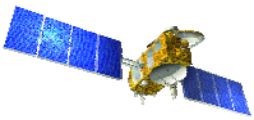
(A) GLOBAL Statistical Jason-2 assessment and cross-calibration with Jason-1



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Overview

The OSTM/Jason-2 (JA2) satellite was successfully launched on June, 20th 2008. Since July, 4th, Jason-2 is on its final orbit, flying in tandem with Jason-1 (JA1), only 55s apart. This poster assesses the JA2 data quality. Missing and edited measurements are monitored. Furthermore relevant parameters derived from instrumental measurements and geophysical corrections are analyzed. Analyzes are focused on JA1/JA2 cross-calibration since both missions are on the same orbit during the Calibration/Validation phase. This allows to precisely assess parameter discrepancies between both missions in order to detect geographically correlated biases, jumps or drifts. The SLA performances and consistency with JA1 are described in poster (B).

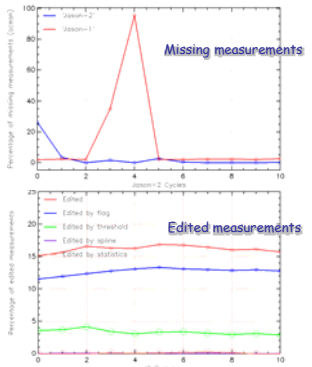
The study is conducted for JA2 cycles 0 to 10, corresponding to JA1 cycles 239 to 249. For both satellites IGDR (Interim Geophysical Data Records) 1 Hz data are used.

For Jason-2, two modes of on board tracking are used: Median tracker (for cycles 1,2,4,6,8,9,10,...) and Diode/DEM tracker (for cycles 3,5,7). Cycle 0 and half of cycle 1 was in SGT mode. Most of the following plots integrate all the cycles from 0 to 10. Indeed analysis of parameters obtained during cycles with different tracking modes does not reveal any particular behavior linked to the tracking mode.

Missing and Edited measurements

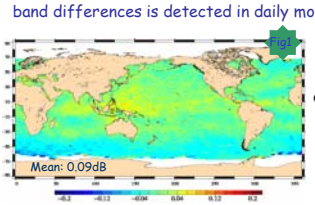
Over open ocean, JA2 and JA1 data coverage are very similar. Few missing measurements are however detected for Jason-2 over ocean, mostly due to station acquisition problems (cycle 001 pass 44-46, cycle 003 pass 33-34, cycle 005 pass 237-240) or ground processing anomalies (cycle 001 pass 145, cycle 005 pass 141). Note that from 7th to 20th of August 2008, no measurements are available for Jason-1, period for which the satellite was in safehold mode. Over coastal and hydrological zones, JA2 is much better than JA1 due to new tracker algorithms (Median and Diode/DEM).

For open ocean calval, the same editing procedure is applied for both satellites. Percentage of edited measurements is very similar, since approximately 16% (~12% due to ice flag and ~3% due to parameters out of thresholds) of ocean Jason-2 measurements are edited for each cycle. In Median mode, small portions of a pass are sometimes edited, due to AGC, Sigma0, waves and apparent mispointing out of threshold.

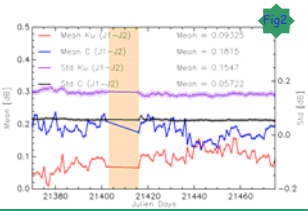


Backscattering coefficient

The JA2 backscattering coefficient (Sig0) shows good agreement with JA1 in Ku and C bands as plotted in map of mean differences (fig. 1) and in daily monitoring (fig. 2). The global bias with JA1 is weak (0.1 dB in Ku-band and 0.2 dB in C-band). In comparison, the global bias between JA1 and T/P was about 2.4 dB. Notice that a small signal (0.1 dB) in both Ku- and C-band differences is detected in daily monitoring (fig. 2).



