Global Jason-2 and Jason-1 Data Quality Assessment

**S. Philipps[1] & S. Desai [2], H. Roinard [1], M. Ablain[1], G.Valladeau[1]
N Picot[3]**

1: CLS 2: JPL 3: CNES

Introduction

- Objectives of altimetry validation activities over ocean are :
  - To check the data availability and validity
  - To analyze the physical content quality of product parameters
  - To estimate the system performances
  - To contribute to a better knowledge of the sea-level physical content
  - To check the system improvement
  - To provide information for users and production centre (My Ocean/DUACS, …)

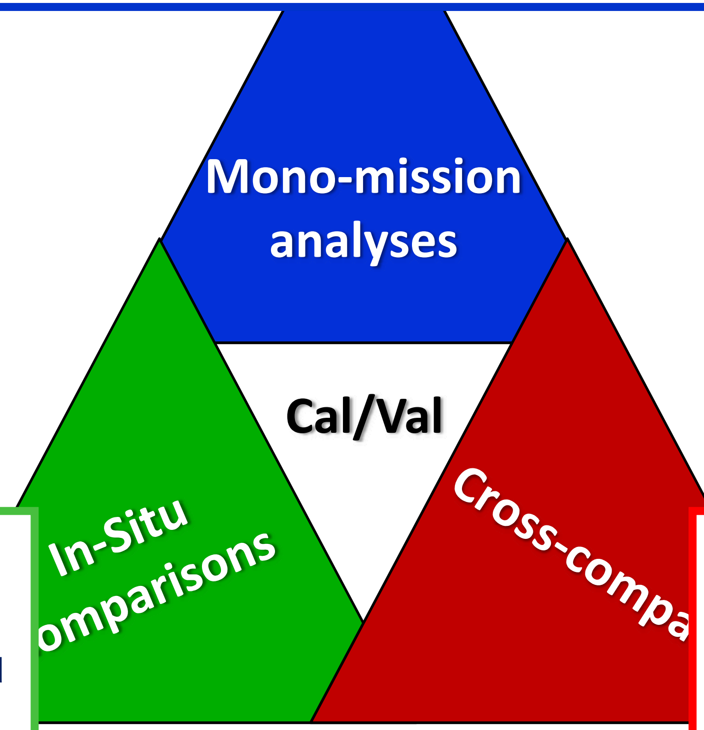
- Since launch of Jason-1 and Jason-2, GDR products are systematically checked on **CNES and JPL** side before distribution to users

Particular events during 2013

- Events:
  - Jason-2 Safe Hold Modes:
    - 25-03-2013 [cycle 174]
    - 30-03-2013 [cycle 174 & 175]
    - 05-09-2013 [cycle 190 & 191]
  - Jason-1 Safe Hold Mode:
    - 28-02-2013 [cycle 527 & 528]
  - Jason-1 was passivated and decommissioned on 1st July 2013 :
    - Contact lost and last measurement : 21-06-2013 [cycle 537]
- Data used:
  - 1 Hz Jason-2 (***homogeneous dataset in GDR product***)

  - 1 Hz Jason-1 (GDR-C)

Check the internal consistency of an altimetric system by analysing the Sea Surface Height (SSH), its parameters and geophysical corrections



