Global Jason-2 and Jason-3 Performances

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TOPEX/Poseidon, Jason-1, Jason-2, and then Jason-3 have allowed to build a high-precision ocean altimetry data record on historical ground track. Two altimeters of those are still in flight (Jason-2 and Jason-3). Their data are analyzed and monitored in order to assess the quality of the products.

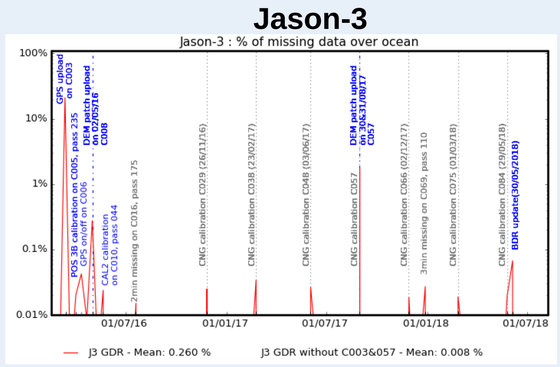
Over the last 2 years many events occurred on Jason-2 mission. A first move of orbit occurred in October 2016 from TOPEX/Jasons historical ground track to the interleaved with Jason-3 one at the same altitude. In July 2017, Jason-2 was moved to a Long Repeat Orbit (LRO), approximately 27 km below the previous orbit still used by Jason-3. At the end of the first Long Repeat Orbit in July 2018, Jason-2 was moved to an new interleaved LRO orbit. Since July 2017, SHM has occurred by three times (in September 2017, February 2018, and July 2018). How are the system performance and data quality affected (or not) by these events?

Since May 17th, 2017, Jason-3 is the only satellite on the TOPEX/Jasons historical ground track. A precise knowledge of Jason-3 data quality and errors is a key activity to ensure a reliable service to scientists involved in climate change studies as well as operational oceanography. We aim at presenting the overall performance of Jason-3 mission through different metrics highlighting the high-level accuracy of this mission.

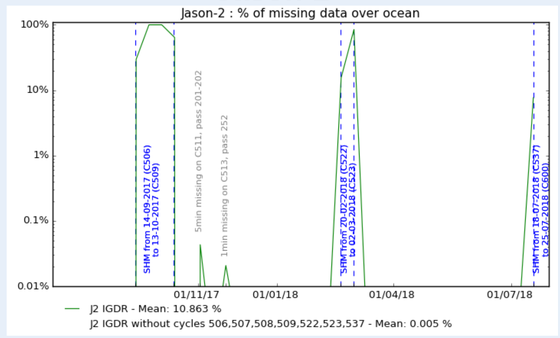
Data coverage and quality

Data availability

Jason-3

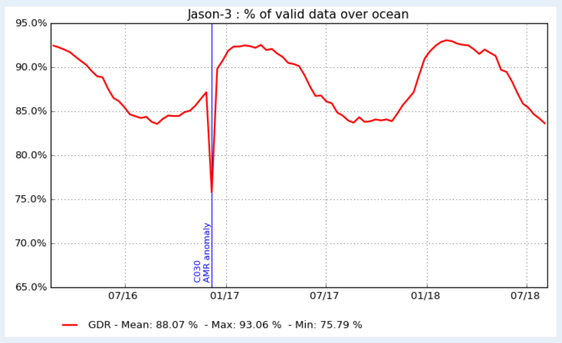


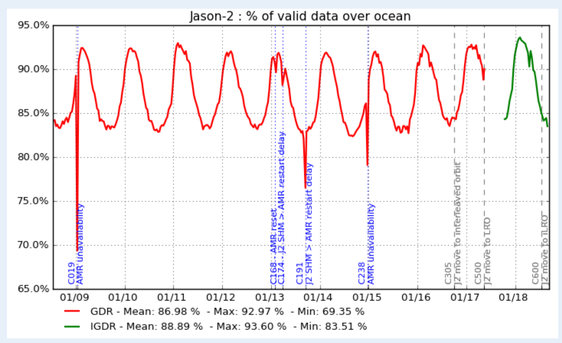
Jason-2



Very good data availability over ocean for both mission : 99.7% for Jason-3 GDR and 89% for Jason-2 IGDR on LRO cycle (including SHM periods)

