(1) SSALTO/CALVAL Performance assessment - Jason-1 / TOPEX/Poseidon cross-calibration

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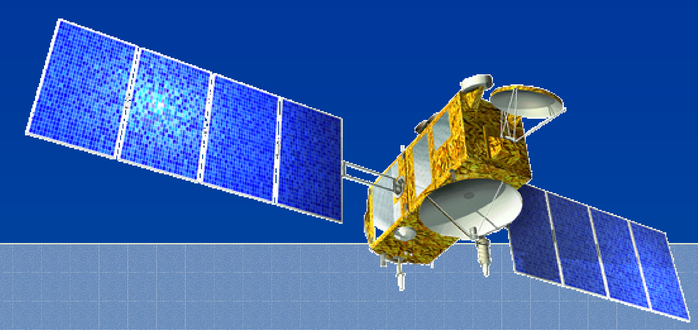


OBJECTIVES

Quality assessment of Jason-1 data

Long-term monitoring of altimeter/radiometer parameters and geophysical corrections

Assessment of algorithm performances and improvements

Jason-1 / TOPEX/Poseidon cross-calibration

PROCESSING & TOOLS

SSALTO/CALVAL activities and studies are routinely performed to assess the Jason-1 GDR data quality using various processing tools:

- Missing measurements, data coverage, data editing
- Crossover analysis (performance evaluations, SSB, time tag bias, orbit error)
- Repeat-track analysis, statistical monitoring (biases and drifts determination)

DATA USED

In order to compare the Jason-1 and T/P performances and to perform the cross-calibration between the two satellites, data have been homogenized:

- same ECMWF atmospheric corrections (rectangular grids)
- Jason-1 geophysical corrections (Got99 tide, Inverse Barometer)
- TOPEX non-parametric SSB (Labroue et al.)

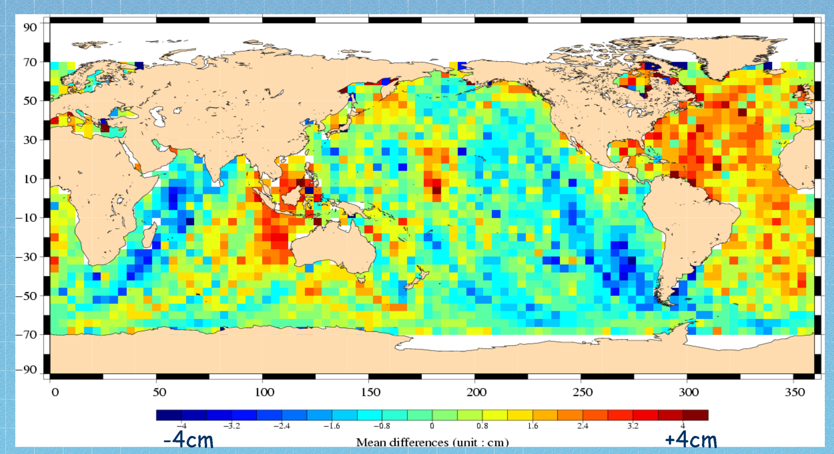
Jason-1 Performance Assessment

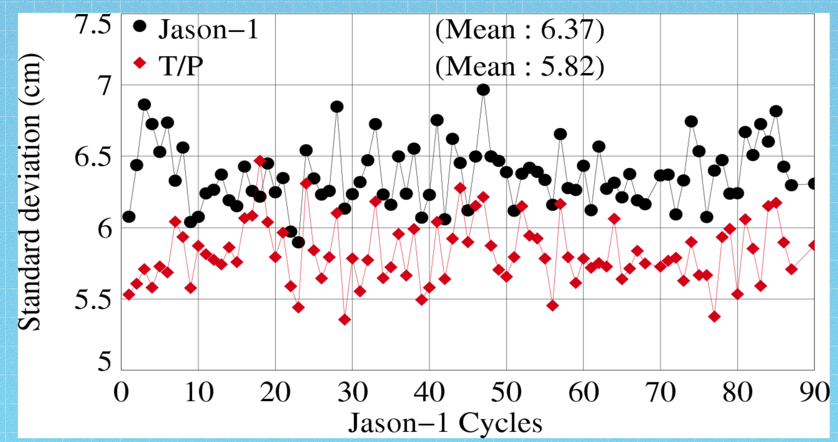
Crossover analysis

As for T/P, geographically correlated orbit errors are the main source of the regional discrepancies in Jason-1 mean SSH crossover differences. Such signals can be largely reduced by an improved gravity model compared to the JGM3 model used in the operational orbit (see SSH performance comparisons in poster 2).

