Envisat / Jason-1 cross calibration

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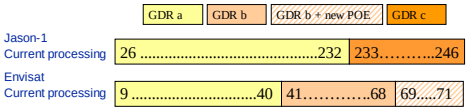
Introduction

Almost six years of Envisat and Jason-1 altimetric measurements are available on a common period in GDR. The cross calibration of these two datasets are routinely performed at the CLS Space Oceanography Division in the frame of the CNES Segment Sol Altimétrie et Orbitographie (SSALTO), ESA French Processing and Archiving Center (F-PAC) activities. This poster presents the main Envisat/Jason-1 cross calibration results.

Data

Since 2008, most Jason-1 products are available in GDR b version from the beginning of the mission and until May 2008. The Envisat products are produced in GDR b version since October 2005. In order to have the most homogeneous dataset possible, updates on the first part of the Envisat series were also implemented.



Jason-1 updates: a SSB model compatible with the MLE4 retracking (Labroue, 2006) has been updated here.

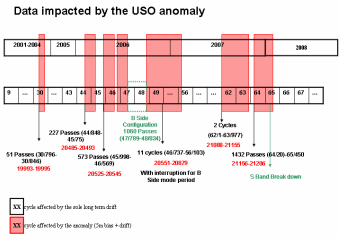
Envisat updates:

- For cycle <41: Geophysical corrections (Mog2D, tides, ...), GDRb SSB, Dual frequency ionosphere correction using GDRb SSB, MWR correction with Side lobes
- For all cycles: USO drift + USO anomaly correction
- For some tests the POE produced by the ESOC center is used

The whole Ra-2 Envisat GDR will be reprocessed in 2009

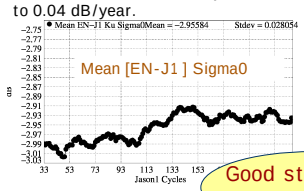
USO anomaly: In February 2006, the RA-2 Ultra Stable Oscillator (USO) clock frequency underwent, for an unknown reason, a strong change of behavior. The anomaly consists in a bias, superposed with an oscillating signal with an orbital period. Auxiliary files are distributed since mid 2006 allowing the users to correct the range from this anomaly. The anomaly periods are detailed beside

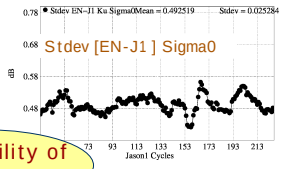
Loss of the S-Band: On the 17 January 2008, a drop of the RA2 S-band transmission power occurred. There is thus no more dual frequency altimeter both in Side A and Side B



Long term monitoring of altimeter parameters

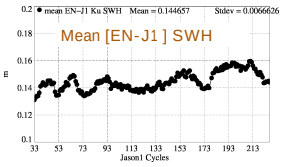
The cycle by cycle mean of Envisat-Jason-1 differences are plotted. The mean difference between Envisat and Jason-1 Ku-band Sigma0 is -2.9 dB. This mean difference has increased by 0.07dB between cycles 48 and 129 which corresponds to 0.04 dB/year.

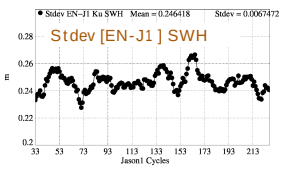




Good stability of SWH and Sigma0

The cycle by cycle mean of Envisat-Jason-1 SWH differences are plotted. These differences are quite stable. Envisat SWH is 15 cm higher than Jason-1 SWH.

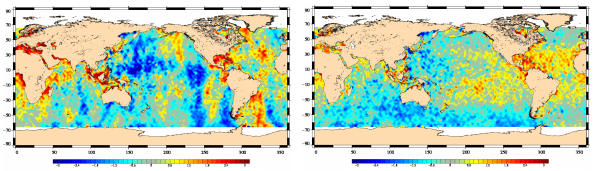




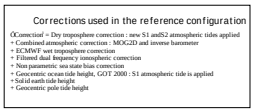
SSH performance assessment

Envisat/Jason SSH differences at 10-day dual crossovers

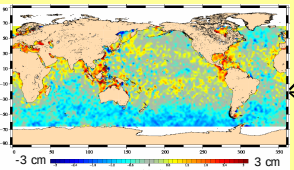
10-day Envisat/Jason-1 dual crossovers have been computed. Mean differences between the two missions are computed in several periods of time and several configurations of SSH. Systematic differences are visible on the Envisat-Jason-1 SSH differences at crossovers.