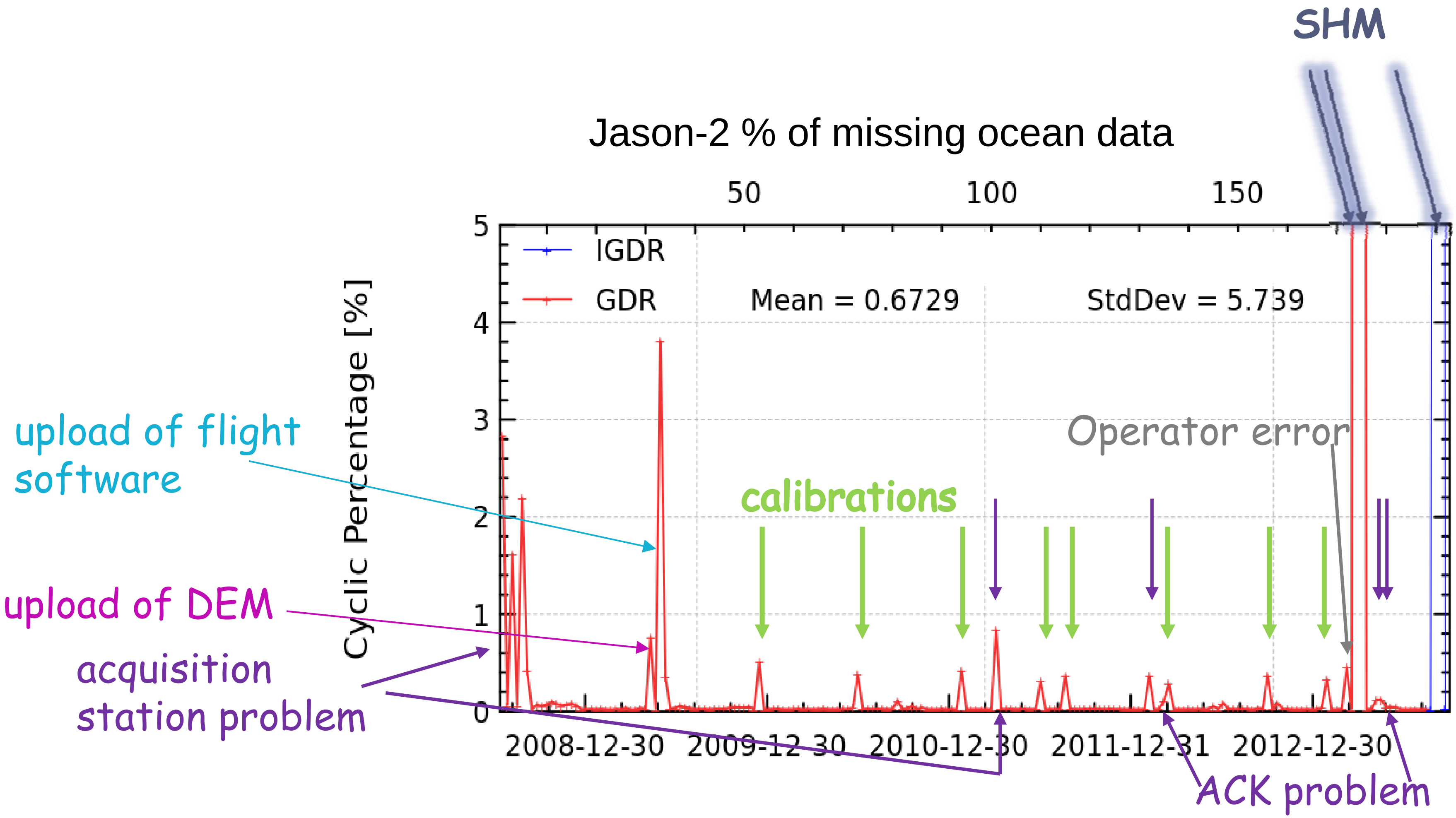
Compute the SSH differences between altimeter data and in-situ measurements (tide gauges, Argo T/S profiles,…) to detect potential drifts or jumps on the long-term time series

Evaluate the coherence between two altimeter systems by comparing their SSH and estimate the