Jason-1 crossover variance seems comparable to that of T/P (same period). However, higher values are found for Jason-1. One source of differences is the orbit quality (in particular in the first cycles). The 1 Hz High Frequency content is the other main source of differences: Jason-1 data are retracked, unlike T/P ones. Consequently, the correlation of 20Hz data is lower for Jason-1 than for T/P (Zanife et al, 2003).

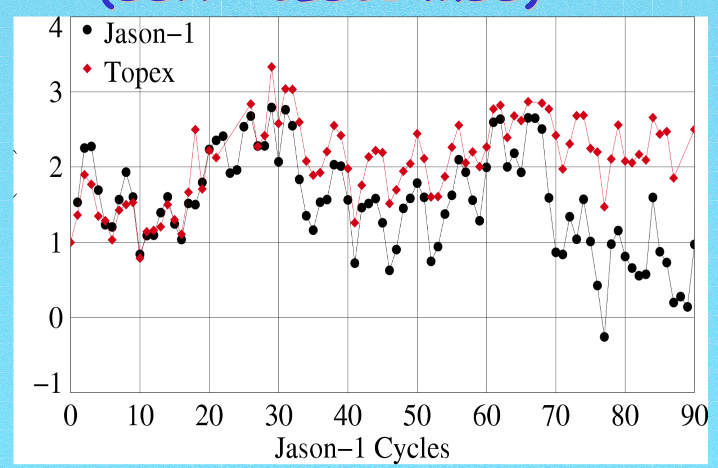
Crossover mean Jason-1 SSH (cycles 1-90)



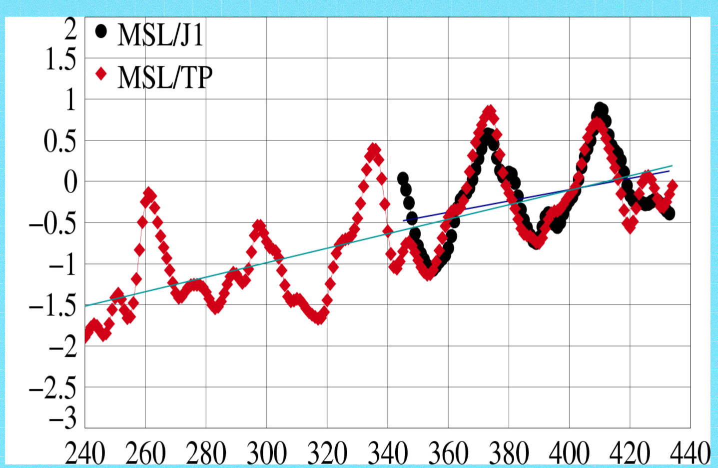


SLA along-track analysis

(SSH - CLS01 MSS)

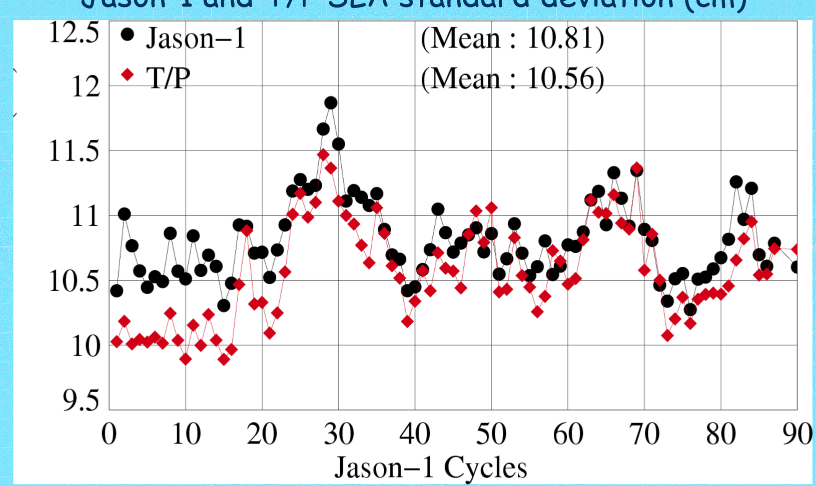


Jason-1 (-14cm) and T/P Mean Sea Level (cm) (top): JMR and TMR corrections applied (bottom): ECMWF wet troposphere correction applied and 60-day filtering.



