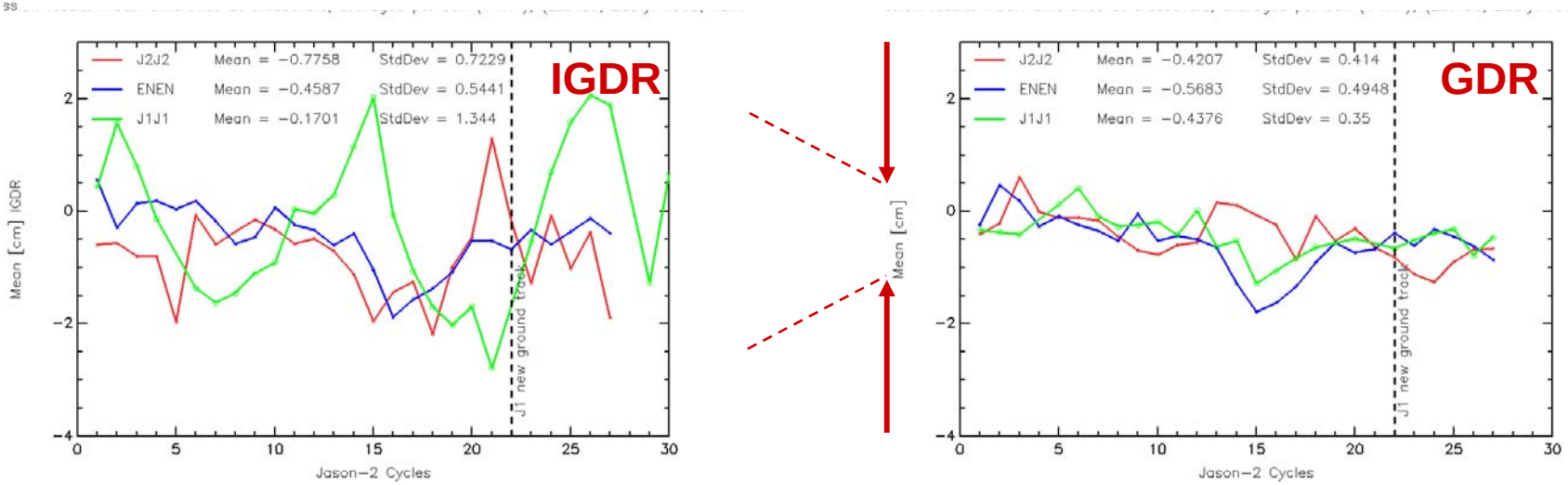
J2J2 GDR



2. *Geographical and temporal stability of the biases*

Temporal variability of the biases

Mean Asc-Desc Monomission SSH at cross-overs over ocean for IGDR and GDR:



Weak biases (all slightly negative) varying in time:

➔J1: Beta cycle (120 Days) in IGDR reduced in GDR (could be reduced by the SAA model now applied on IGDR)

➔EN: Best stability with MOE not so much improved in GDR (the known annual signal can be observed on these data)

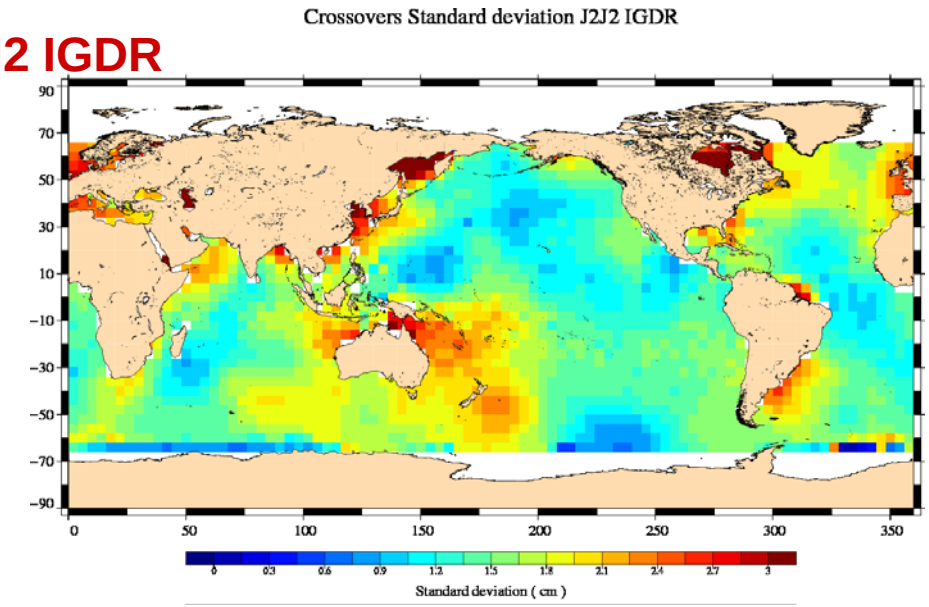
➔J2: good stability slightly improved in GDR

Standard deviation of the cyclic average	IGDR	GDR
J1	1.3 cm	0.35 cm
EN	0.54 cm	0.49 cm
J2	0.72 cm	0.41 cm

