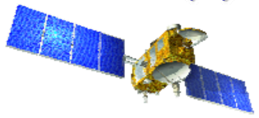
(B) Jason-2 and Jason-1 SLA Performances and Consistency



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Overview

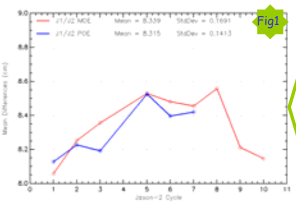
This study aims at presenting the Jason-2 and Jason-1 SLA performances and consistency. On the one hand, SSH crossovers analyses provide the global performances of the Jason-2 system using OGDRs, IGDRs products and a preliminary Jason-2 POE orbit. Performances with similar Jason-1 statistics are compared. On the other hand, along-track analyses allow us to check the SLA consistency between both missions. Peculiar attention is paid on the global SSH bias and correlated geographically SSH bias using MOE and POE orbits.

Data used for Jason-1 and Jason-2		
Products	Jason-1	Jason-2
OGDRs	Cycles 239 to 249	Cycles 0 to 10
IGDRs	Cycles 239 to 249	Cycles 0 to 10
GDRs	Cycles 239 to 246	Preliminary POE updated in IGDRs data for cycles 1 to 7

Along track SLA analyses

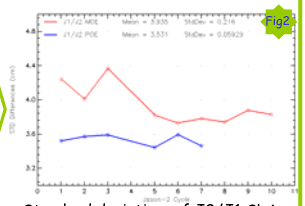
Cycle by Cycle monitoring

The global SSH bias between Jason-2 minus Jason-1 is +8.3 +/- 0.2 cm using MOE or POE orbits for both satellites (Fig. 1), and without using any correction in SSH calculation. It is very stable with weak variations around 0.2 cm. Applying all the usual correction (not shown here), the bias is reduced close to 7.5 cm, mainly due to the altimeter ionospheric bias between Jason-1 and Jason-2.
The standard deviation of global SLA differences is also very stable and weak over all the Jason-2 period (fig.2) with figures close to 3.9 cm RMS using MOE orbits and 3.5 cm RMS using POE orbits.



Mean of J2/J1 SLA differences (cm)

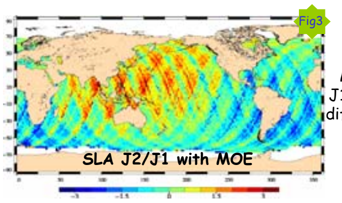
Impact of MOE and POE orbits for J1 and J2



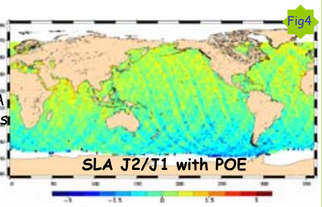
Standard deviation of J2/J1 SLA differences (cm)

Spatial Analyses

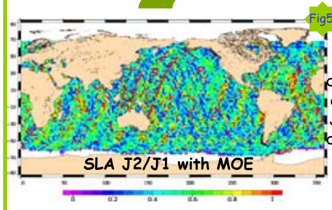
The map of mean of Jason-1/Jason-2 SLA differences over all the period from IGDRs products highlight correlated geographical biases as plotted in figure 3, ranging between +/- 3 cm. As expected, these patches are almost completely removed using POE orbits (fig. 4), showing the very good consistency between both missions. However, very weak hemispheric structures remain with an amplitude close to 1 cm. They are very likely related to the orbit calculation. In addition, the structures observed using MOE orbit vary in space and in amplitude from one cycle to another as shown by the analyze of the temporal variability of the SLA differences (fig. 5). Using POE orbit, these variations are significantly reduced (fig. 6).



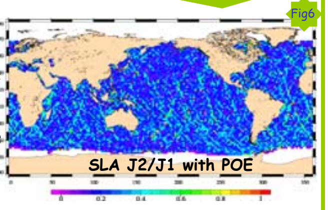
Mean of J1/J2 SLA differences (cm)



Impact of Jason-1 and Jason-2 POE orbits

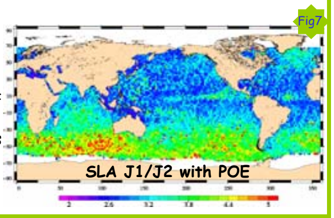


Temporal standard deviation of of mean of J1/J2 SLA differences (cm)

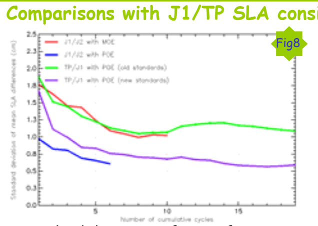


The standard deviation of SLA difference is, as expected, mainly depending on the SWH (fig. 7). This is explained by the 1-Hz SSH noise higher in strong SWH area due the ground processing. No abnormal feature is highlighted, showing the good consistency of both SLA between 3 and 5 cm RMS.