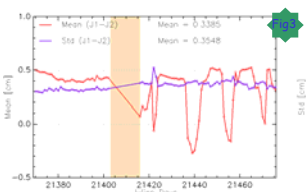
Map of JA1-JA2 Ku-band Sigma0 differences (mean over cycles 0 to 10) (fig. 1). Daily monitoring of mean and std of JA1 - JA2 Sig0 difference (fig. 2).

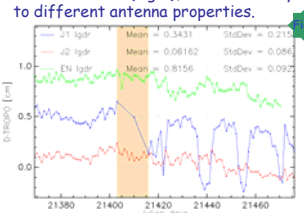


Wet troposphere correction

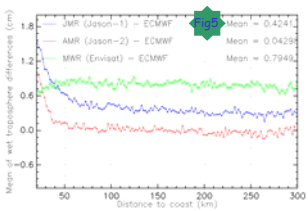
Difference of JMR - AMR radiometer wet troposphere correction (fig. 3) showed in the beginning of the mission a small drift (probably due to the heating of the instrument), during cycles 1 to 3, it was quite stable. After the Jason-1 safehold, difference shows a signal up to 7 mm amplitude. The reason is unknown, but caused by JMR (JA1), as visible on fig. 4 showing difference between radiometer and ECMWF model.

Towards the last cycles, a small drift seems to be visible, not only for JA1 and JA2, but also for Envisat, so this is probably due to the model. Behavior of JMR and AMR far away from coast is similar (fig.5), with AMR staying more stable than JMR when approaching coast related to different antenna properties.





Daily monitoring of JA1-JA2 radiometer correction (fig.3). Mean of radiometer - model wet troposphere correction per day (fig.4) and in function of coast distance (fig.5).

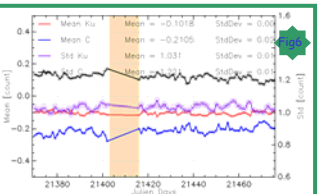


Number and Rms of 20 Hz elementary range measurements

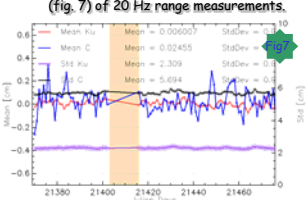
Daily monitoring of JA1 - JA2 difference concerning the number of Ku and C-band 20 Hz elementary range measurements is very stable (fig. 6). Rms of 20 Hz elementary range measurements are equivalent for JA1 and JA2 (fig. 7).

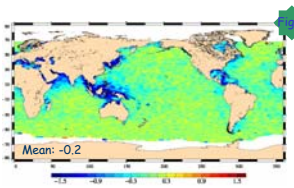
Up to now, the MQE (Mean Quadratic Error between the measured waveform and the best fitted Brown model) is not used during the 20 Hz to 1 Hz compression. The number of elementary valid 20 Hz measurements per second is consequently higher for JA2 than for JA1.

Fig. 8 and 9 show, that this difference is mostly visible where the MQE is great ie where the waveforms (in C band) are corrupted.

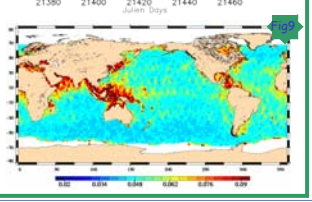


Daily monitoring of mean and std of JA1 - JA2 difference for number (fig. 6) and rms (fig. 7) of 20 Hz range measurements.



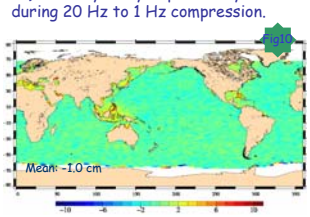


Difference map of JA1-JA2 number of elementary 20 hz C-band range measurements for JA2 cycle 010 (fig. 8), map of 20 hz C-band MQE (fig. 9).