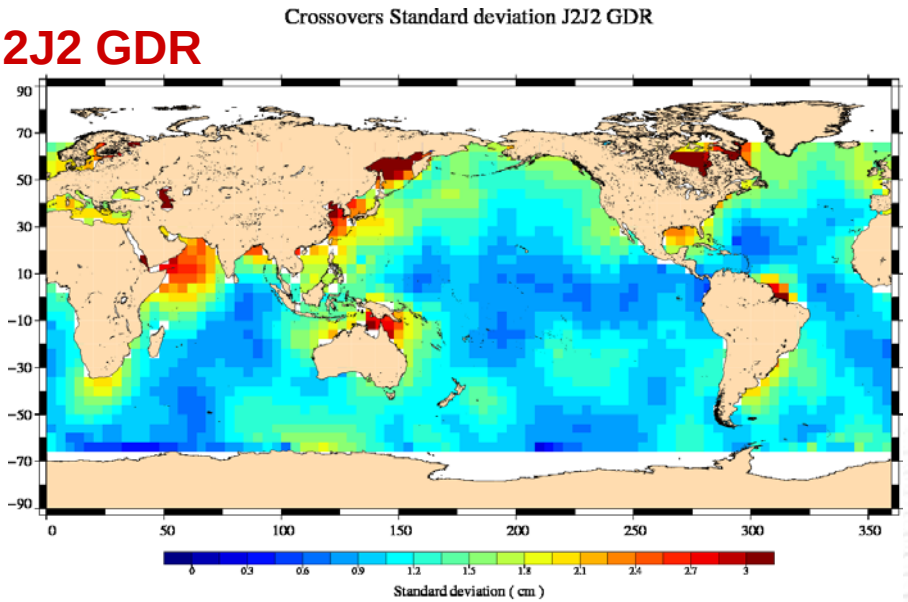
Geographic variability of the biases

Standard deviation of the cyclic mean SSH differences at cross-overs over ocean

J2J2 IGDR



J2J2 GDR



Computed on 22 cycles.

A smoothing is also applied in order to identify the long wave length variations (and not the one linked to the ocean variability)

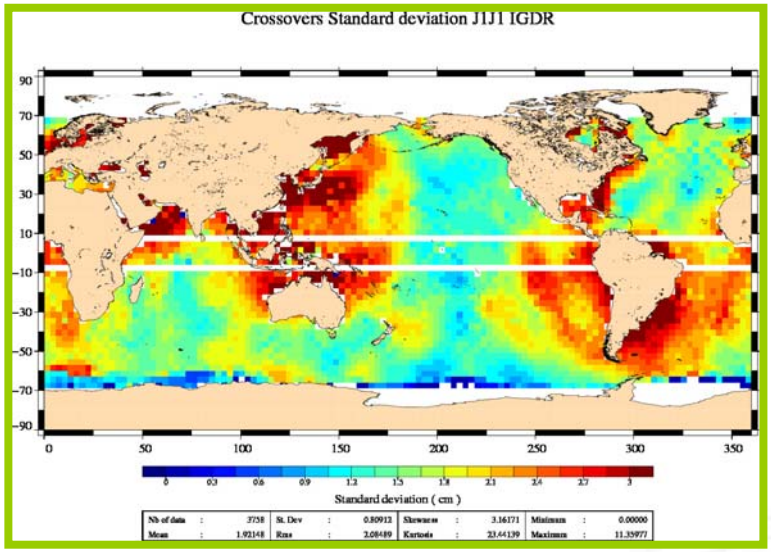
Geographic Mean Standard deviation	IGDR	GDR
J1	1.9 cm	1.4 cm
EN	1.4 cm	1.3 cm
J2	1.6 cm	1.2 cm