potential improvement of the computation of a new altimeter standard in the SSH calculation.

Mono-Mission Analyses

Data coverage

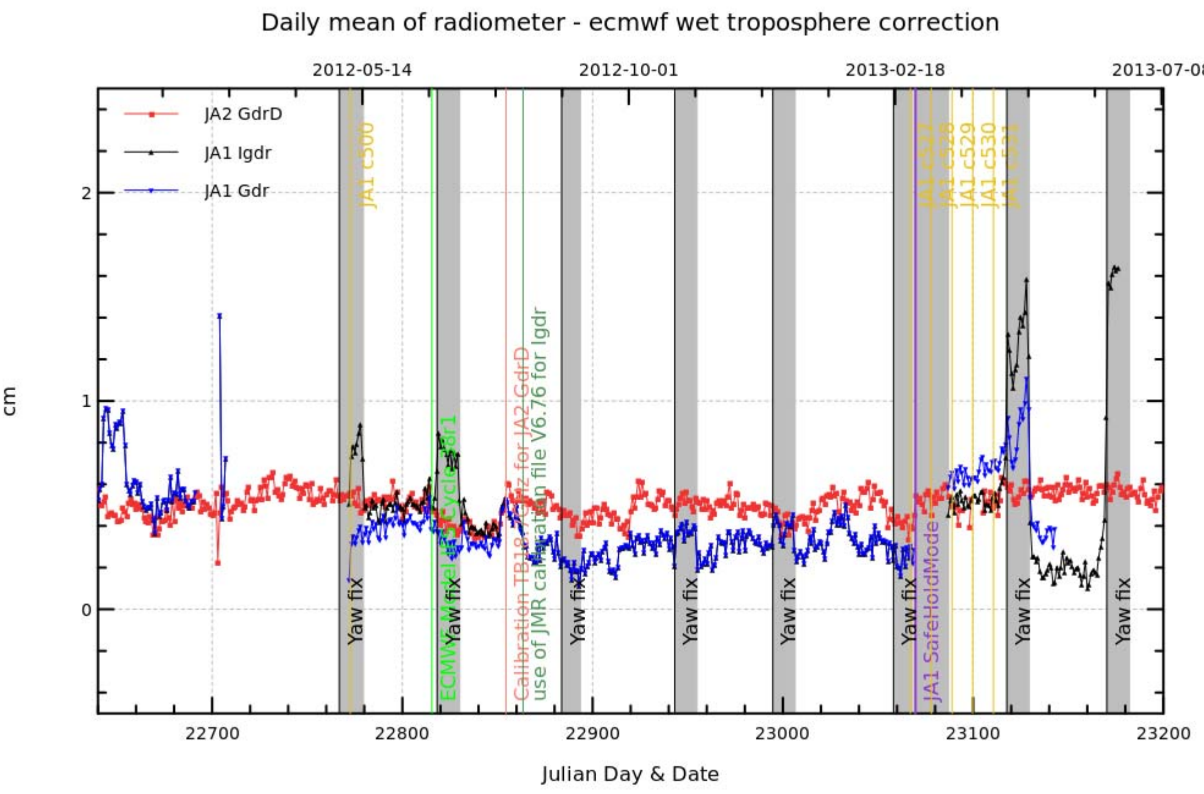
- Jason-1 (> 95 %) and especially Jason-2 (> 99%) have excellent data coverage
- only few data rejected (~3.5 %) after land and ice removal