Standard deviation of J1/J2 SLA differences (cm)



Comparisons with J1/TP SLA consistency during the Cal/Val phase



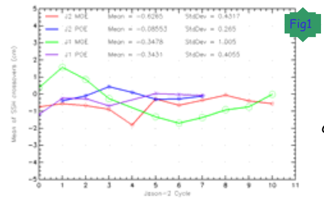
Standard deviation of map of mean SLA differences versus the period length (cm)

The standard deviation of map of mean SLA differences over a given period provides also a good criteria to measure the SLA consistency. Using 20 cumulative cycles (Jason-1 Cal/Val phase), the statistic forTP/J1 SLA differences was around 1.1 cm RMS with old standards (2002) and 0.6 cm RMS with new standards (2007). At the moment, J2/J1 differences using POE orbit provide a similar statistic but using only 6 cycles. In addition, applying MOE orbit, the statistic is in the same order as J1/TP one with old standards but with a POE orbit.

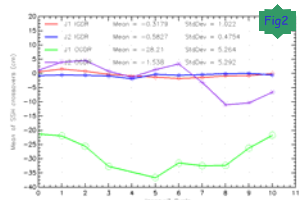
SSH Crossovers analyses

Cycle by Cycle monitoring

The monitoring of Jason-2 SSH statistics at crossovers are very good. A slightly improvement is observed using IGDRs in comparison with Jason-1 : SSH crossover mean is more stable (fig 1), and SSH crossover standard deviation is lower (5.5 cm RMS for J2 instead 5.7 cm RMS for J1 (fig.3)). Results is reversed comparing the GDRs products, but the Jason-2 's POE orbit is preliminary at the moment.
Concerning the OGDRs, a dramatic improvement is observed at SSH crossover mean (fig. 2) and standard deviation (fig. 4). This is explained by the better quality of Jason-2 DIODE orbit .

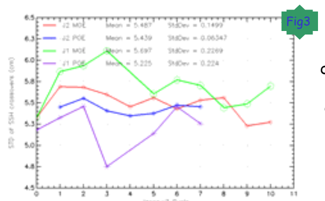


Mean of SSH crossovers (cm)

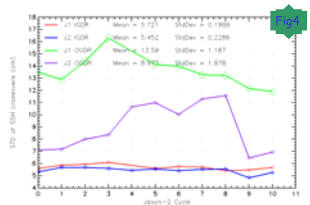


Impact of MOE and POE orbits for J1 and J2

Impact of MOE and DIODE orbits for J1 and J2

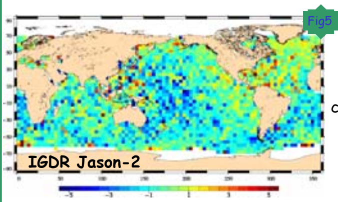


Standard deviation of SSH crossovers (cm)

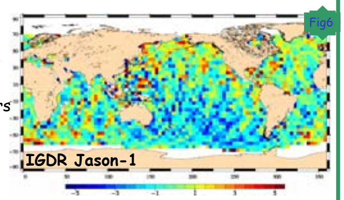


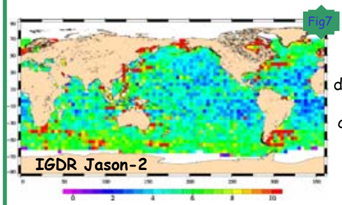
Spatial Analyses over all the period

The map (over all the period) of SSH crossovers mean is a little more homogeneous for Jason-2 (fig. 6) than for Jason-1 (fig.6) using IGDR products. Maps of SSH crossovers standard deviation are similar (fig. 7 and 8) between both missions, with RMS statistics slightly weaker for Jason-2 in weak oceanic variability areas. These both items bring out the very good quality of Jason-2 SSH in relationship with the quality of Jason-2 MOE orbit,.

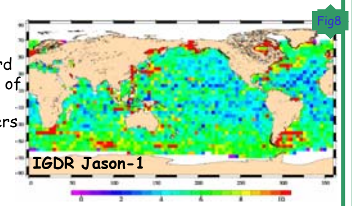


Mean of SSH crossovers (cm)





Standard deviation of SSH crossovers (cm)



Conclusion

In this study, we show the good performances of Jason-2 SSH in the same order or better than Jason-1 ones. In addition, the SLA consistency between both missions is already very good just 4 months after the launch, in the same order as Jason-1/TP over all the verification phase. The weak remaining SLA differences observed by hemisphere using the POE orbits (around 1 cm) are likely due to the orbit calculation differences between both missions. The ageing of Jason-1 (no more GPS data) explains very likely these differences.

Then, additional Jason-2 cycles will not be useful to better analyze the Jason-2 SSH performances and the SLA consistency with Jason-1. From this Cal/Val point of view, and in order to better benefit from these both missions for scientific applications, Jason-1 satellite can then be moved to its new interleaved orbit as soon as possible.

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Nice, November 2008