Valid data over ocean



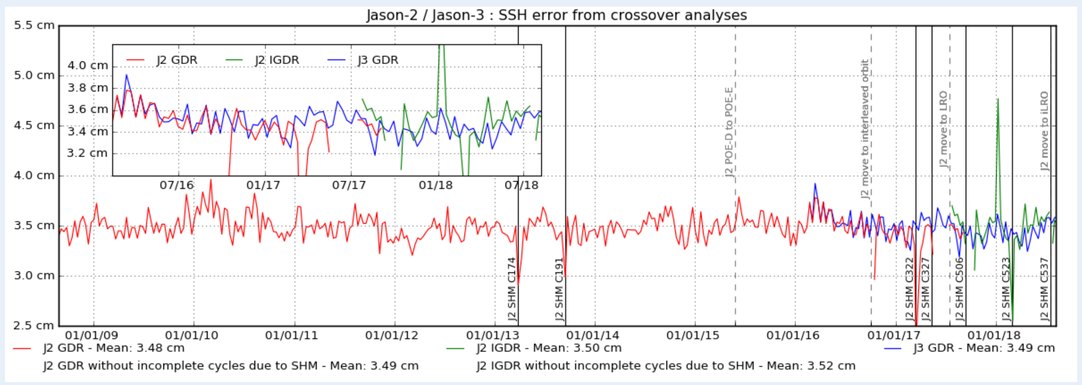


An annual signal due to ice coverage cycle is visible (~9% of rejected data in average). Out of these rejected points, the editing process removes between 3% and 4% of data when no anomaly.
Level is consistent for Jason-2 over each period (historical ground track, interleaved, then LRO and i-LRO).

Radiometer behavior

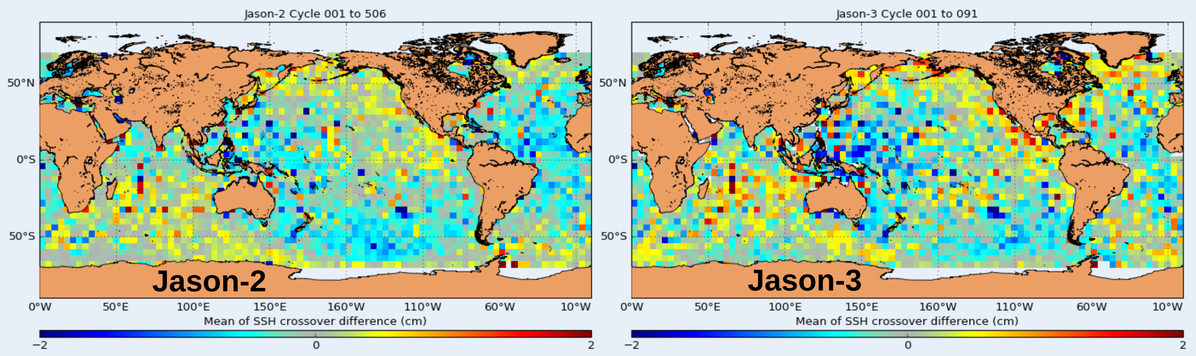
Compared to Jason-3 and AltiKa, Jason-2 radiometer wet troposphere correction minus ECMWF model difference is drifting over the first quarter of year 2017. Also, each SHM on Jason-2 introduces jumps of radiometer minus wet tropospheric correction. Jason-3 and AltiKa behaviors differ from July 2017 onwards.
Taking into account standard deviation of this difference, Jason-2 and Jason-3 show similar levels, lower than AltiKa (GDR-C) and Sentinel-3A.

Error from crossovers analysis



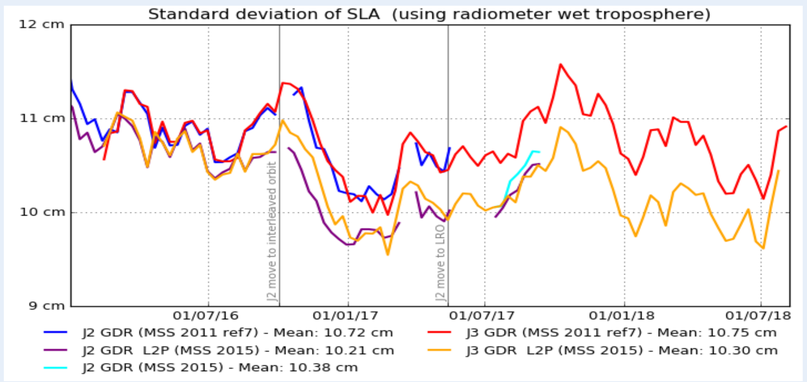
Sea Surface Height (SSH) error for Jason-2 and Jason-3 is deduced from crossovers analysis using radiometer data and selecting |latitudes| < 50°, bathy<-1000m, oceanic variability < 20 cm. ⇒ SSH error is close to **3.5 cm**.

Spatial distribution of mean SSH differences shows geographically correlated patterns with differences remaining below 2 cm.



⇒ Crossovers analysis demonstrates the good performance of both missions Jason-2 and Jason-3.

