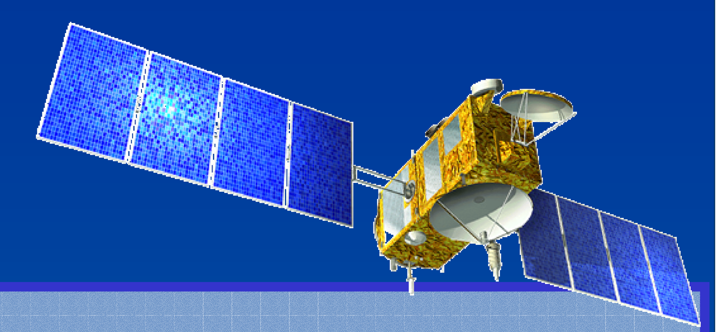
(2) SSALTO/CALVAL activities – T/P and Jason-1 consistency and performances

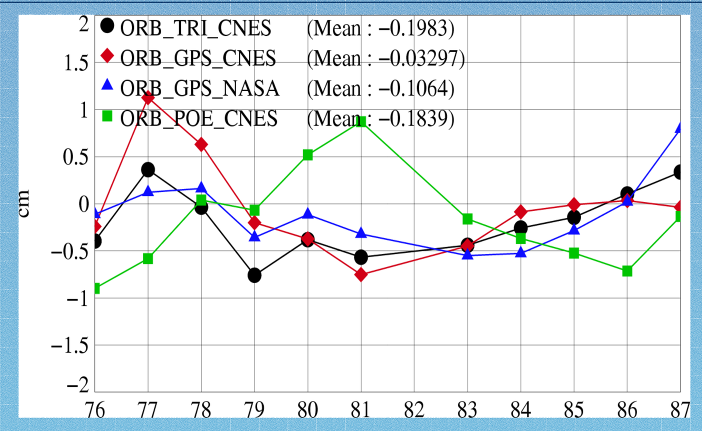
J.Dorandeu, M. Ablain, Y. Faugère, F. Mertz – **CLS**. P. Vincent, N. Picot - **CNES**.



Orbit assessment

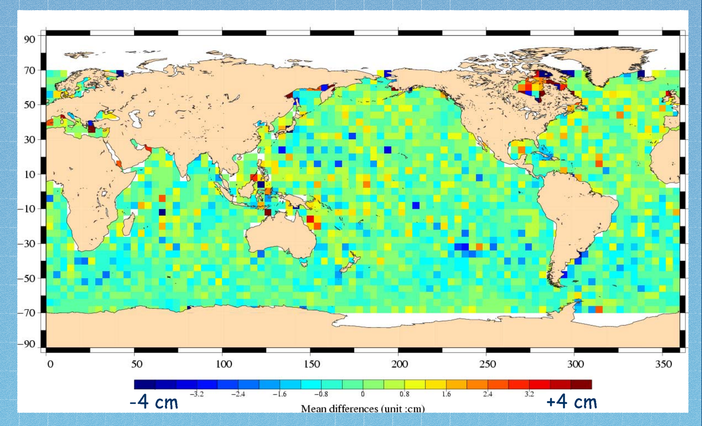
Performance comparisons

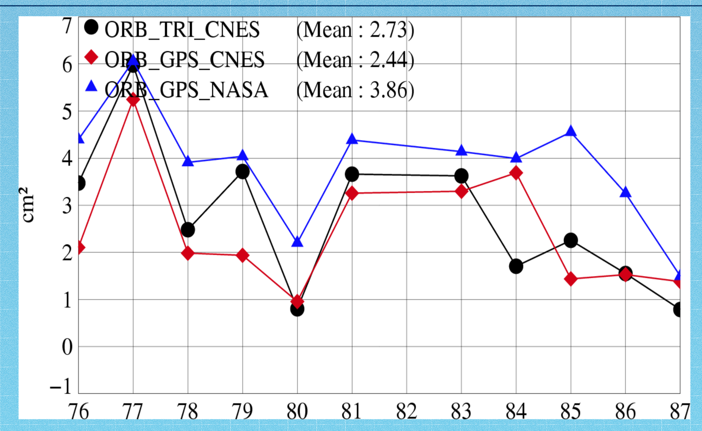
Several precise orbits have been tested (JPL GPS, CNES GPS and CNES tri-technique) with respect to the Jason-1 operational orbit (POE). These new orbits use the same earth gravity field (CGM01s), whereas JGM3 is used for the POE orbit.
Different tracking techniques are also considered: DORIS+SLR (CNES POE), GPS (JPL GPS and CNES GPS) and DORIS+SLR+GPS (CNES tri-technique)



