CALVAL splinter summary

Regional and Global CAL/VAL for Assembling a Climate Data Record

Chairs: P. Bonnefond, B. Haines, S. Nerem; S. Desai, N. Picot

Local calibration/validation
(*focusing on bias*)
Wednesday, October 19th
Chairs: P. Bonnefond, B. Haines, S. Nerem

6 oral presentations

3 posters

Local Cal/Val summary report

- Good coherence of absolute biases from in-situ studies but also from regional approach
  - 10-15 mm rms differences for T/P, Jason-1&2
  - Stability from one OSTST meeting to another at the mm level
- First results of the use of transponder (Gavdos)
  - Very good stability of the range bias (20 mm rms) but absolute value needs to be revisited after transponder calibration at CNES
  - Datation bias of 40 ms has also been derived
- Frequency analysis of the bias time series:
  - shows a clear 60d signal for T/P-ALTB from Harvest and Bass Strait (not as clear for ALTA @ Harvest, as well as for Jason-1&2)

Global calibration/validation
Thursday, October 20th
(*focusing on corrections quality assessment and error budget assessment*)
Chairs: S. Desai, N. Picot

6 oral presentations

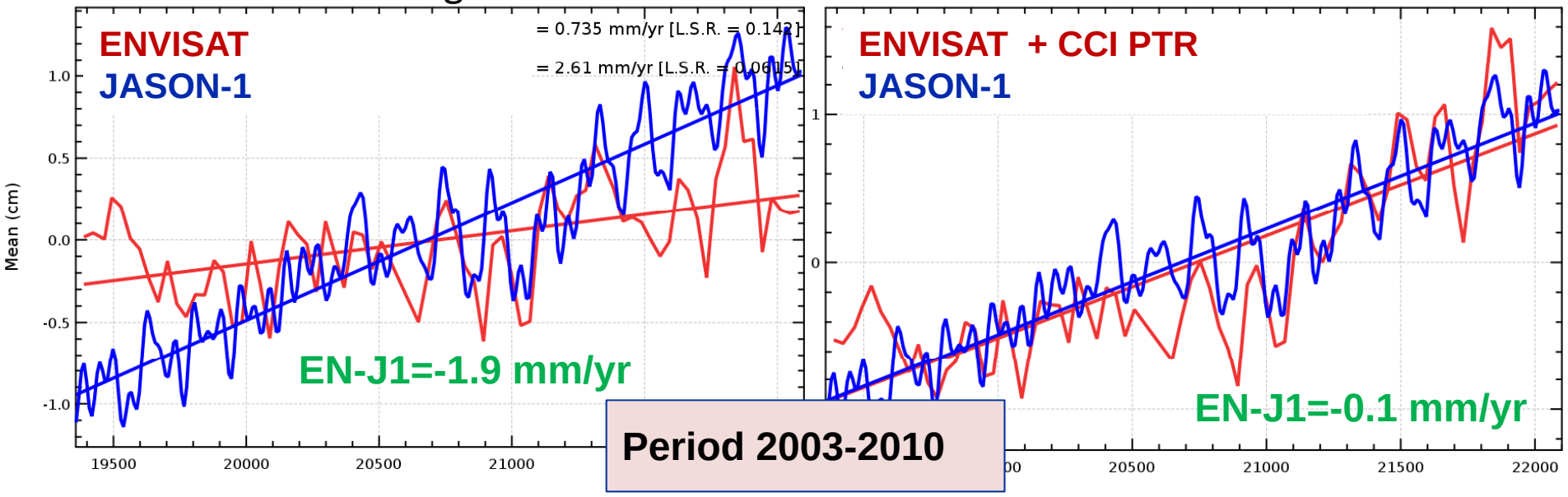
10 posters

Global Cal/Val summary report

- Very good data quality data from Jason-1&2 missions:
  - All papers demonstrated the high performance of those missions, using Xover and SLA metrics.
  - The overall stability of the reference missions was also emphasized, however the radiometer wet tropospheric correction has some instabilities that need to be monitored carefully.
  - Global in situ data analysis (tide gauges and/or ARGO) is also very important, and benefits are evidenced for both altimeter missions and in situ data sets.
  - Preliminary results support that the apparent drift of OSTM/Jason-2 relative to tide gauges has been resolved:
    - Reduced to +0.28 mm/yr thanks to tide gauge editing (land motion, e.g. Pago Pago), new orbits (variable gravity field) + AMR calibration.