Standard deviation of Sea Level Anomaly

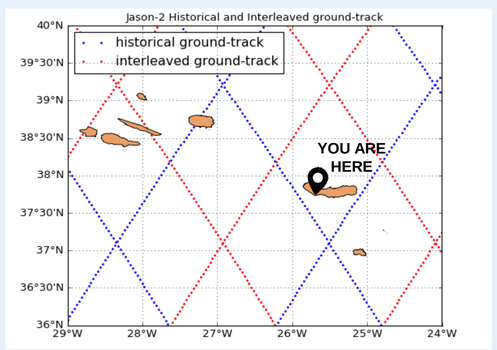


CNES/CLS2015 solution significantly improves this performance metric as 20 years of data are used instead of 7 years.

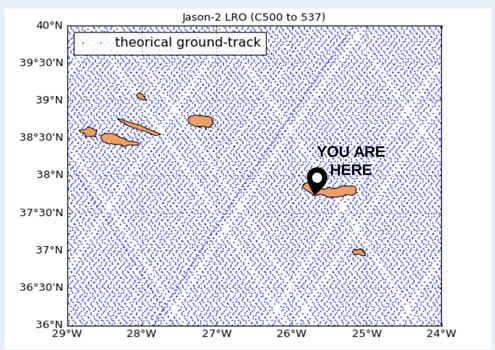
Standard deviation of SLA is 10.7cm in average for both Jason-2 and Jason-3 GDR-D products. This is significantly reduced using more recent MSS solutions.
SLA from current GDR use CNES/CLS2011 ref7 years solution (**J3** and **J2** repetitive) whereas L2P products contain CNES/CLS2015 solution (**J3** and **J2**).
Note that from Jason-2 move to LRO onwards, MSS solution in operational GDR is CNES/CLS15 (J2-LRO),

Focus on Jason-2

Topex/Jason historical orbit	Interleaved orbit	First drifting orbit	Second drifting orbit
C001 → C303	C305 → C327	C500 → C537	C600 → C…
12/07/08 → 02/10/16	13/10/16 → 17/05/17	11/07/17 → 18/07/18	From 25/07/18



Cycle 001 to 303 Cycle 305 to 327

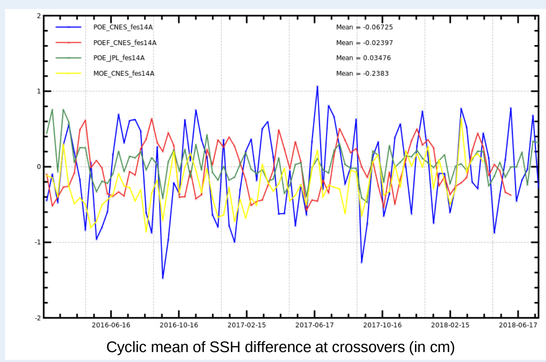


First LRO, Cycle 500 to 537

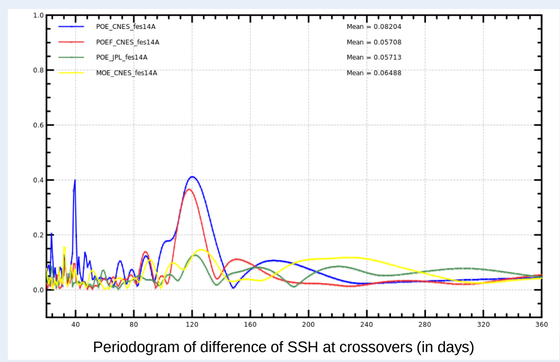
The Jason-2 Long Repeat Orbit is approximately 27 km below the historical T/P orbit still used by Jason-3. The very long repeat cycle yields a fine grid : thanks to 1 year on Long Repeat Orbit, spatial resolution from J2 data is approximately 8-km: it is beneficial for marine geodesy (e.g. improvement of bathymetry and mean sea surface models).

Focus on Jason-3

Despite the good quality of Jason-3 orbit solution, a 120-days signal remains on Jason-3 SSH differences at crossovers with GDR data. This signal disappear (JPL POE) or is reduced using alternative orbit solutions. (see dedicated poster on orbit poster session)



Cyclic mean of SSH difference at crossovers (in cm)



Periodogram of difference of SSH at crossovers (in days)

Conclusions :

Jason-2 and Jason-3 missions show both excellent performances in terms of data availability and quality.
Jason-2 LRO data quality will allow to improve mean sea surface models out of historical ground track
Thanks to long term stability, Jason-3 is still the reference mission to Global Mean Sea Level (not shown here - https://www.aviso.altimetry.fr/en/data/products/ocean-indicators-products/mean-sea-level.html)

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