The cycle by cycle mean sea level of Jason-1 and T/P are consistent over cycles 1-25. Correcting for JMR wet troposphere correction errors is needed for MSL monitoring since the variations in the JMR have a large impact on the Jason-1 MSL over cycles 26-90.
With the ECMWF correction, the two MSL estimates become consistent.
The SLA standard deviation shows good performances for both satellites. However, slightly higher variability is observed for Jason-1 (same reasons as for the crossover analysis), during the same track period. The T/P variability is higher on the interleaved track because of lower accuracy of the MSS on this new ground track.

Jason-1 and T/P SLA standard deviation (cm)

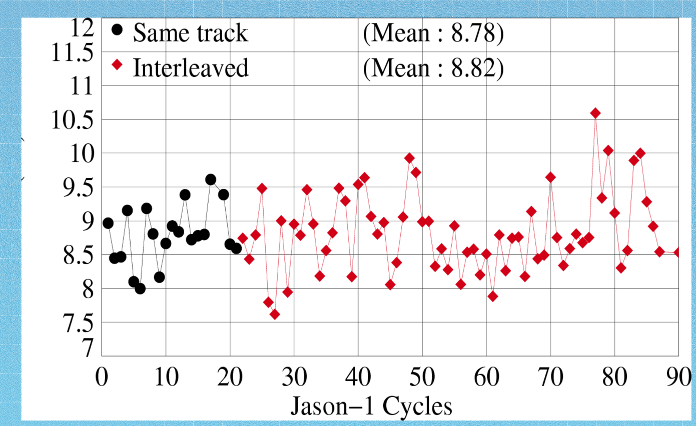


Jason-1 / TOPEX/Poseidon Cross-calibration

Altimeter parameters

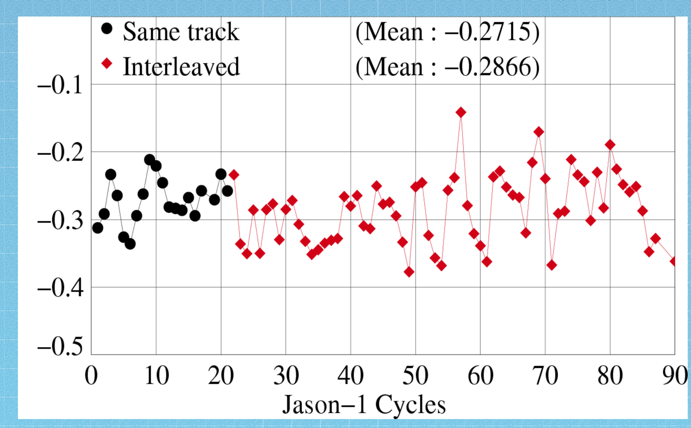
SWH

T/P - Jason-1 Ku-band SWH differences (cm)



Ionosphere correction

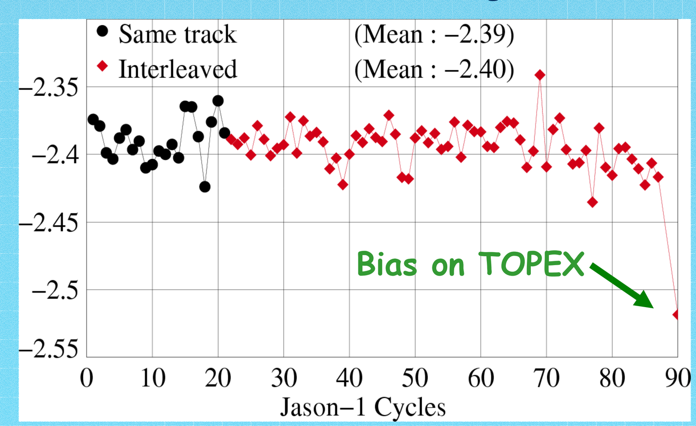
T/P - Jason-1 iono differences (cm)



Biases between Jason-1 and T/P altimeter parameters remain steady through the Jason-1 life time (except for the C-Band SIGMA0).