Global Cal/Val summary report

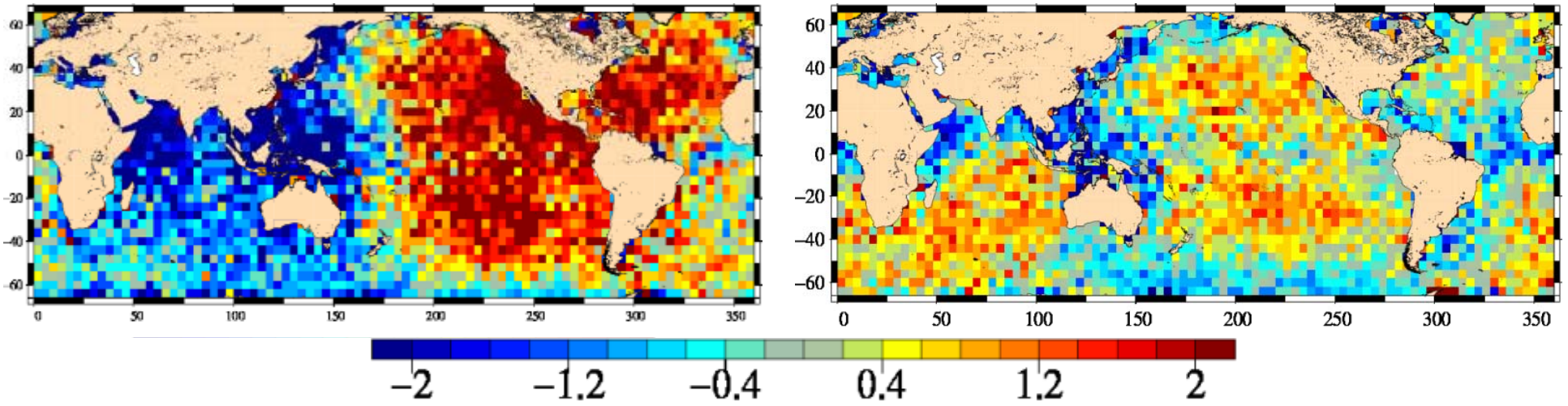
- LRM CryoSat retracking has been experienced by several groups and performance seems good
  - NOAA is ready to distribute products through RADS, pending approval by ESA
- ENVISAT 'GDR_C' reprocessing is ongoing, improving the data quality:
  - However, some remaining drifts are evidenced, mainly for the period 2002-2003, and the PTR correction was not included in this reprocessing with the correct sign.



Global Cal/Val summary report

- ENVISAT ‘GDR_C’ reprocessing is ongoing, improving the data quality:
  - POE GDR_D quality improves the coherence with Jason-1&2 missions: this reinforces the need for a **routine multi mission CalVal activity**.

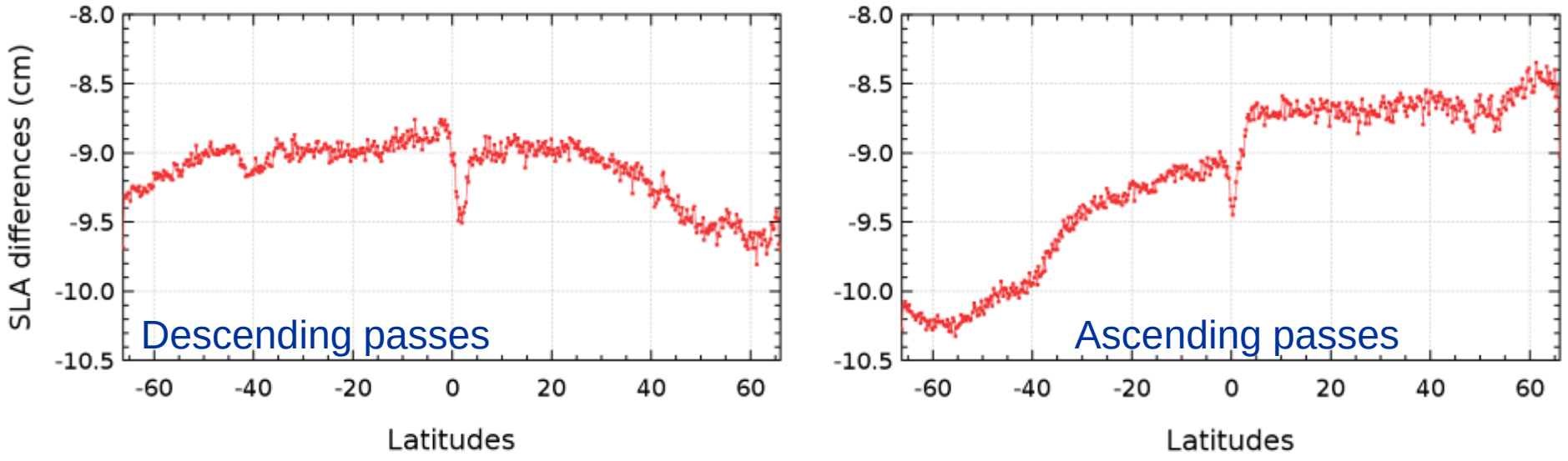
EN GDR-C orbits / J1 GDR-C orbits **2010** EN GDR-D orbits / J1 GDR-D orbits



Global Cal/Val summary report

- Empirical corrections have been computed to improve Mean Sea Level trends derived from all the altimetry missions. TOPEX has unusual behavior as a function of latitude.

