SARAL/AltiKa performance assessment: from meso-scale to climate

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Main performance metrics

➢ SARAL/AltiKa is a very accurate altimetric mission which performances are summarized here.
➢ After it has been moved to a drifting orbit, with the first drifting cycle (labeled 100) beginning on July 4th, 2016, no impact on mission performances was noticed.

Data availability

➢ Since the beginning of the mission, data availability over ocean is excellent with 99.6 % of available data, SHM period included (99.3 % on Jason-2).

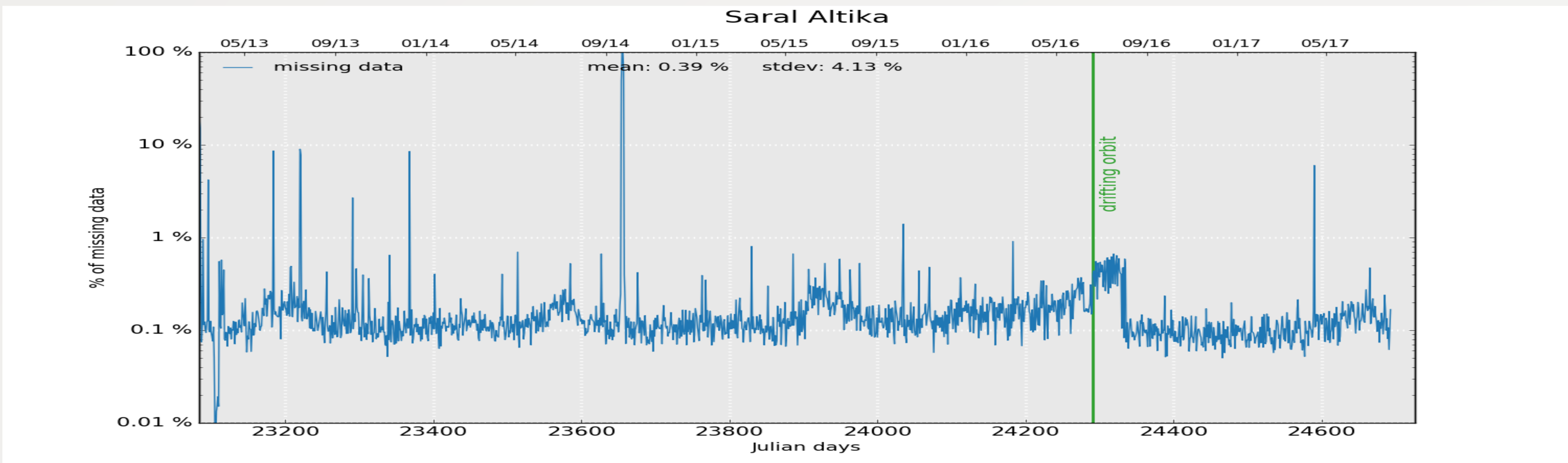


Fig1 Percentage of missing data : GDR cycle 1 to 111

Long term stability

➢ SARAL/AltiKa's global mean sea level record is very consistent with the reference curve, derived from a combination of Topex/Jason-1/Jason-2 time series.

➢ SARAL/Altika GMSL's shows a 4,78 mm/year evolution, thus keeping pace with Jason 2 (4.41 mm/year). It is a very satisfying statistic knowing that the time series for SARAL is still under 5 years which is the minimum period required to have a significant trend.

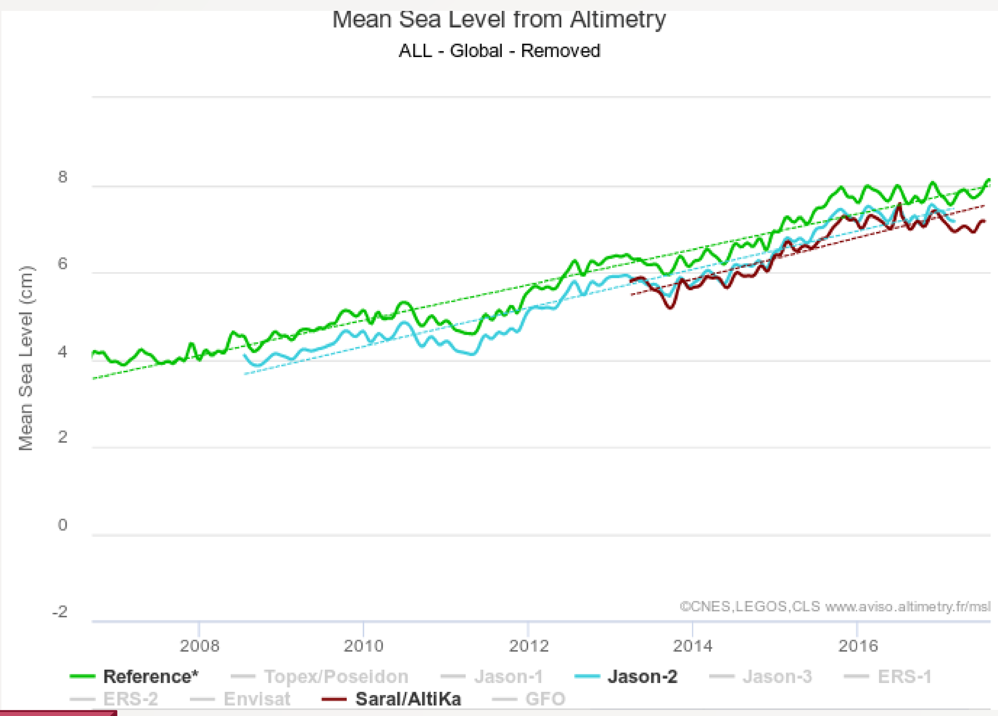


Fig2 GMSL records for SARAL/AltiKa

Plateform behavior

Mispointing events

Due to the loss of the reaction wheel, mispointing events occur randomly. These events are carefully monitored and waveform derived pointing is routinely compared to platform information provided by ISRO (Fig3). The currently observed mispointing levels are stable and do not impact data quality except the editing of punctual track portions.