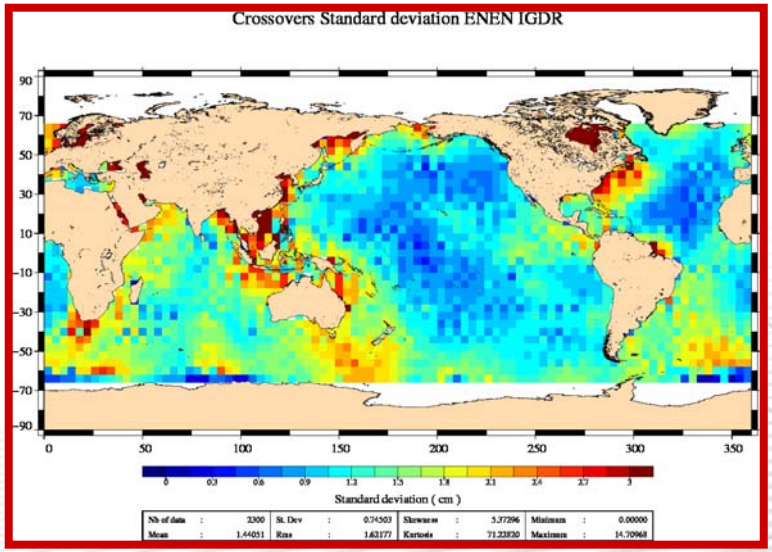
Conclusion

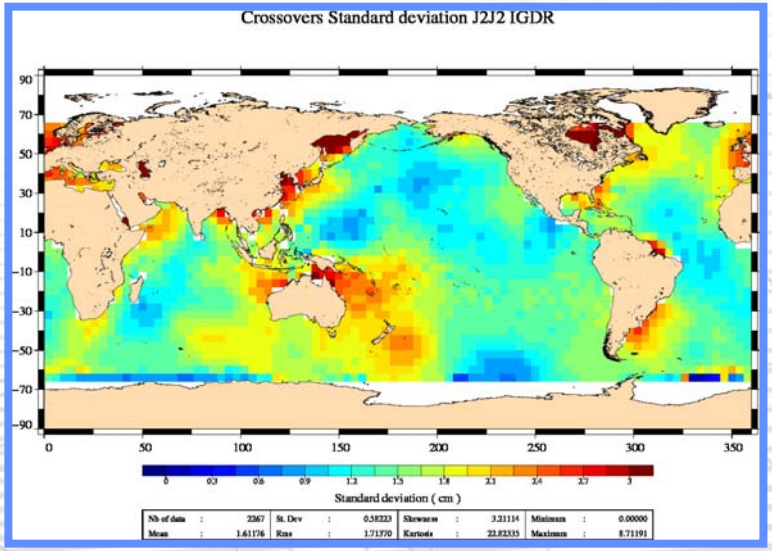
- Centimetric precision is reached for all orbits.
- Jason-1 POE improvement (weaker bias per basin and better time stability) compared to the MOE can be seen on the SSH cross-over analysis
- Envisat MOE and POE have very similar quality with still some weak geographical biases observed between ascending and descending tracks.
- Jason-2 POE and MOE both give homogeneous (geographically) and stable (temporally) Asc/Dsc discrepancies. **Jason-1 and 2 are very consistent using POE orbits.**
- More results about Envisat altimetric data and on the dual cross calibration between missions in « Calval session » presentations and posters

Additionnal slides

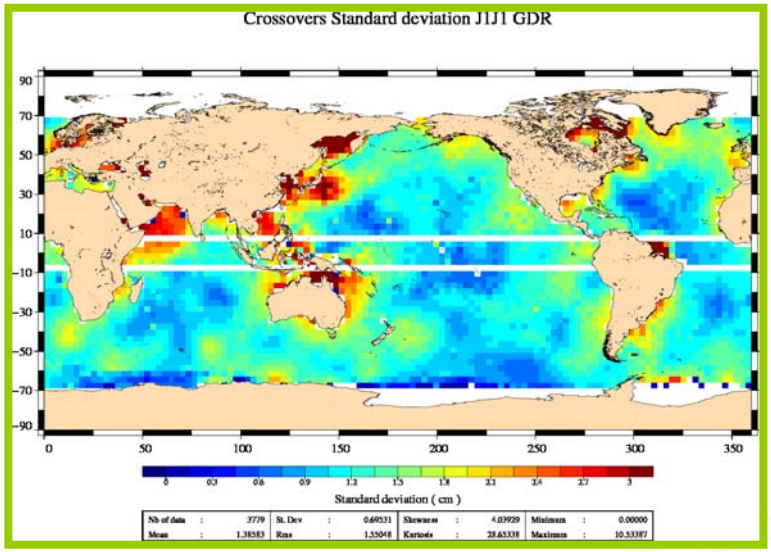
Standard dev at cross-overs using IGDR SSH (with MOE)