TOPEX reprocessing is required to improve the climate altimetry data record.



Cal/Val discussion

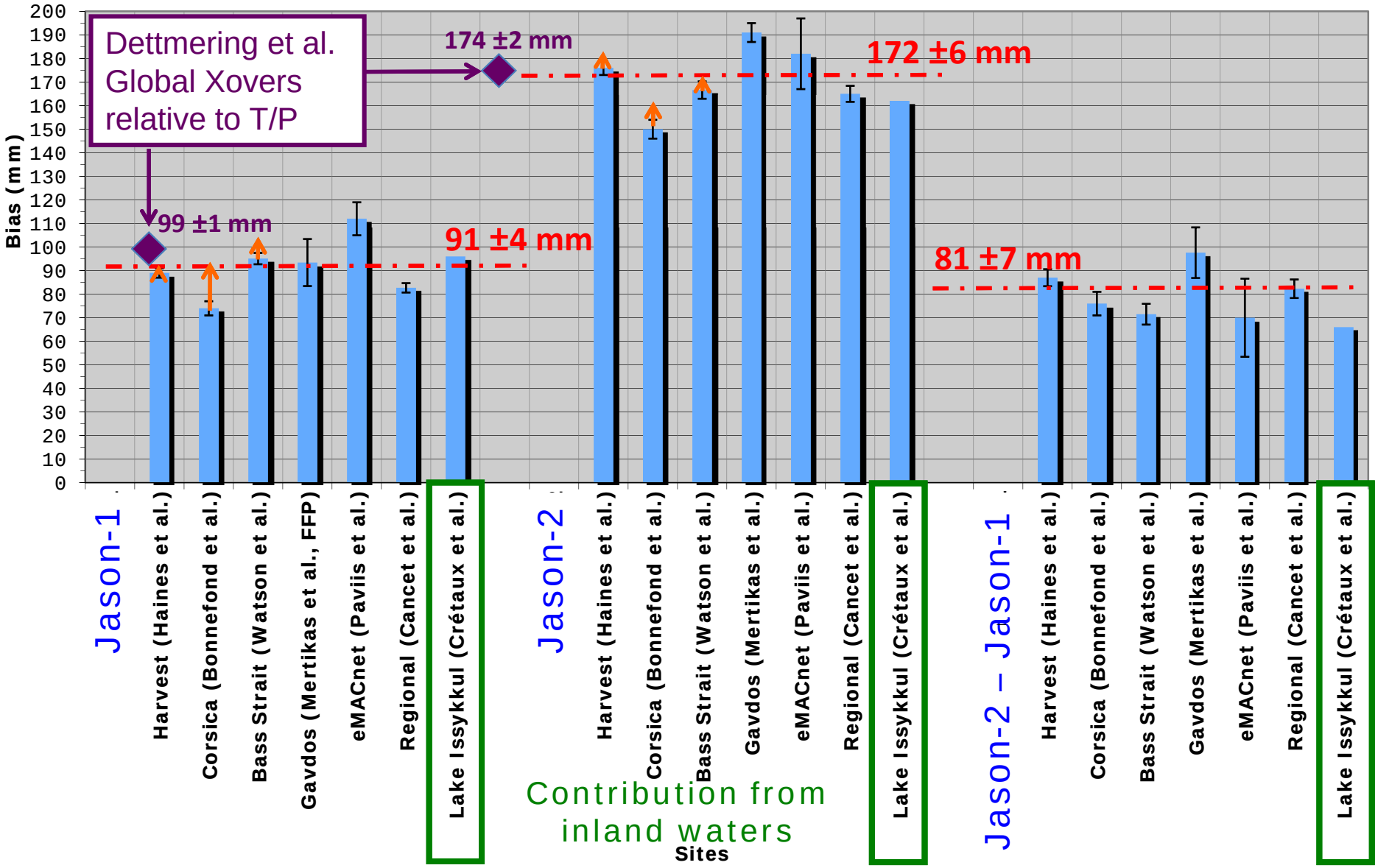
- Some questions were raised:
  - As the GDR is the data set for the climate record, is the 60-d latency used for JA2 a good compromise? One proposal is to enforce a mandatory reprocessing (every 2 years ??) of the GDR, keeping in mind the need to ensure the long-term stability (radiometer, orbit, ….) of the climate data record.
  - JA1&2 error budget figures ? The error budget needs to be assessed regularly: there are still issues with the figures available today (mainly on wind and SWH)
  - Analysis on other key parameters? This should be reinforced (wind, water vapor, …), with expert support from other communities.
  - Add quality metrics on the operational products (OGDR and IGDRs) ? There is a need to provide more data quality metrics data to end users: this should addressed in future OSTST CalVal meetings
  - Assessment of CryoSat SAR data quality ? It will be challenging taking into account the small areas covered. It was noticed, however, that the Mediterranean Sea provides a good target (low variability) and that it is better to keep the current SAR acquisition in place (long term analysis). It was also recommended to plan more SAR acquisitions over in situ sites (tide gauges, …)
  - Orbit centering and reference point ? Do oceanographers want the orbit referred to the center of mass of the whole Earth system, or to the origin of the terrestrial reference frame? On the long term (periods > 1 yr), the two should agree. At annual frequencies, however, the two disagree at the 5-mm level. Note that there is no consensus model for the annual geocenter motion.