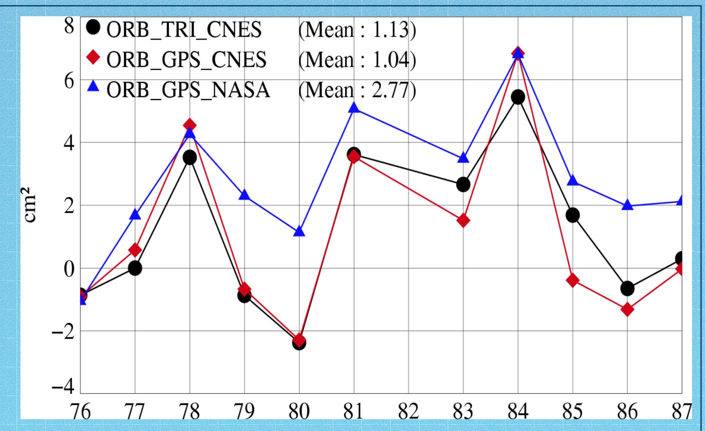
Jason-1 mean crossover differences:

(left): Cycle by cycle comparison
(right): averaged through cycles 1-90 from JPL GPS orbit. To be compared to the map on poster (1)



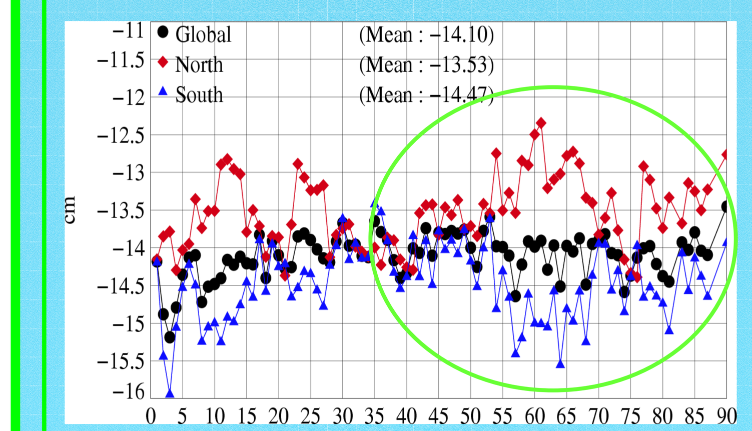


Gain in Jason-1 ΔSSH variance relative to the POE operational orbit at crossovers (left) and from along-track SLA (right).