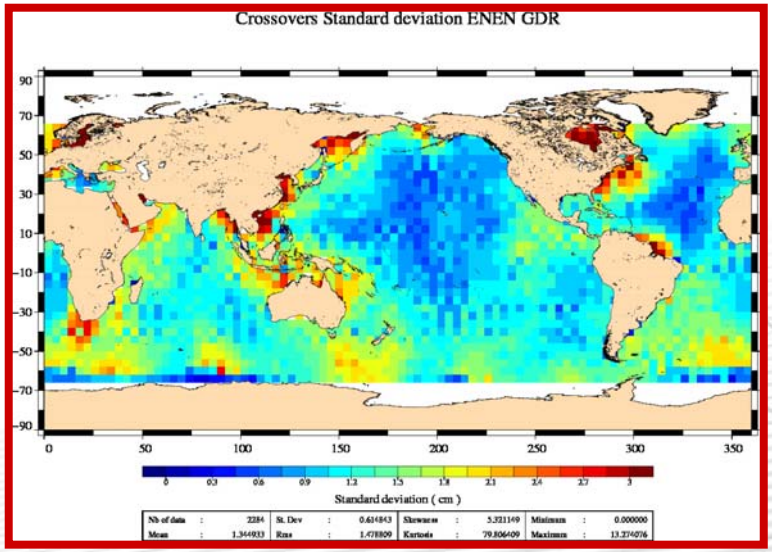


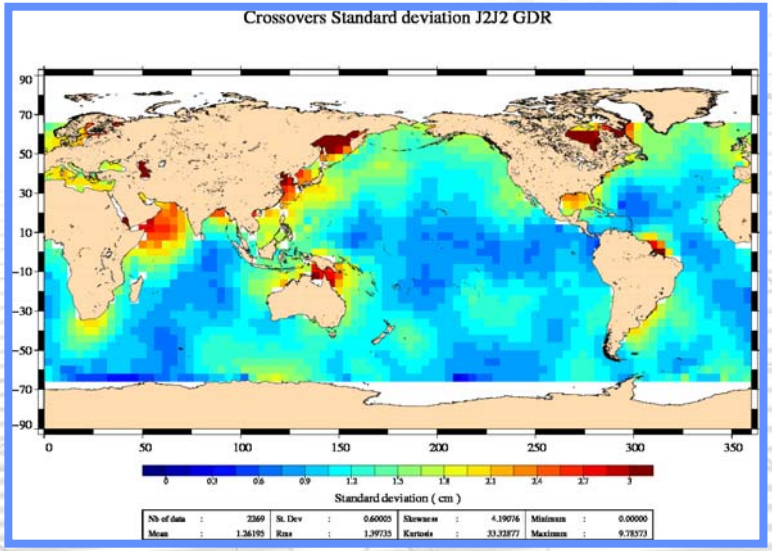




Standard dev at cross-overs using GDR SSH (with POE)







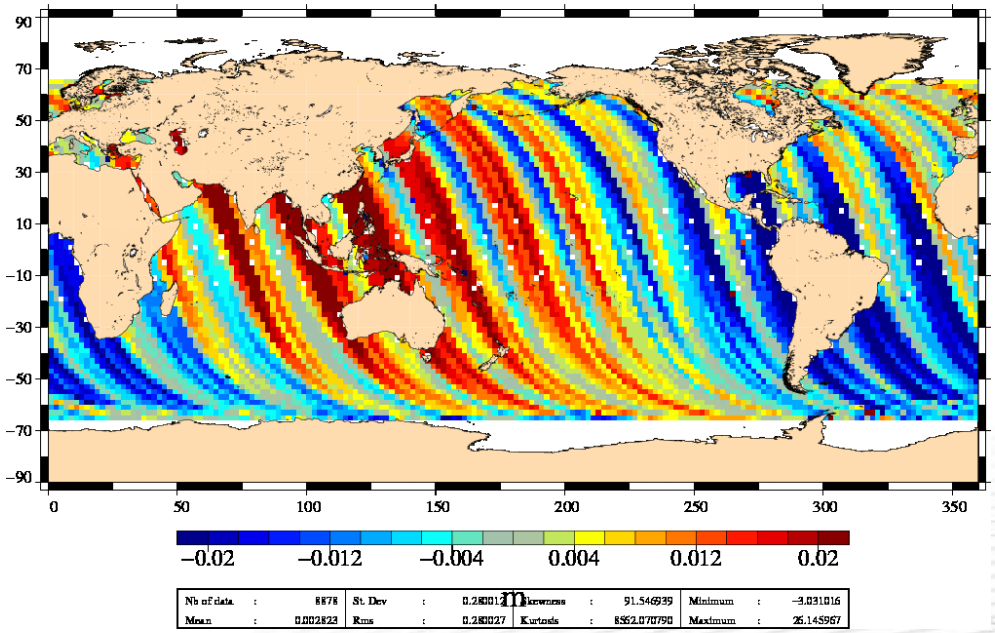
Ascending/Descending descrepencies for the difference Orbit POE – MOE

Jason-1:

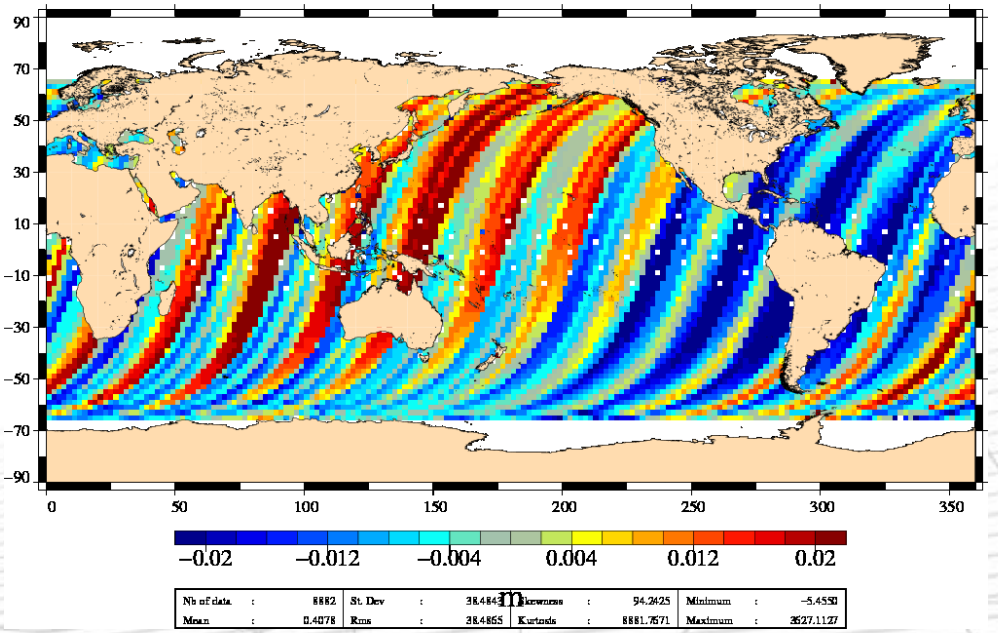
➔ Discrepancies on both ascending and descending tracks