Summary of the absolute biases from in-situ calibration sites

Use of the Enhanced Path Delay (Brown et al., JPL)

Based on GDR-C and GDR-T for Jason-1 and Jason-2 respectively

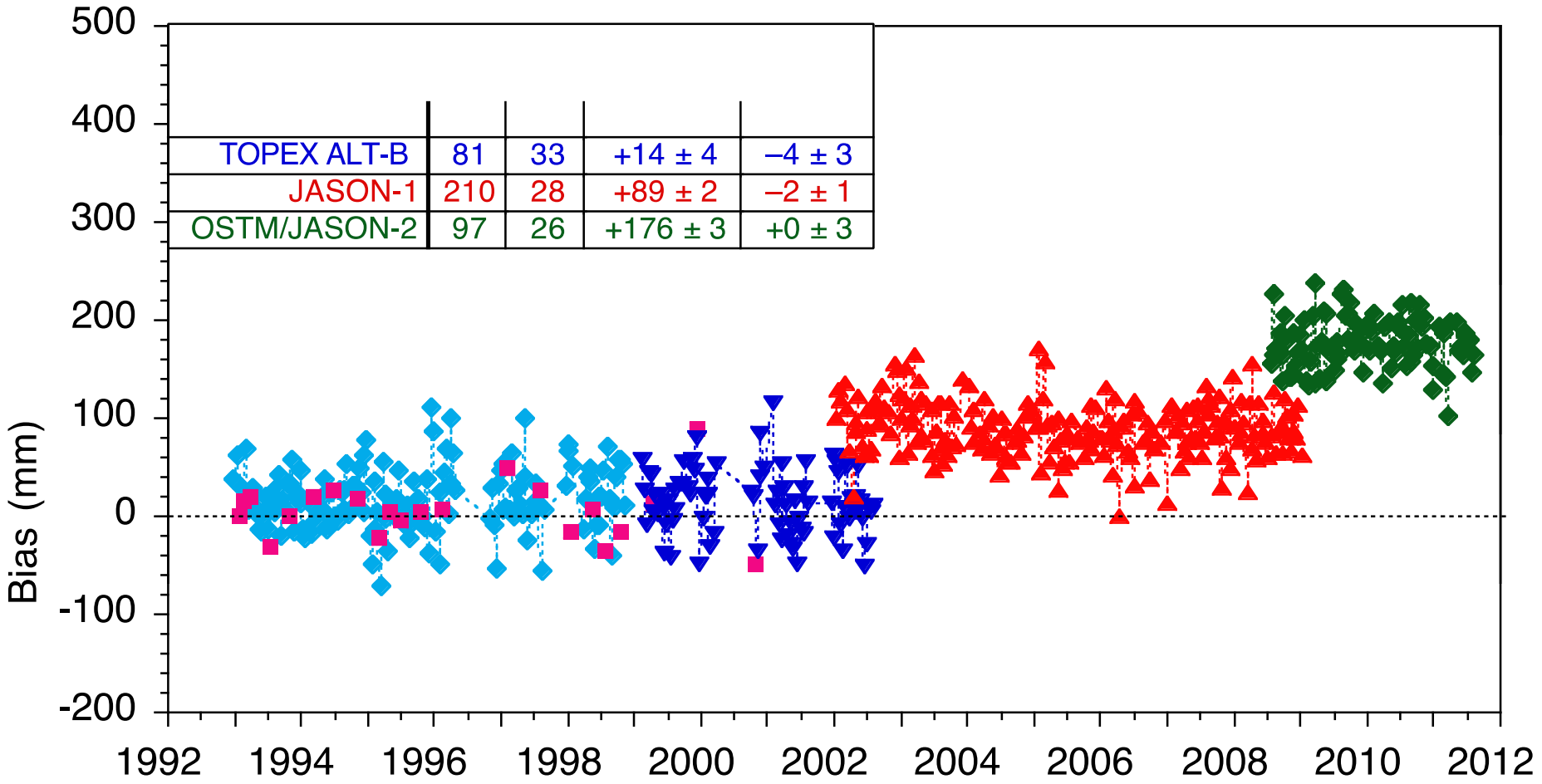
better reconciles results from individual calibration sites



Harvest SSH Calibration Time Series

Nominal Time Series:

T/P: MGDR + reprocessed orbits (*Lemoine et al.*, 2010) and wet trop. (*Brown et al*., 2009); **Jason-1:** GDR-C; **Jason-2**: GDR-T