Mono-mission analysis

Stability of the radiometer wet troposphere correction

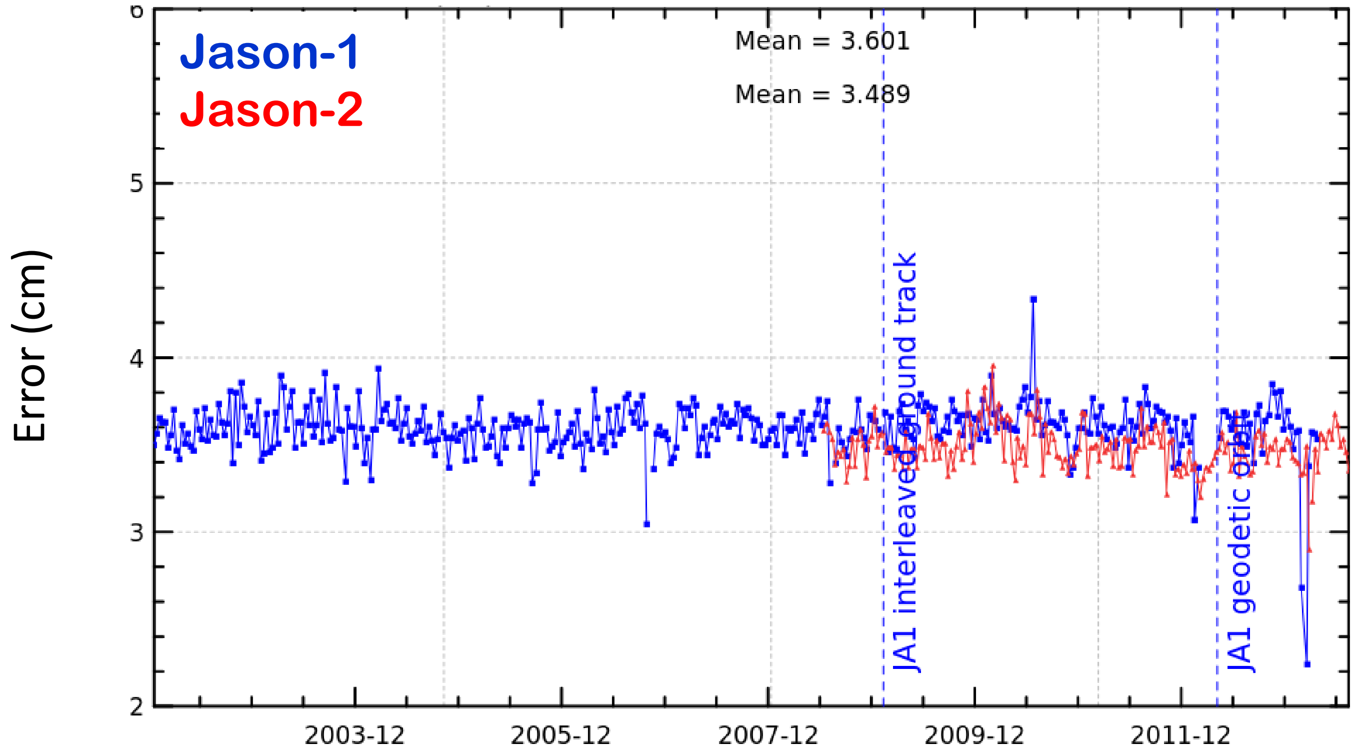
- Daily monitoring of radiometer – model wet troposphere correction showed impact of more than 1 cm during Yaw fix periods after March 2013 safehold
- GDR production was interrupted in order to allow generation of new calibration coefficients (JPL), which reduces the attitude dependant error of JMR
- A pre/post safehold bias remains (to be addressed by an end-of-mission dedicated recalibration of the JMR)