Cycles 239-260

Even tracks ORB POE – MOE J1



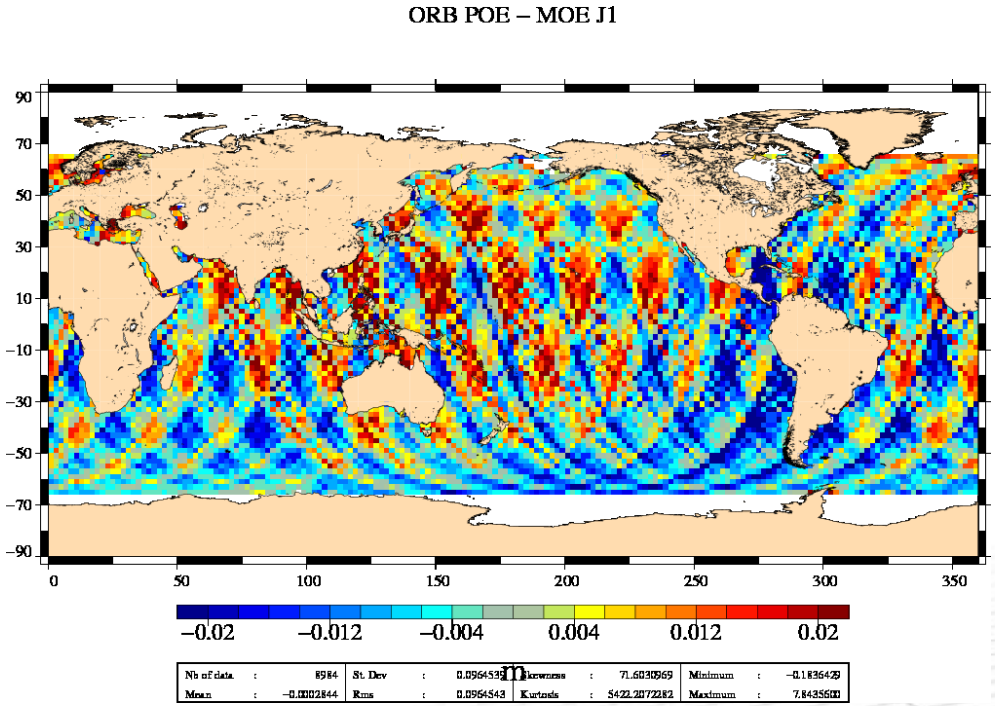
Odd tracks ORB POE – MOE J1



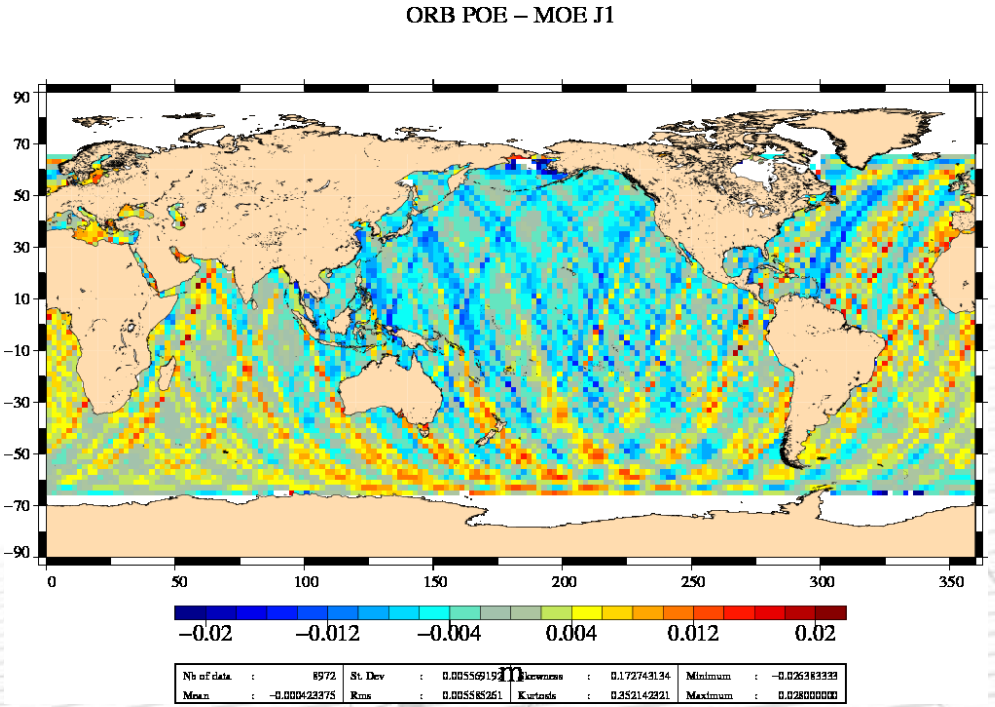
SAA introduction effect

Strong reduction effect on the POE-MOE Jaons-1difference

Cycles 257-260

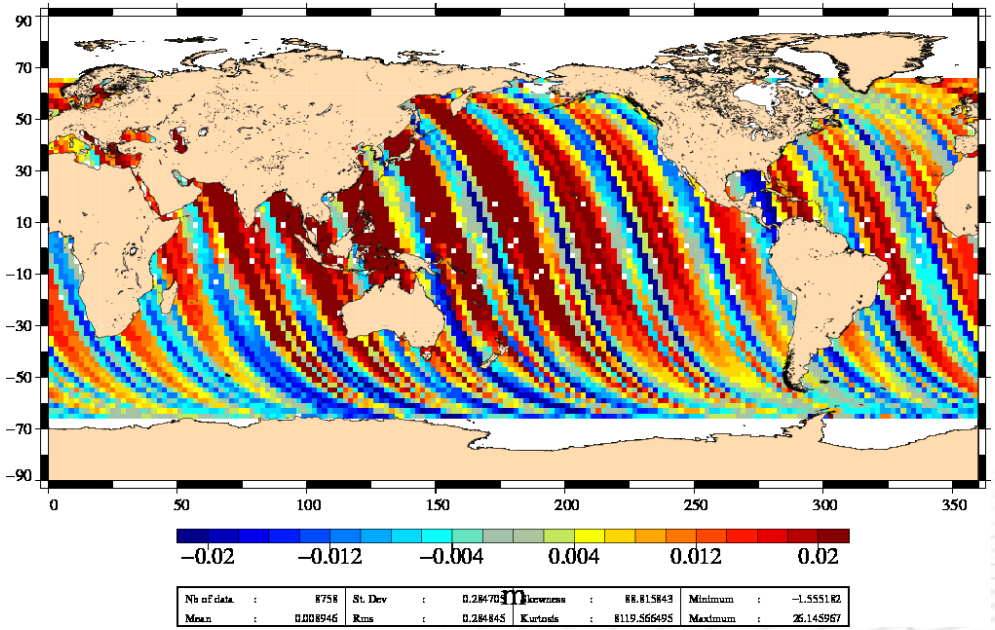