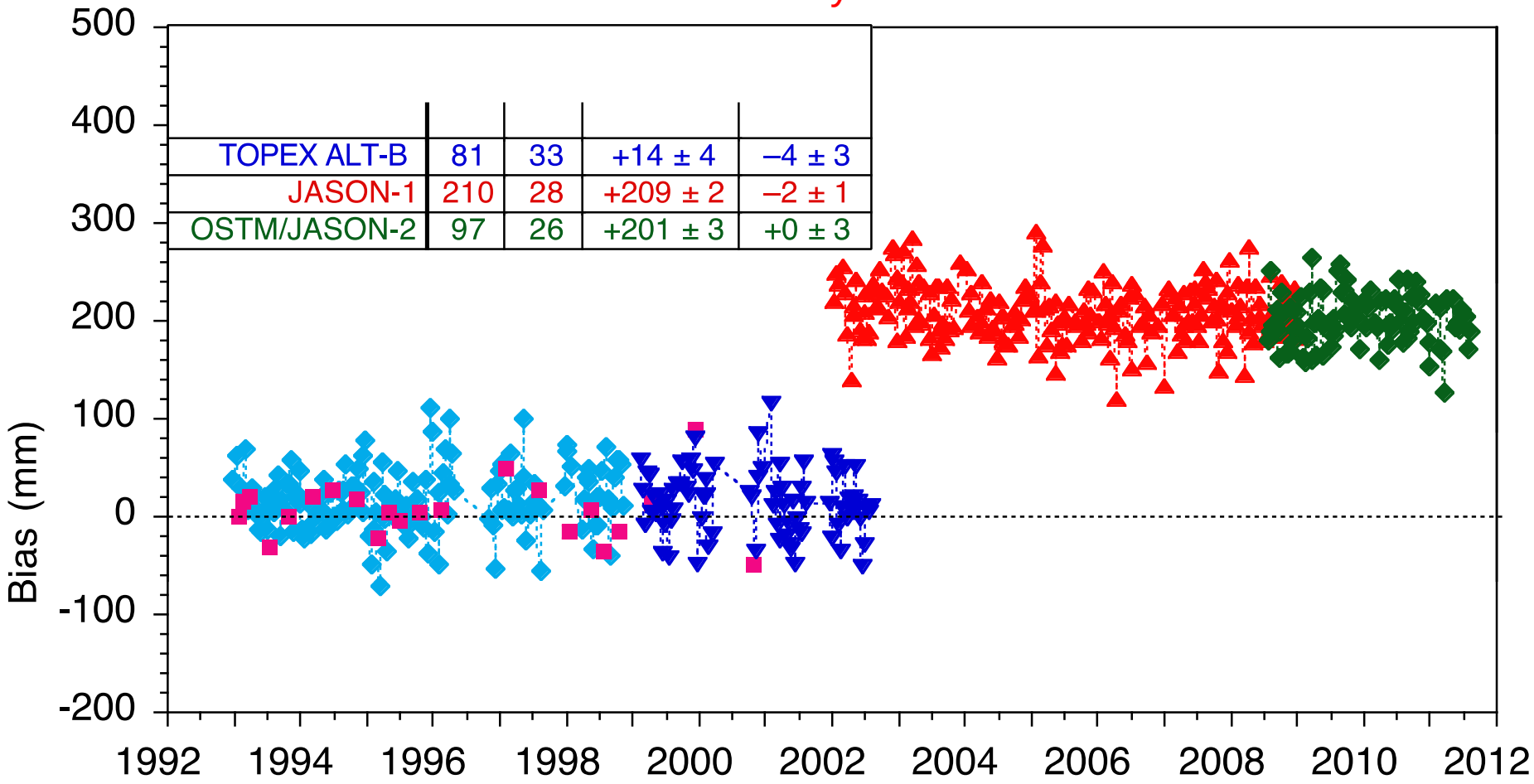


Harvest SSH Calibration Time Series

Update 1:

Correct Jason-1 and Jason-2 ranges for errors (biases) from altimeter characterization files (*Desjonquères et al.*, 2009)

=> Both biased by ~20 cm

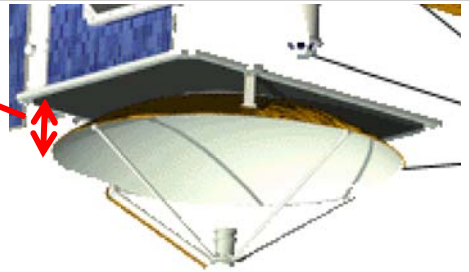


Harvest SSH Calibration Time Series

Update 2:

Correct Jason-1 and Jason-2 ranges due to inconsistent definition of antenna reference point (*Desjonquères et al.*, 2011)