System error

- Altimeter system error JA1/JA2 products after removing of instrumental noise for time scales < 10 days (using radiometer data):

cm	Jason-1	Jason-2
OSDR/OGDR	8.57	4.62
IGDR	4.06	3.77
GDR	3.60	3.49

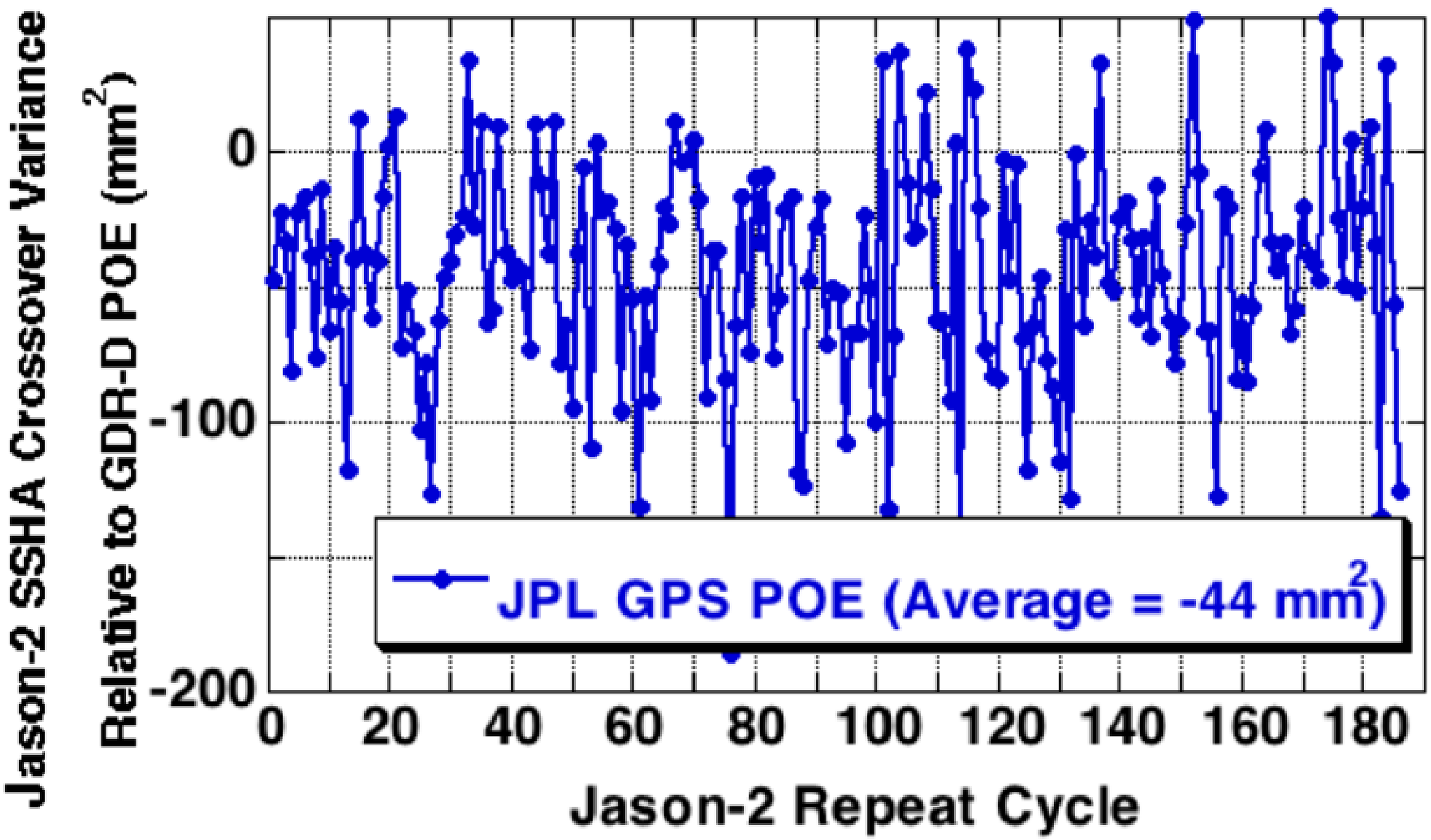


GDR

selection on
- *|latitude|<50*
- *bathy<-1000m*
- *low variability areas*

Impact of standards on System error

- Using JPL GPS POE instead of GDR-D POE reduces the system error by 44 mm2



Multi-Mission Analyses

Geographical correlated errors between missions

Multi-mission analysis

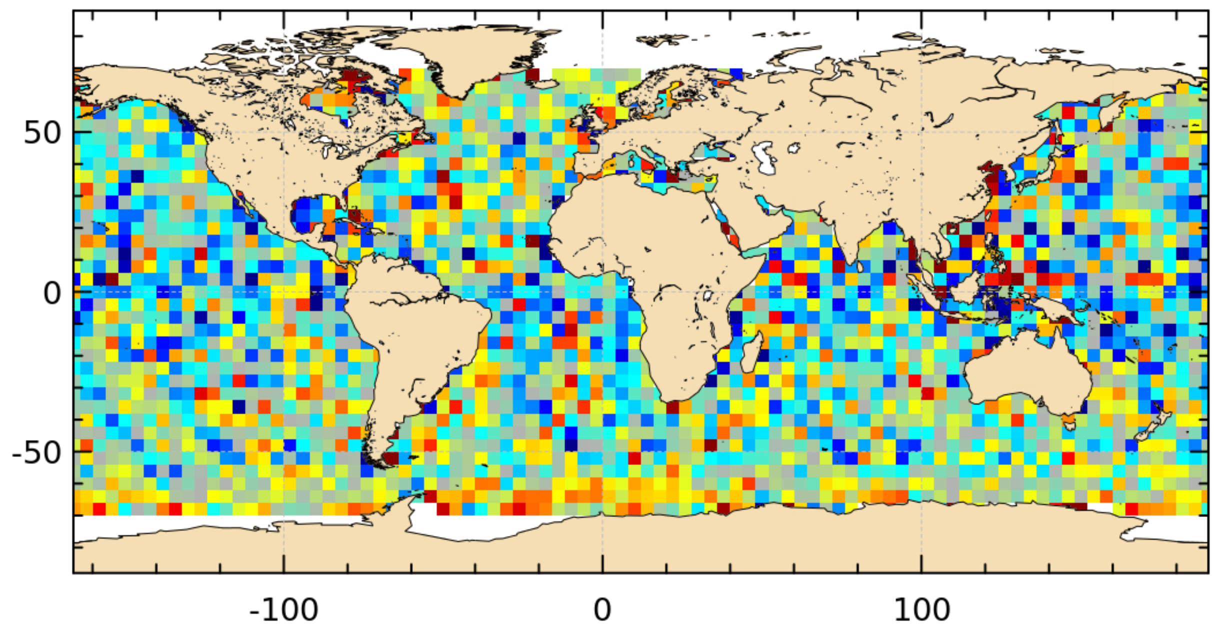
Product standards
JA1: POE-C/D, GOT00,SSB
JA2: POE-D,GOT4V8,SSB

JA1 updated standards
JA1: **POE-D, GOT4V8**,SSB
JA2: POE-D,GOT4V8,SSB

+ updated **SSB 2012**
(for JA1 +JA2)

+ Doris only orbit (for JA1 + JA2) without down-weighting of SAA stations for JA1