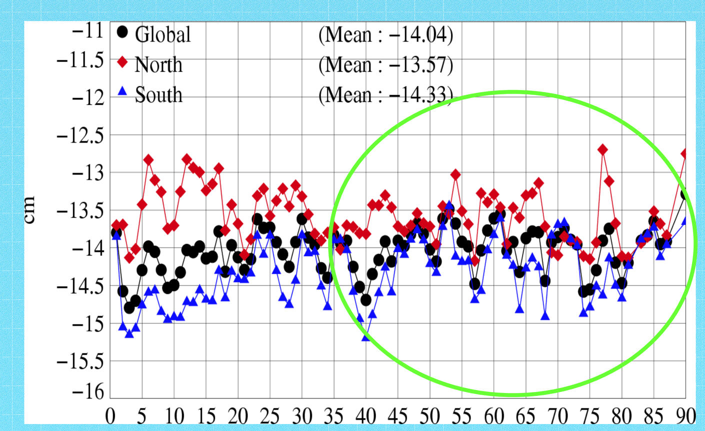


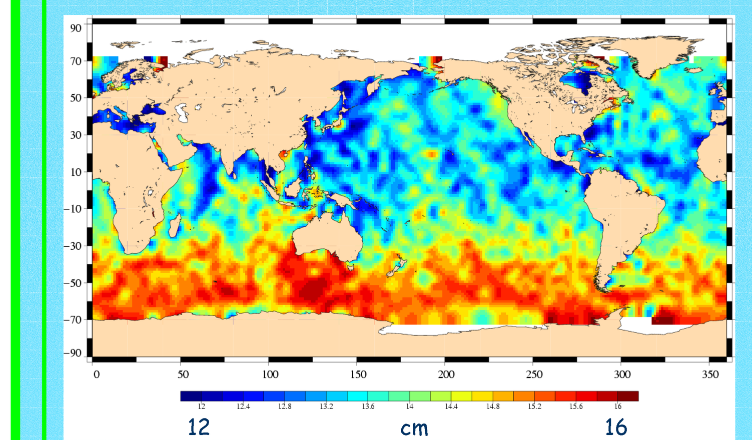
Consistency between T/P and Jason-1

Global differences between Jason-1 and T/P are computed using respectively the GDR orbit and the JPL GPS orbit for Jason-1. Larger differences between Northern and Southern hemispheres are evidenced with the GDR orbit from cycle 55 onwards.
These hemispheric differences are removed with the JPL GPS orbit. Other regional signals might be explained by different earth gravity fields in the two orbits.

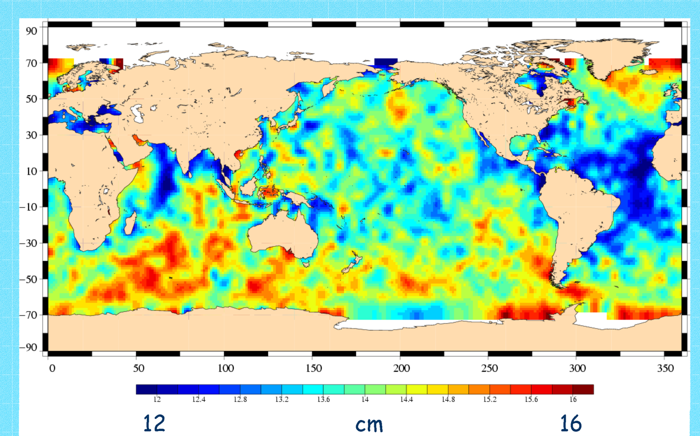


Cycle by cycle global and hemispheric SLA differences between Jason-1 and T/P with the CNES POE orbit (left) and the JPL GPS orbit (right).





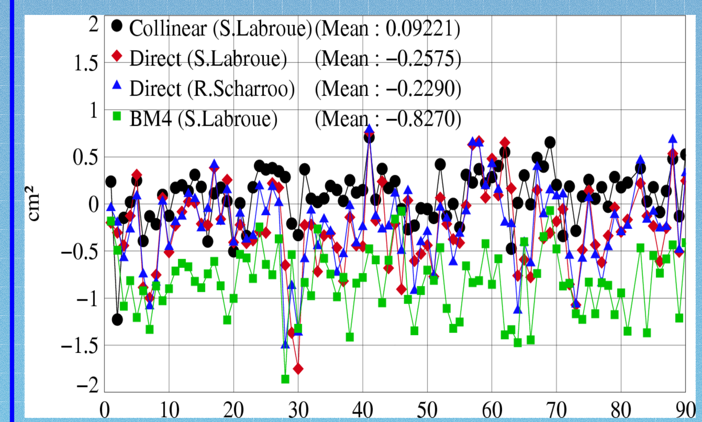
SLA differences between Jason-1 and T/P with CNES POE orbit (left) and JPL GPS orbit (right). (Jason-1 cycles 54 to 87)