Cycles 267-270

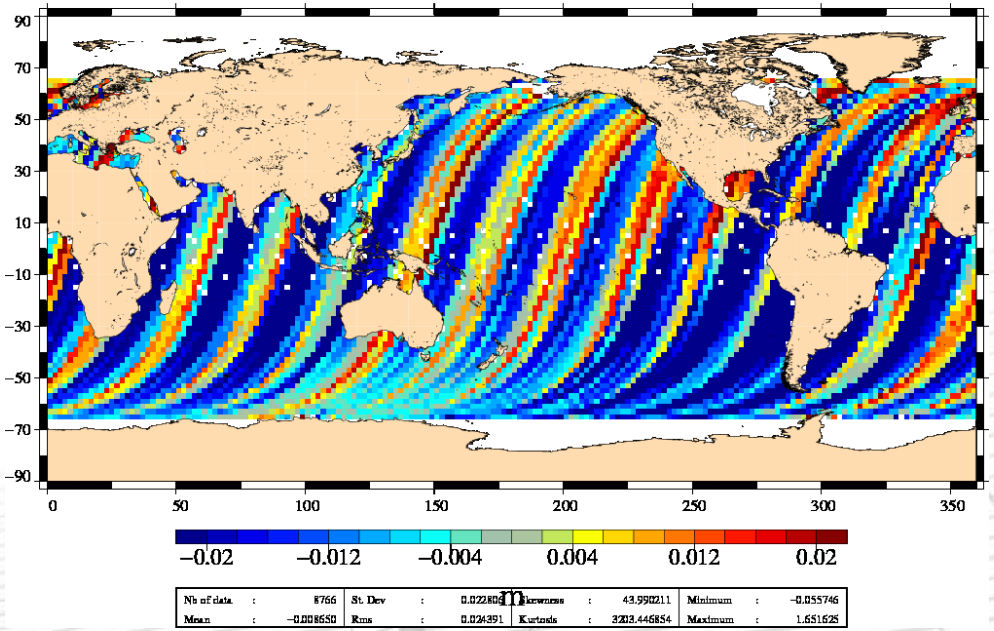


Cycles 257-260

Even tracks ORB POE – MOE J1

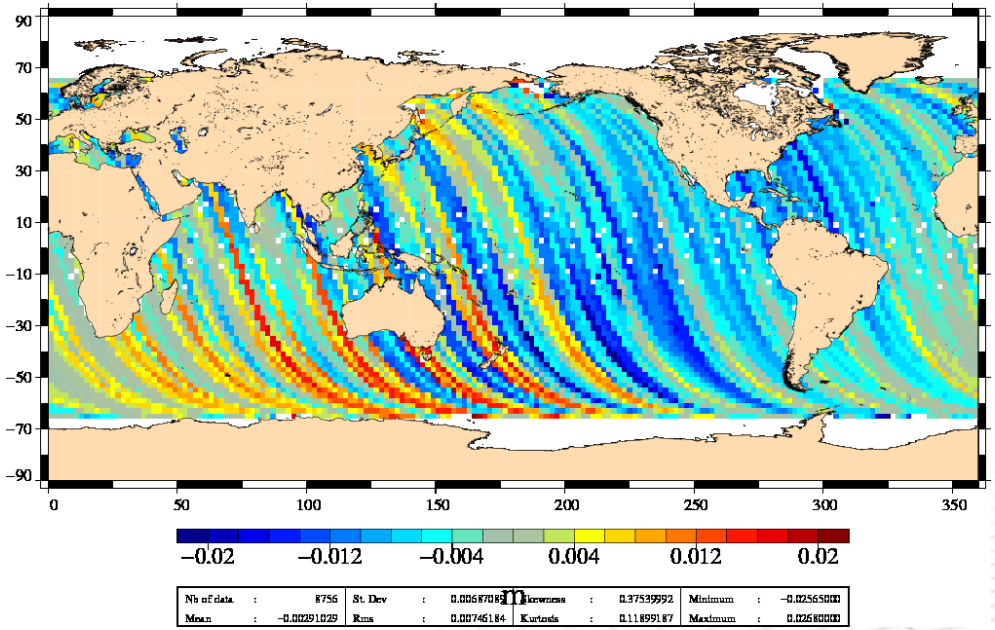


Odd tracks ORB POE – MOE J1

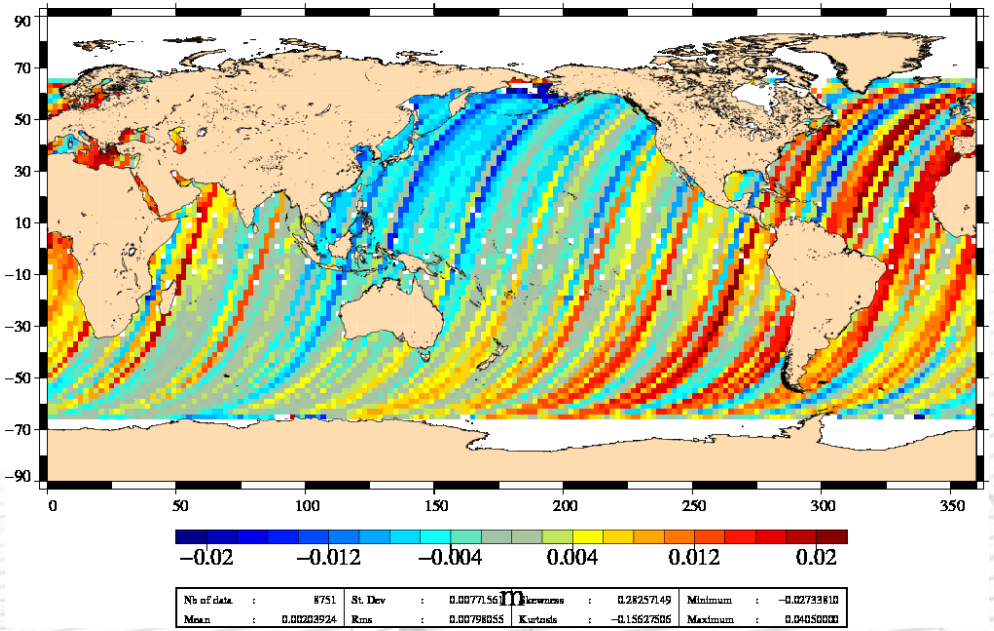


Cycles 267-270

Even tracks ORB POE – MOE J1



Odd tracks ORB POE – MOE J1