JA1– JA2 mean at crossovers over year2009 using model WTC



centered around 0.072, median= 0.072, std= 0.024 m

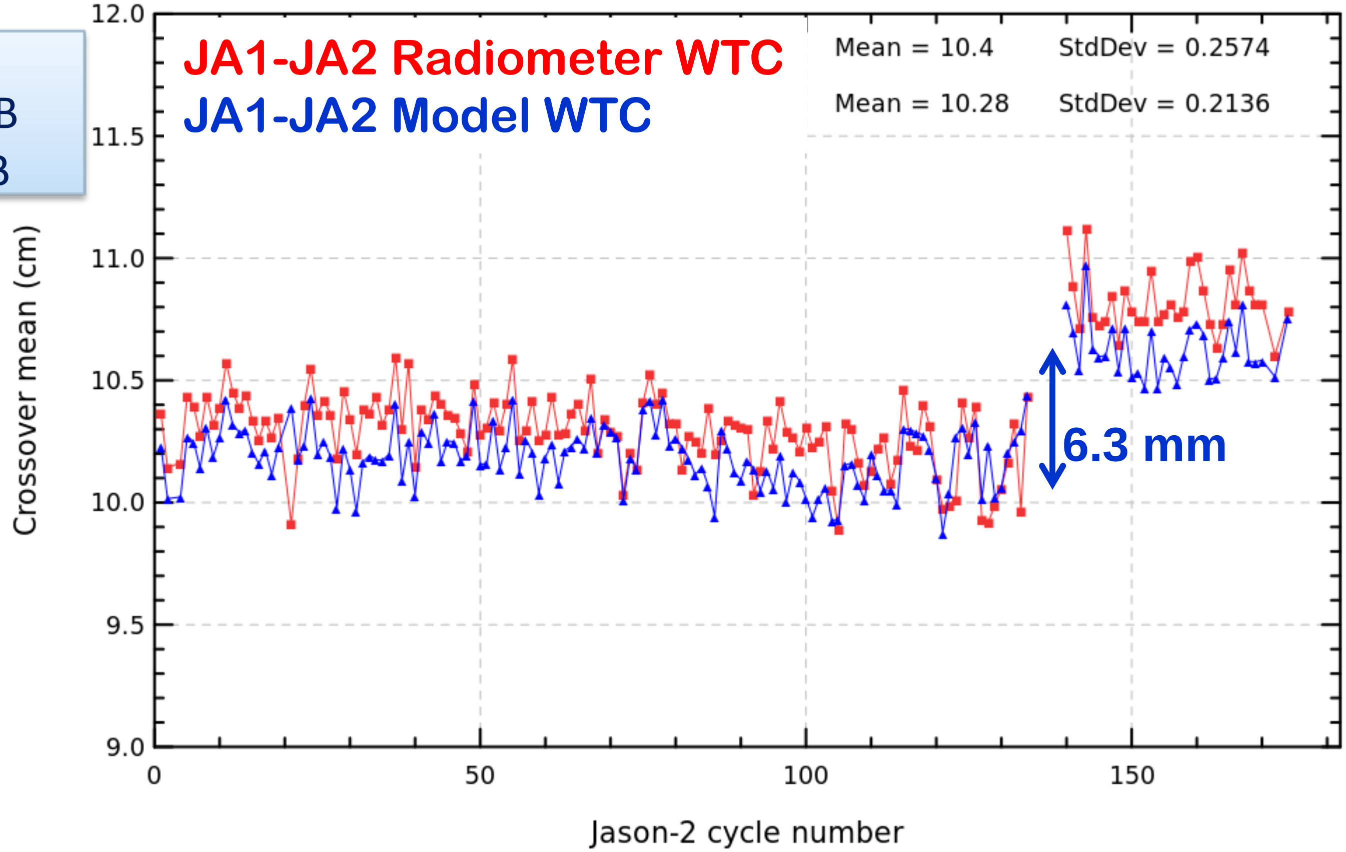
- 1.5 cm … 1.5 cm

Evolution of differences between missions

Multi-mission analysis

- Temporal monitoring of Jason-1 – Jason-2 mean at crossovers shows a jump of several mm after switch to geodetic mission for JA1
  - partly explained by small jump on JMR wet troposphere correction and more precise PRF
- Has to be corrected when computing global mean sea level trends for JA1