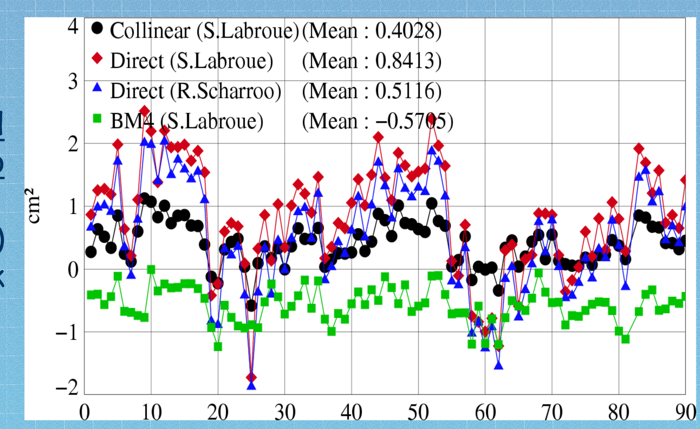
Comparison of SSB models

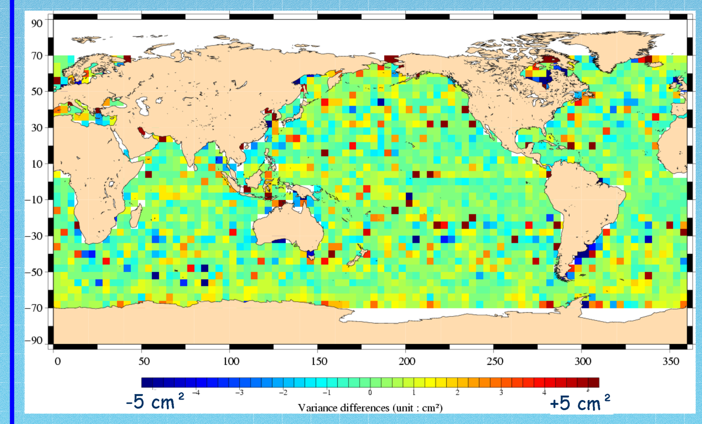
Performance comparisons

Differences in SSB estimation methodologies are investigated in terms of SSH variance reduction from Jason-1 altimetry.
- Non-parametric estimations lead to better performances, even at crossovers
- The collinear method performs slightly better than direct methods at crossovers (which is an independent dataset for both estimations).
- Not surprisingly, the direct method reduces more the variance of along-track SLA (the dataset it has been fitted on) but is likely to be more dependent on ocean signals.

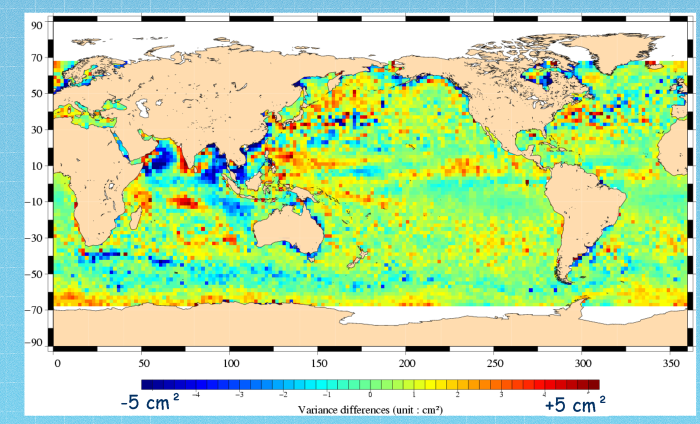


Difference in ΔSSH variance relative to the GDR SSB model at crossovers (left) and from along-track SLA (right).

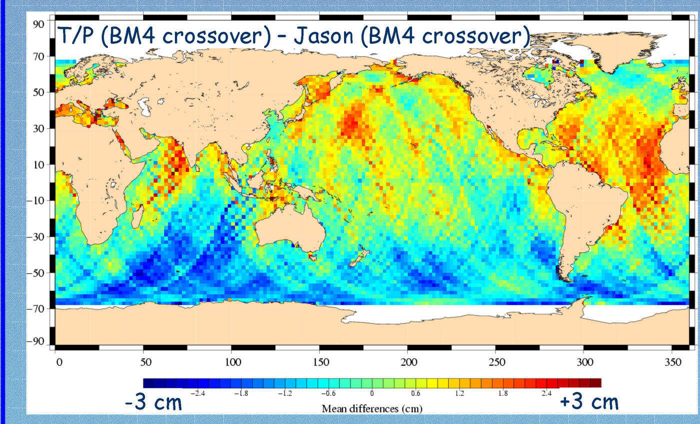




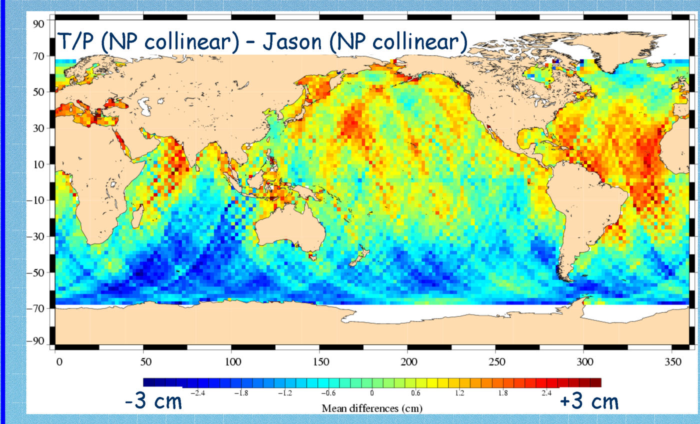
Difference in ΔSSH variance with the direct method instead of the collinear method at crossovers (left) and from along-track SLA (right).