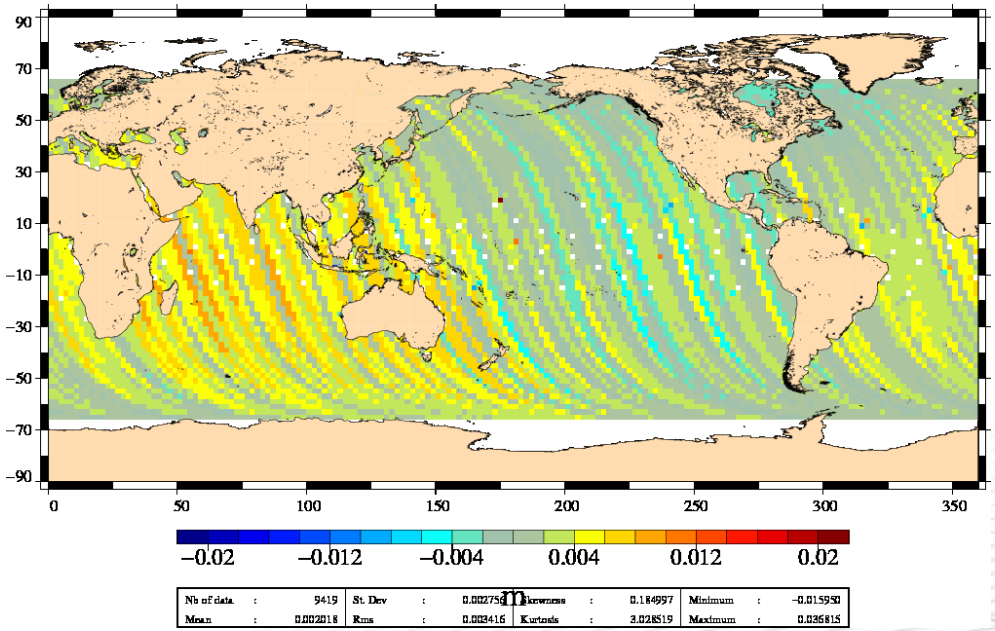


Ascending/Descending descrepencies for the difference Orbit POE – MOE

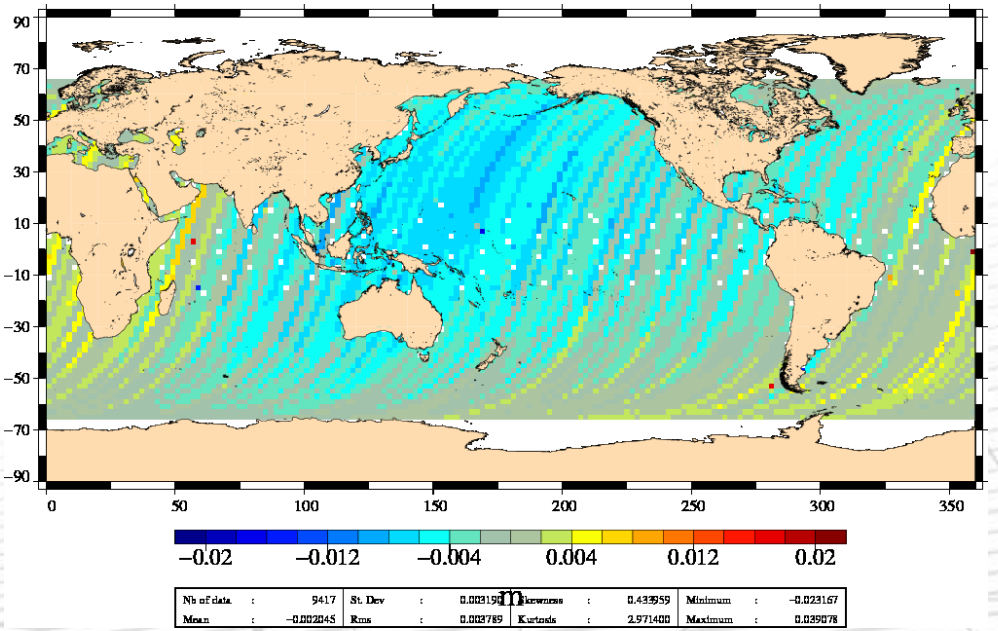
Jason-2:

➔ Around 4mm bias between Ascending and descending tracks (due to MOE, cf Average X_SSH GDR/IGDR)