JA1 updated standards
JA1: **POE-D, GOT4V8**,SSB
JA2: POE-D,GOT4V8,SSB

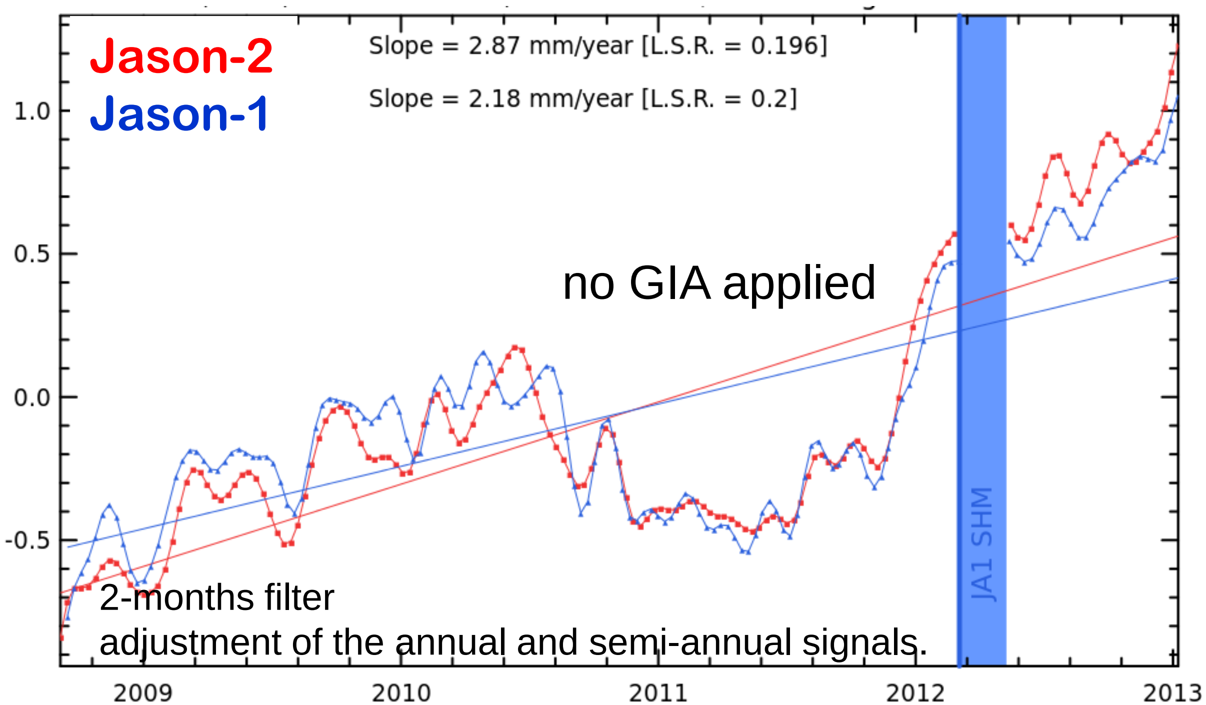


Comparison between Jason-1 and Jason-2 GMSL

Multi-mission analysis

- Global Mean Sea Level computed :
  - over **common period of Jason-1 and Jason-2**
  - bias between JA1 repetitive and JA1 geodetic corrected

→ ~4.5 years (July '08 -> February '13) shows differences of about **0.7 mm/yr** with radiometer wet troposphere correction



Multi-mission analysis

Global MSL monitoring

Difference of Jason-2 GMSL – Jason-1 GMSL computed over Jason-2 cycles

JA1 updated, homogeneous solutions for:

- POE-D orbit,
- GOT4.8 tide,
- MSS 2011

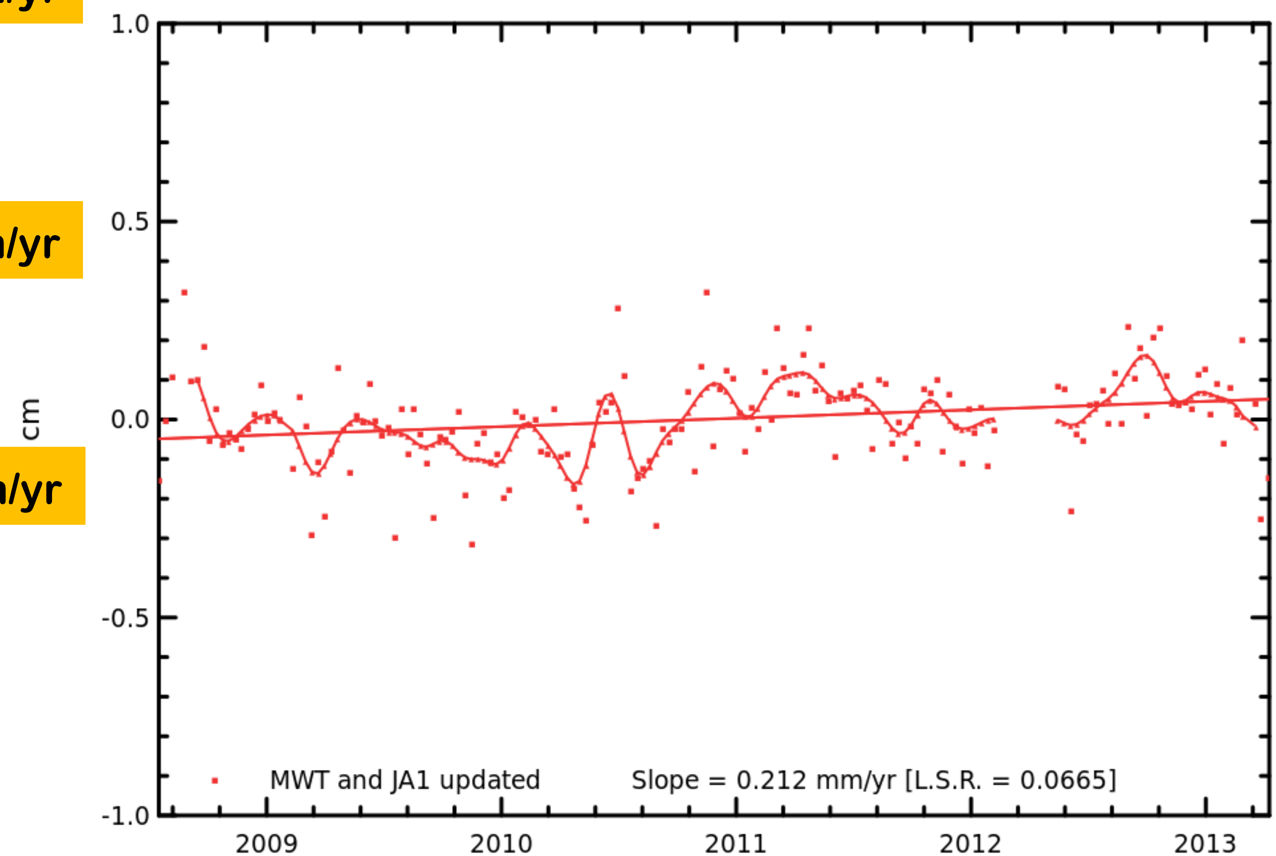
Radiometer Wet Troposphere + JA1 product data — **0.71mm/yr**