Differences between Jason-1 and T/P

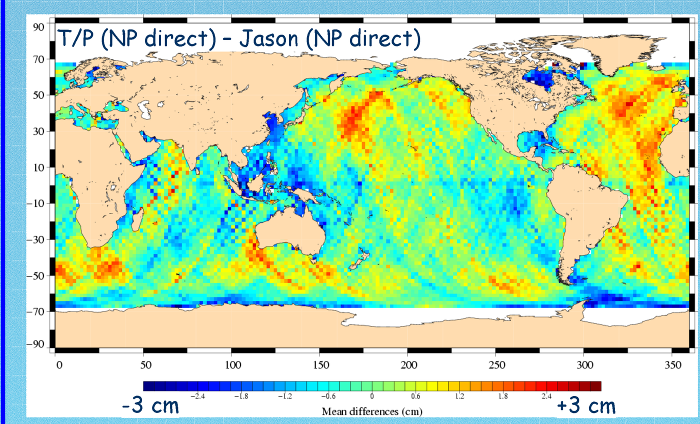


The impact of the different SSB estimation methods is analyzed on (T/P – Jason-1) SSH differences. Cycles 1-21 are used to compute precise (T/P – Jason) repeat-track differences.



As shown on the poster (see orbit assessment), North/South differences are probably due to orbit errors.

- Using direct SSB estimation methods instead of crossover or collinear methods significantly impacts (T/P–Jason) differences.



- "true" orbit errors seem to be reduced by the direct method (via the geographical distribution of SWH).

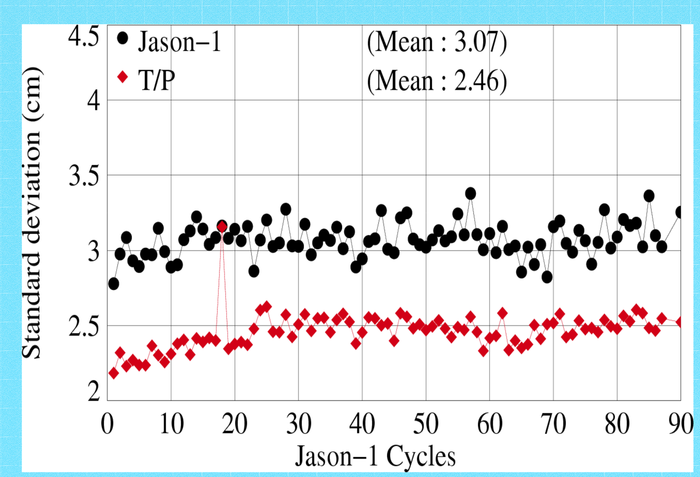
Jason-1 / TOPEX performance investigation

Jason-1 and T/P performances are similar. However T/P figures are slightly lower than Jason ones. In order to better understand this difference, the SSH-MSS differences have been filtered along-track (low pass filter) for both satellites. The short and long wavelength contents have been separated and analyzed at crossovers and at collinear differences.

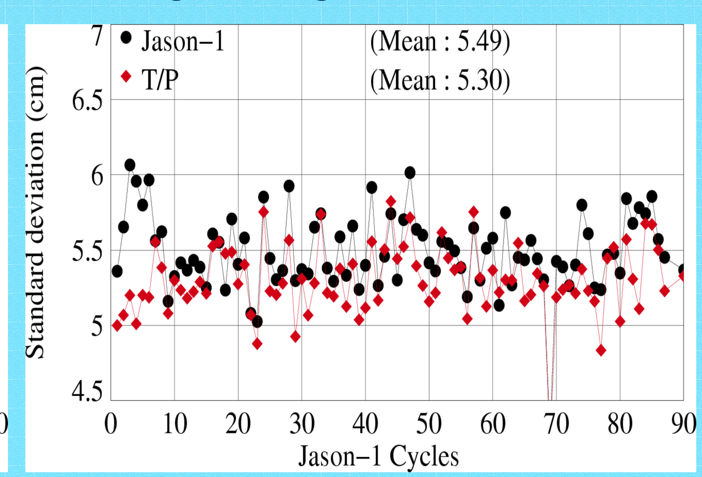
Crossover analysis

Low Pass filter applied with a 50 km cut-off wavelength.
1) Crossover differences of the short wavelength signal (a) show the impact of the different ground processing between TOPEX and Jason-1 (Zanife et al, 2003).
2) Long wavelengths (b) mainly show the impact of orbit errors on both missions (GDR orbits).