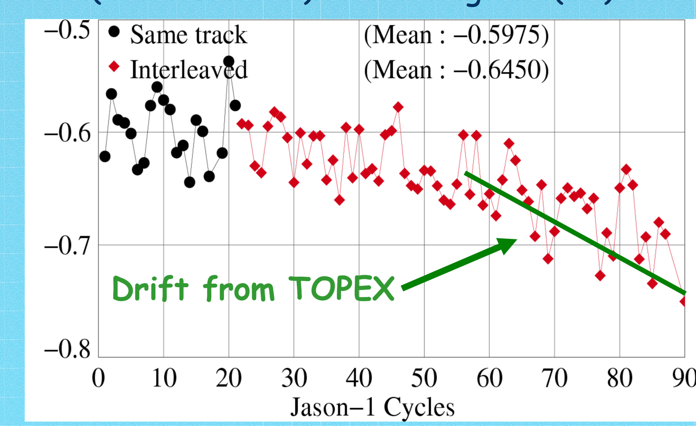
Ku-band Sigma0

(T/P - Jason-1) Ku-band Sigma0 (dB)



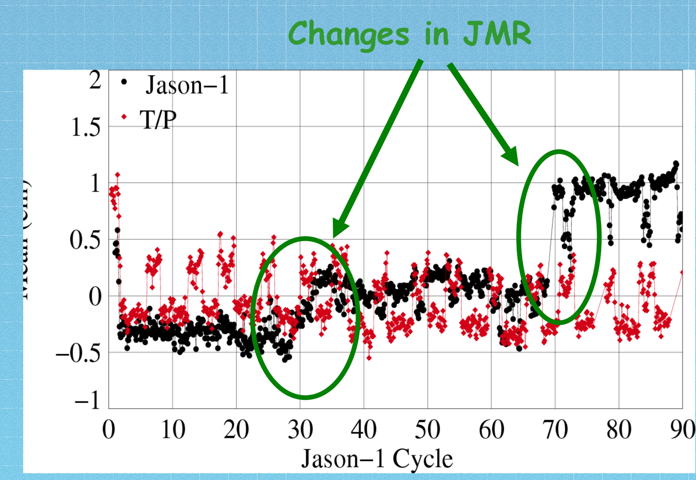
C-band Sigma0

(T/P - Jason-1) C-band Sigma0 (dB)



JMR / TMR comparisons

Radiometer - ECMWF wet corrections (cm)

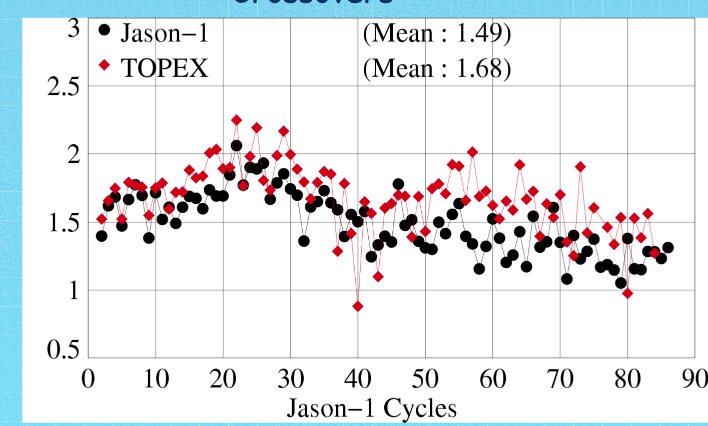


Cross-calibration and long-term monitoring allowed us to detect changes in the JMR correction: the strong change (-5 mm) over cycles 28-31 and the jump (-1 cm) just after the platform anomaly in cycle 69.
Comparisons to the ECWMF model show that the JMR correction is now more impacted by yaw mode transitions.

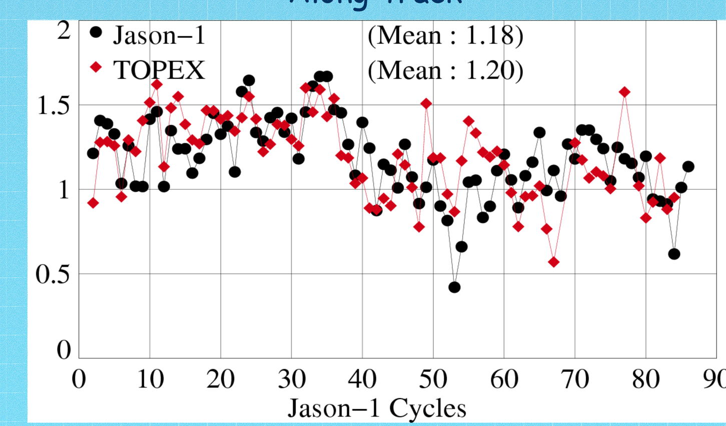
The performances of JMR and TMR corrections are compared in terms of SSH variance with respect to the ECMWF correction. The gain in variance is higher with the TMR than with the JMR. The JMR anomalies have no impact on the performances.
An improvement of the model is observed after cycle 40.