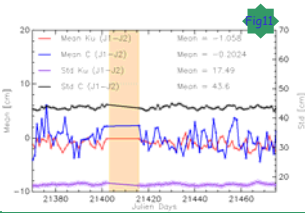


Significant Wave Height

The Significant Wave Height (SWH) shows very good agreement between JA2 and JA1 (fig. 10). Daily monitoring (fig. 11) of mean and std of JA1-JA2 SWH differences shows no drift neither for Ku-band nor for C-band. Waves between JA1 and JA2 are more coherent in Ku-band than in C-band. Mean of JA1-JA2 SWH differences are : -1 cm (Ku-band) and -0.2 cm (C-band). Std of JA1-JA2 SWH differences are : 17.5 cm (Ku-band) and 43.6 cm (C-band). Mean Ku-band SWH difference between T/P and JA1 was 8.9 cm. Weak regional differences around Indonesia (fig. 10) are very likely explained by the difference of MQE editing criteria used for both missions during 20 Hz to 1 Hz compression.

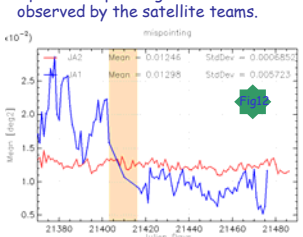


Map of JA1-JA2 Ku-band Sigma0 differences (mean over cycles 0 to 10) (fig.10). Daily monitoring of mean and std of JA1 - JA2 SWH difference (fig.11).

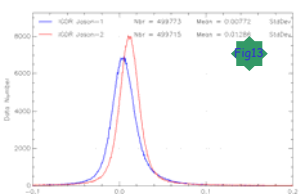


Apparent squared mispointing from waveforms

Daily monitoring of apparent squared mispointing from JA2 waveforms is much more stable than JA1 (see fig.12). This is due to reduced star tracker availability for JA1 which leads to a poorer pointing of the satellite. The JA2 satellite has no real mispointing, but mean value of apparent squared mispointing is around 0.0125 deg2 (0.11 deg), which is slightly higher than what is observed by the satellite teams.

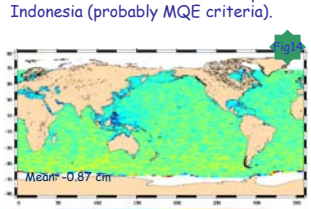


Daily monitoring of JA2 apparent squared mispointing (from waveforms) (fig. 12). Histogram showing JA1 and JA2 apparent squared mispointing for JA2 cycle 010 (fig. 13).



Altimeter ionospheric correction

The map of mean differences over cycles 0 to 10 (fig. 14) shows that altimeter ionospheric correction of JA1 and JA2 are in good agreement. Note that the global bias is -0.9 cm (under investigation), but it is stable (fig. 15) with small variations up to 2 mm from one day to another. As for other altimeter parameters, differences are slightly higher in some regions like Indonesia (probably MQE criteria).



Map of JA1 - JA2 ionospheric correction, mean over cycles 0 to 10, except for cycle 4 (fig. 14). Daily monitoring of JA1-JA2 (filtered) altimeter ionospheric correction (fig. 15).

Conclusion

This study, using 11 cycles of Jason-2 flying in tandem with Jason-1, shows the very good consistency between altimetric parameters of JA1 and JA2.
Improvements are observed thanks to the JA2 radiometer (AMR), more stable than the JMR. Furthermore, the new JA2 DEM tracking mode (used during cycles 3, 5, and 7) shows no impact on parameter analysis of 1 Hz ocean measurements. The very small differences observed (principally in C-band) do not impact the SSH computation (see poster B). They are very likely due to the MQE editing which is not yet tuned for JA2 (under investigation).

Finally, from the Cal/Val parameter analysis point of view, additional JA2 cycles in tandem configuration are not necessary to better estimate on the one hand, the quality of Jason-2 parameters and on the other hand, the parameter consistency with Jason-1.

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