a) Crossover differences short wavelengths (<50 km)

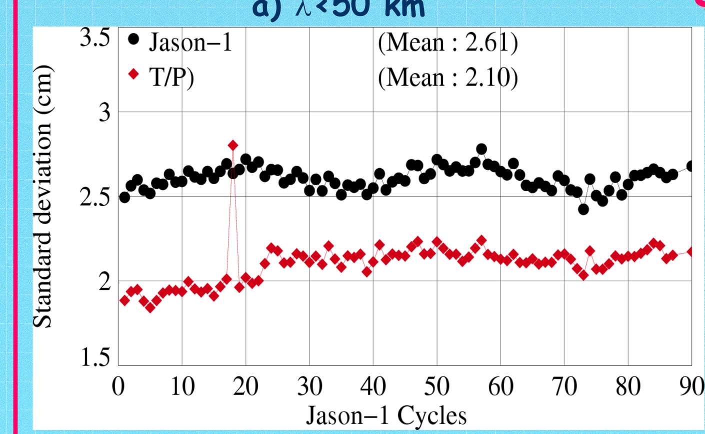


b) Crossover differences long wavelengths (> 50 km)



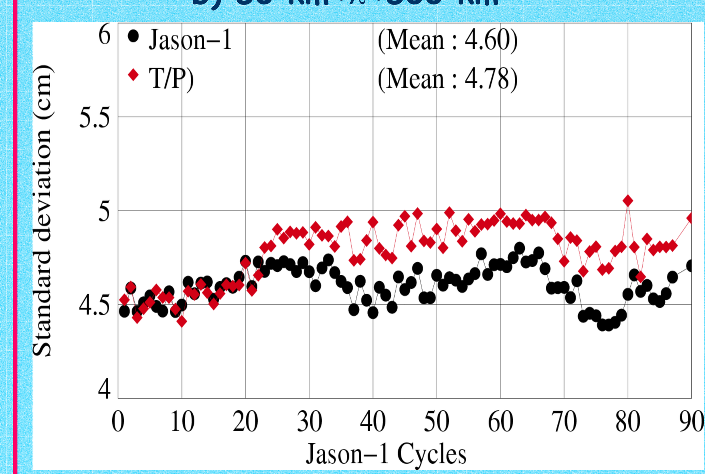
SLA variability

a) λ<50 km

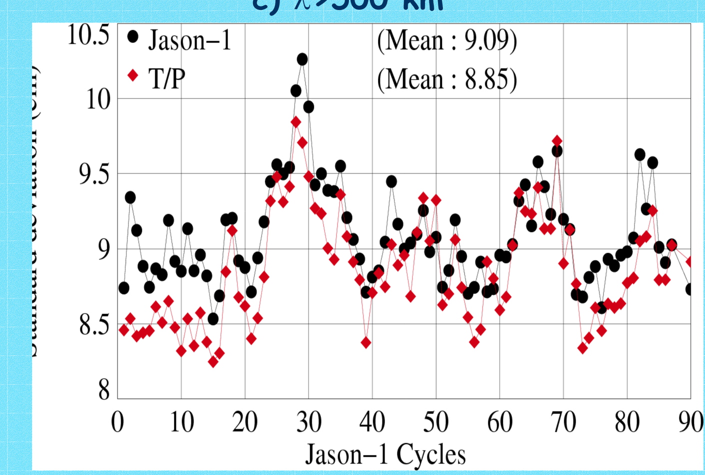


As in the crossover analysis, short and long wavelength contents of SLA (with wavelength respectively lower than 50 km and greater than 500 km) mainly show the effect of the ground processing (a) and the orbit quality (c).
The MSS adds errors at medium and short wavelengths when it is used outside the nominal T/P/Jason ground track (on last T/P cycles).

b) 50 km<λ<500 km



c) λ>500 km



Collecte Localisation Satellites
8-10 rue Hermes
31526 Ramonville Saint Agne - France

Ocean Surface Topography Science Team Meeting

St-Petersburg, November 2004

Centre National d'Etudes Spatiales
18 avenue Edouard Belin
31401 Toulouse cedex 4 - France