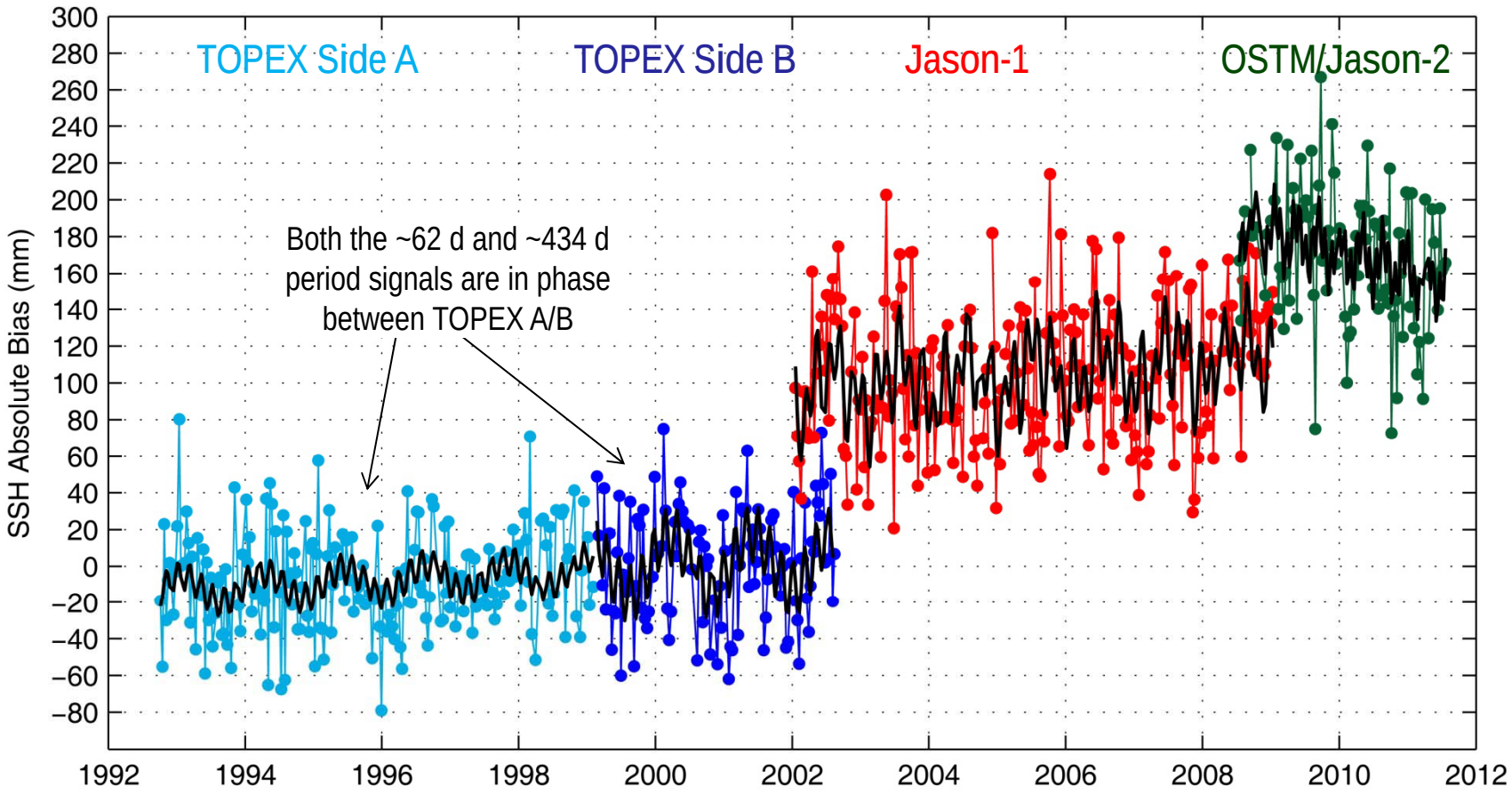
=> ~20 cm removed => ~zero biases



TOPEX ALT-B	81	33	+14 ± 4	–4 ± 3
JASON-1	210	28	+28 ± 2	–2 ± 1
OSTM/JASON-2	97	26	+20 ± 3	+0 ± 3

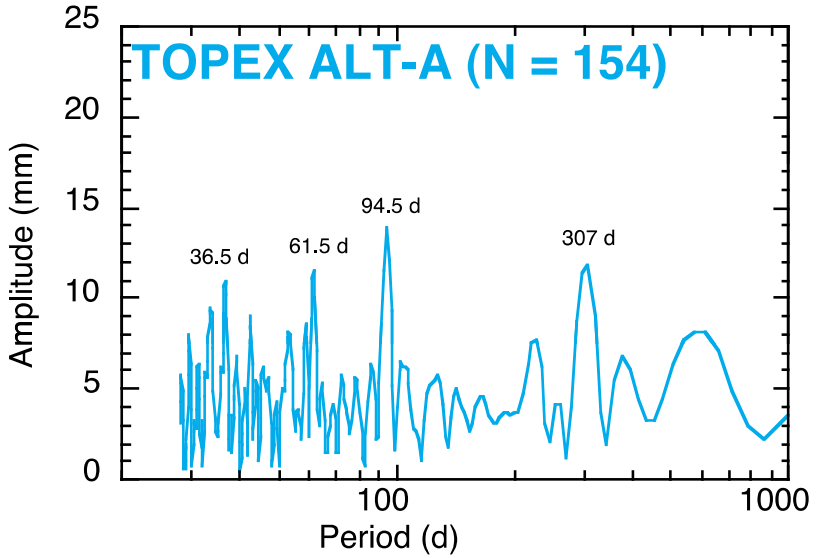
Preliminary results (Corsica & Harvest) using the first 8 cycles of Jason-2 GDR-D also show that the bias is almost removed