⇩

Radiometer Wet Troposphere **+ JA1 updated** — **0.63mm/yr**

⇩

Model Wet Troposphere + JA1 updated — **0.21mm/yr**



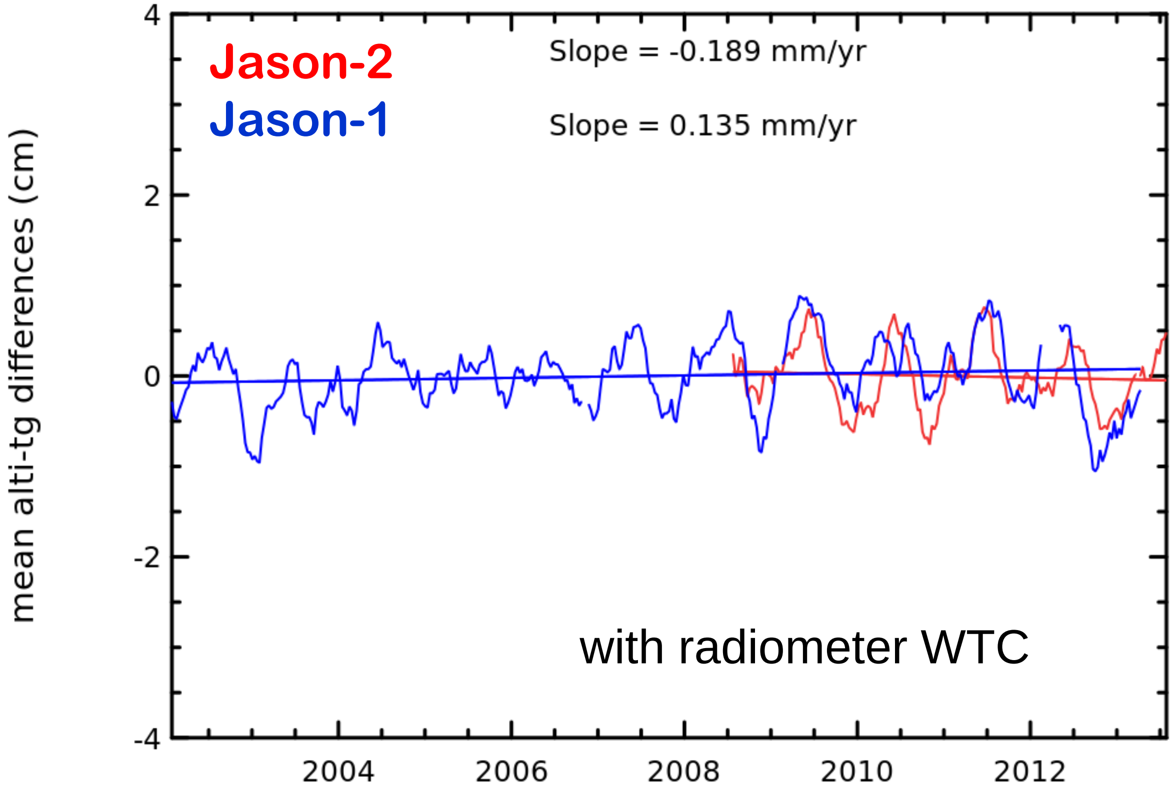
In-situ comparisons

Comparison to tide gauges

The error of Jason-1 & 2 GMSL trends is estimated thanks to comparison to tide gauges :

- Jason-1 GMSL drift : 0.1 mm/yr from 2002 to 2013
- Jason-2 GMSL drift : -0.2 mm/yr from 2008 to 2013
- Considering the error of the method (0.7 mm/yr), this drift is not significant

Jason-1 & 2 allow to estimate very accurately the GMSL



Synthesis/ Conclusion

- Jason-1 and Jason-2 data coverage and quality are excellent for both satellites, with a very good consistency
  - ⇒ SSH error <= 4 cm for temporal scales < 10 days
  - ⇒ Global MSL trend differences <= 0.3 mm/yr (with model WTC)
  - ⇒ Correlated geographical bias < 1 cm

- Some discrepancies have been detected :
  - ⇒ Radiometer drifts ~0.4 mm/yr between JMR and AMR
  - ⇒ Correlated geographical bias between orbit solutions and SSB solutions which changes slightly in time.

- Although Jason-1 mission is ended, further work is needed to improve Jason-1 data in parallel to Jason-2 and SARAL/Altika missions for mesoscale and climate applications.

- This work, as well as interactions between production teams, CalVal teams and experts contributes to the high quality of the Jason data.