The geographically correlated differences are reduced mainly thanks to the use of Grace Gravity fields in the orbit calculation. The use of the SSB J1 compatible with the new standards is also a key point in this improvement.

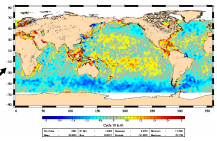


Very good consistency between Envisat and Jason-1



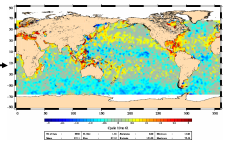
The mean differences are less noisy for the GDR B + ESOC POE thanks to the longer period used. A North/South structure now dominates the difference: negative differences are observed in the Southern Hemisphere at high latitudes.

+ MWR correction



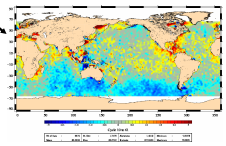
•Using the radiometer correction instead of the model increases the inconsistency

+ GIM ionosphere correction



•Using the GIM correction instead of the dual frequency ionosphere correction has few impact

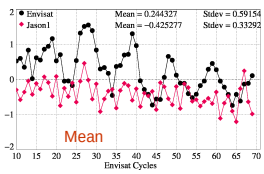
using FES 2004 tide model

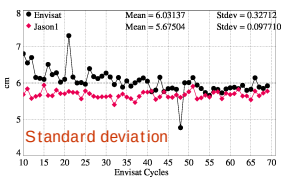


•Using the FES2004 model instead of the GOT00 model increases the inconsistency

Cross comparison of the performances

Envisat and Jason-1 crossovers have been computed on the same area excluding latitudes higher than 50°, shallow waters and using exactly the same interpolation scheme to compute SSH values at crossover locations. Annual signal is visible on the mean curve for Envisat. The standard deviation values for Envisat/Envisat and Jason-1/Jason-1 SSH crossover differences are very similar: respectively 6.0 cm and 5.7 cm



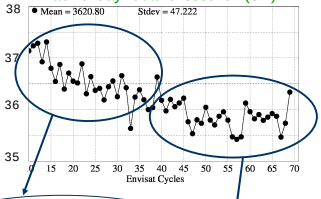


Similar performances for both satellites

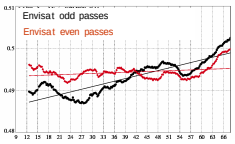
Envisat SSH Bias and Mean Sea Level

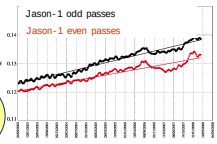
MSL trends from Envisat, Jason-1 are compared using the same corrections. The results are obtained after area weighting and removal of annual and semi-annual signals. An additional 60-day period sinusoid has been fitted and removed for Jason series. Note that the ECMWF model is used both on Envisat and Jason-1 in order to have consistent comparisons.

Cyclic EN-J1 mean SSH differences at 10-day dual crossover (cm)



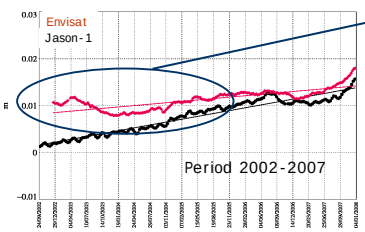
MSL estimation separating ascending and descending passes





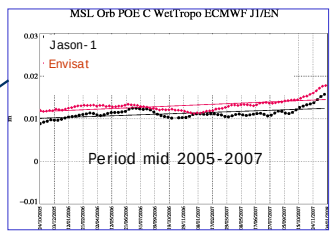
Sea level measured differently on Ascending and descending passes

MSL Orb POE C WetTropo ECMWF J1/EN



abnormal behaviour in Envisat SLA at the beginning of the period

Good consistency between the two missions after mid 2005: ~2 mm/year



Impact of the loss of the S-Band

The loss of S-Band has a direct impact on the quality and the continuity of the Envisat MSL through the lost of the dual frequency correction.
The GIM model is available in the GDR products. Studies are necessary to insure the optimum continuity possible after January 2008

References

ØEnvisat and Jason-1 Cyclic and yearly quality assessment and cross calibration reports
http://www.aviso.oceanobs.com/en/calval/index.html

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8-10 rue Hermes
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OSTST meeting
Nice, November 2008