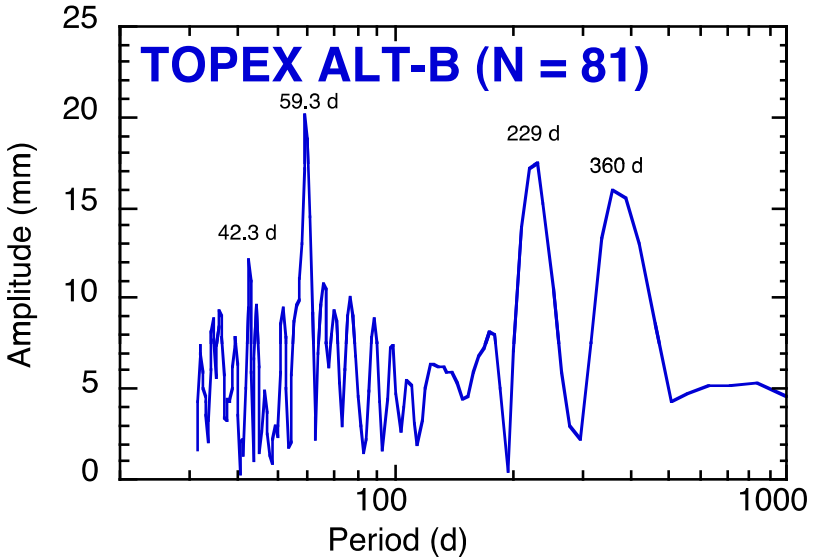
Bass Strait Absolute Bias Record

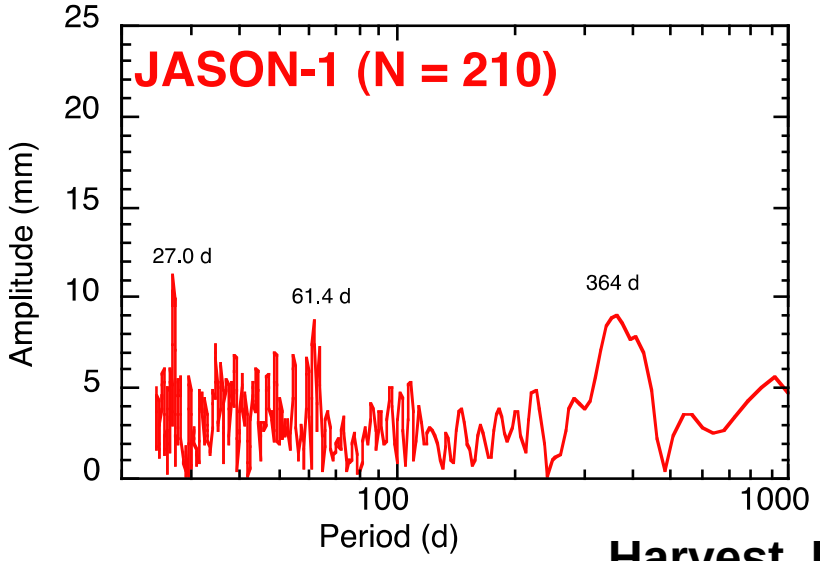


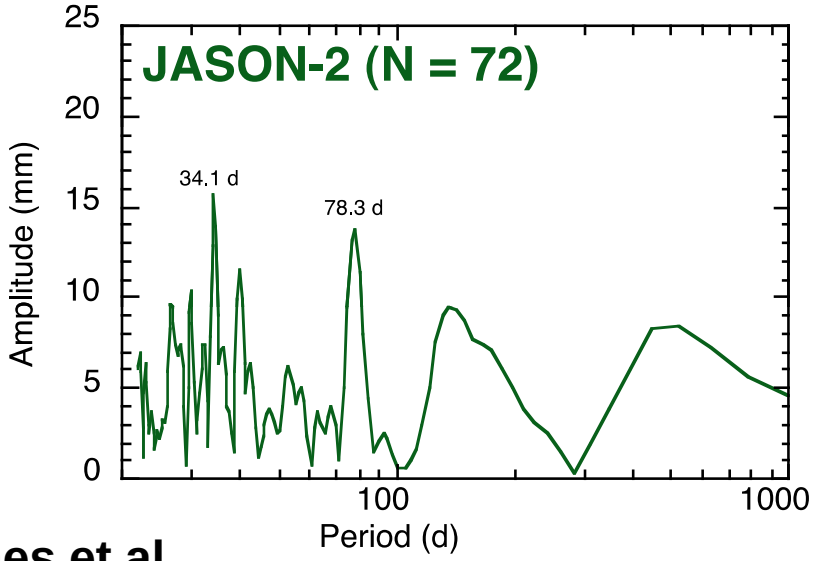
	TOPEX Side A	TOPEX Side B	Jason-1	OSTM/Jason-2
Linear rate:	+1.8 ± 1.0 mm/y	+1.2 ± 2.6 mm/yr	+2.6 ± 1.0 mm/yr	-11 ± 4 mm/yr
Variance exp:	10 %	27 %	29 %	20 %
Residual RMS:	25 mm	26 mm	31 mm	32 mm
Periodic terms:	62d + 434d	62d + 434d	62d + 116d + 365d	34d + 116d

Periodograms of SSH Bias Time Series









Harvest, Haines et al.

T/P : MGDR CG_CORR not applied.
S1/S2 atmospheric tide not applied to dry trop.