Even tracks ORB POE – MOE J2



Odd tracks ORB POE – MOE J2

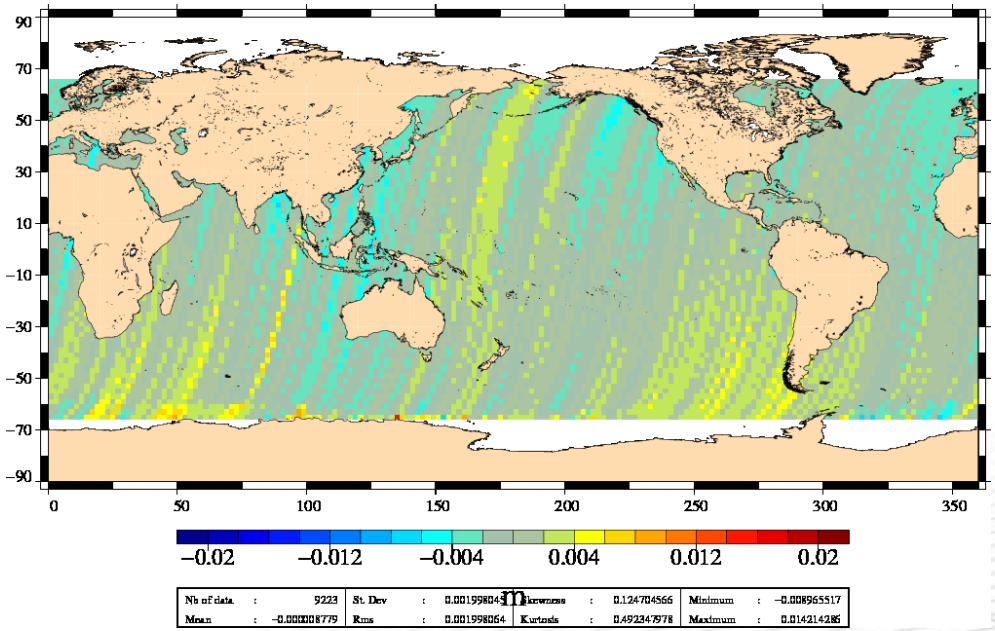


Ascending/Descending descrepencies for the difference Orbit POE – MOE

Envisat:

➔ Very good consistency both on Ascending and descending tracks

Even tracks ORB POE – MOE EN



Odd tracks ORB POE – MOE EN