Gain in SSH variance (cm RMS) when applying radiometer corrections rather than ECMWF wet troposphere corrections

Crossovers

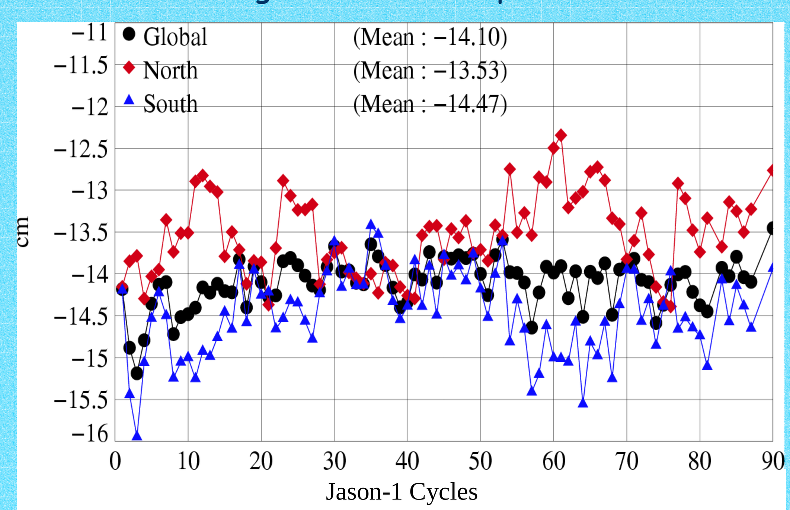


Along-track



SSH cross-calibration

T/P - Jason-1 global and hemispheric differences



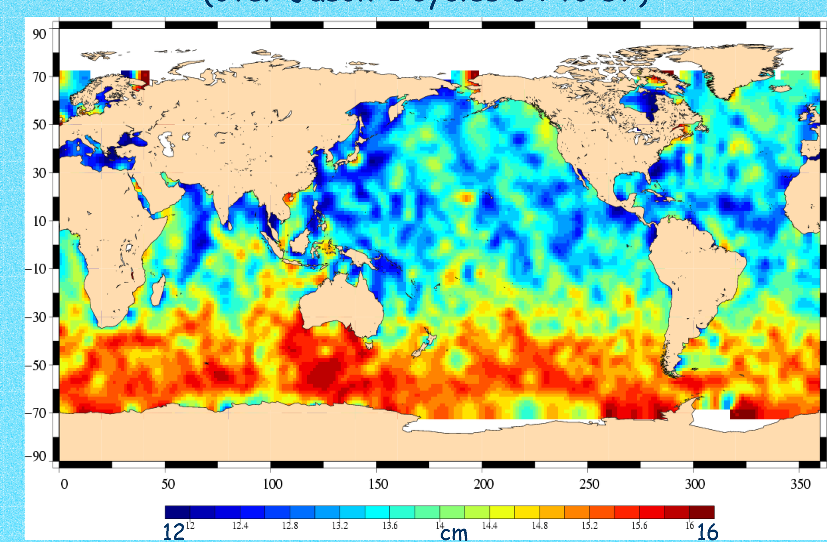
These results are obtained using the same ECMWF wet troposphere correction (to avoid any JMR correction impact).

The cycle by cycle (T/P - Jason-1) Mean SSH differences show that the global bias between the 2 satellites is quite stable around -14 cm.
However, there are significant hemispheric differences, up to 2 cm.

Dual crossovers of (Envisat / T/P) and (Envisat / Jason-1) are used to compare T/P and Jason-1. This allows to avoid systematic (ascending/descending) differences when (T/P / Jason-1) crossovers are only used.

See also the performance investigations in poster (2).

T/P - Jason-1 SSH differences at Envisat crossovers (over Jason-1 cycles 54 to 87)



Ocean Surface Topography Science Team Meeting

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