ASSESSMENT OF CURRENT GLOBAL AND REGIONAL MEAN SEA LEVEL ESTIMATES BASED ON THE TOPEX/POSEIDON JASON-1 & 2 CLIMATE DATA RECORD

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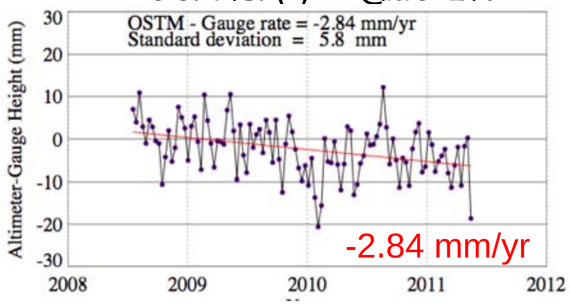
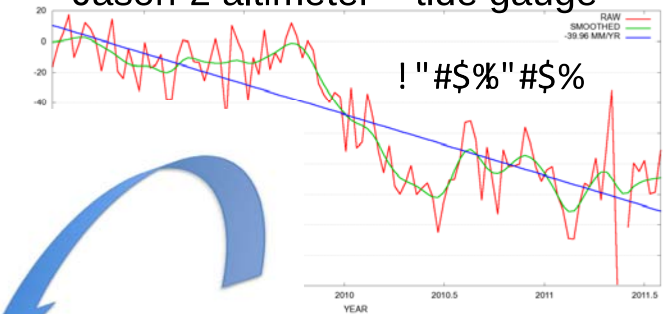
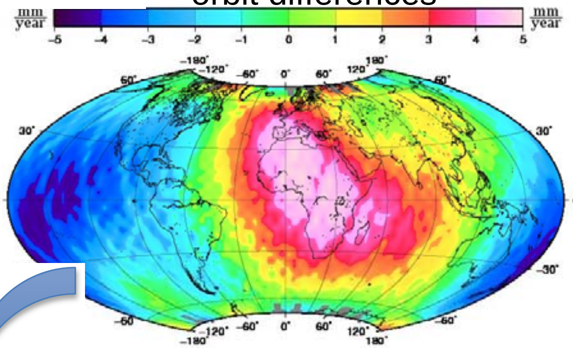


Jason-2 altimeter – tide gauge



Rates of Jason-2 STD1007 – STD1110 orbit differences



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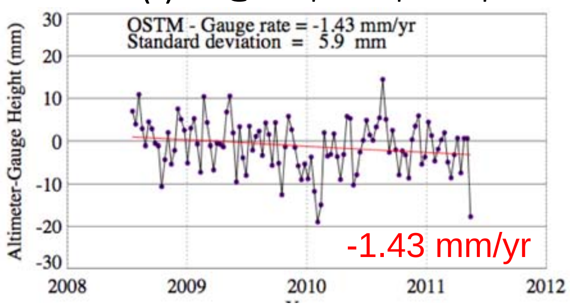

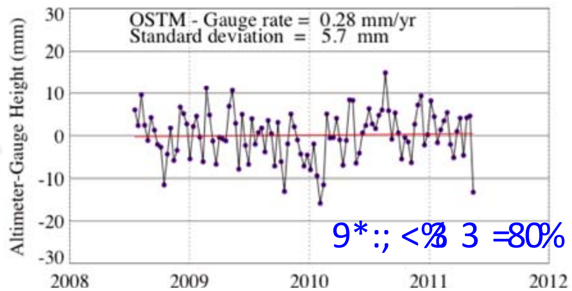

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