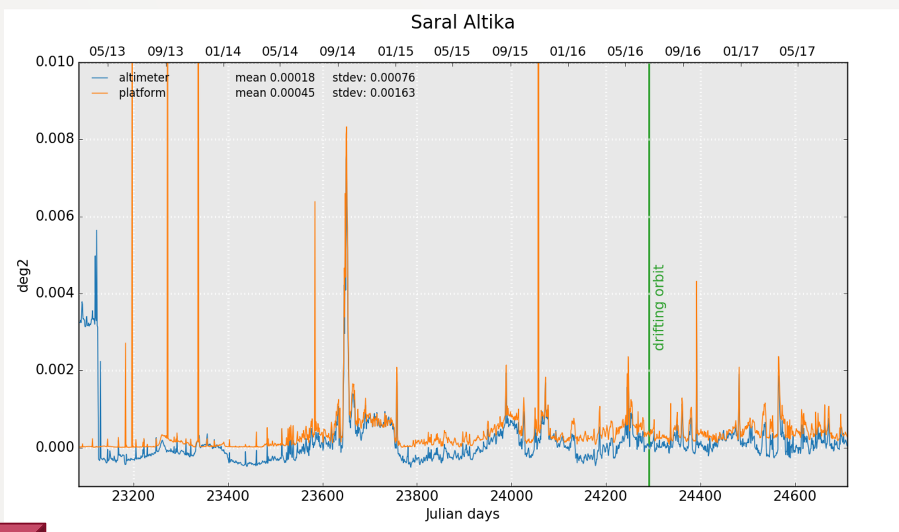


Fig3 Plateform stability (from waveform mispointing estimate and ISRO information)

Altitude loss during drifting orbit

Since SARAL/AltiKa is not maintained on orbit anymore, its platform fall happens to be correlated to the solar flux. Three years ago, during the maximum solar activity, it used to fall of about 2m per day(Fig4). Today, the drop is ten times slower (about 20cm per day).

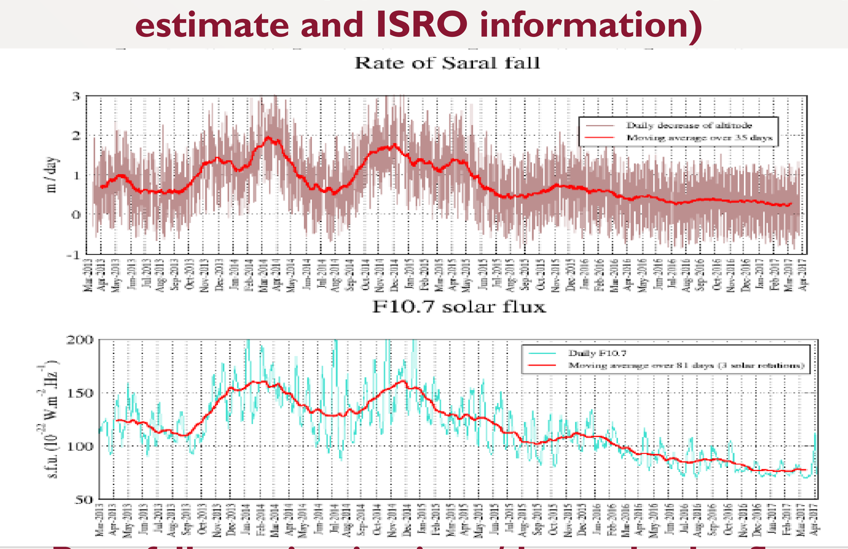
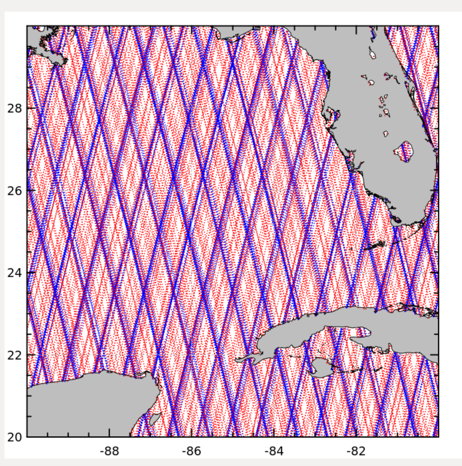


Fig4 Rate fall monitoring in m/day and solar flux estimation

Drifting orbit ground track



SARAL/Altika's orbit change provides a larger data coverage which opens up new opportunities for Mean Sea Surface sampling , Inland water level studies …

Fig5 [blue] Repetitive orbit ground track [red] Drifting orbit ground track

Crossovers

➢ Typical standard deviation of SSH differences at crossovers is 5.3 cm for GDR data (5 cm on Jason-2 and Jason-3).
➢ Mean difference between ascending and descending tracks is slightly negative around -0.4 cm.
➢ Spatial distribution of mean SSH differences shows no geographically correlated patches with differences remaining below 2 cm.
➢ Crossovers analysis demonstrates the excellent performances of SARAL/AltiKa.

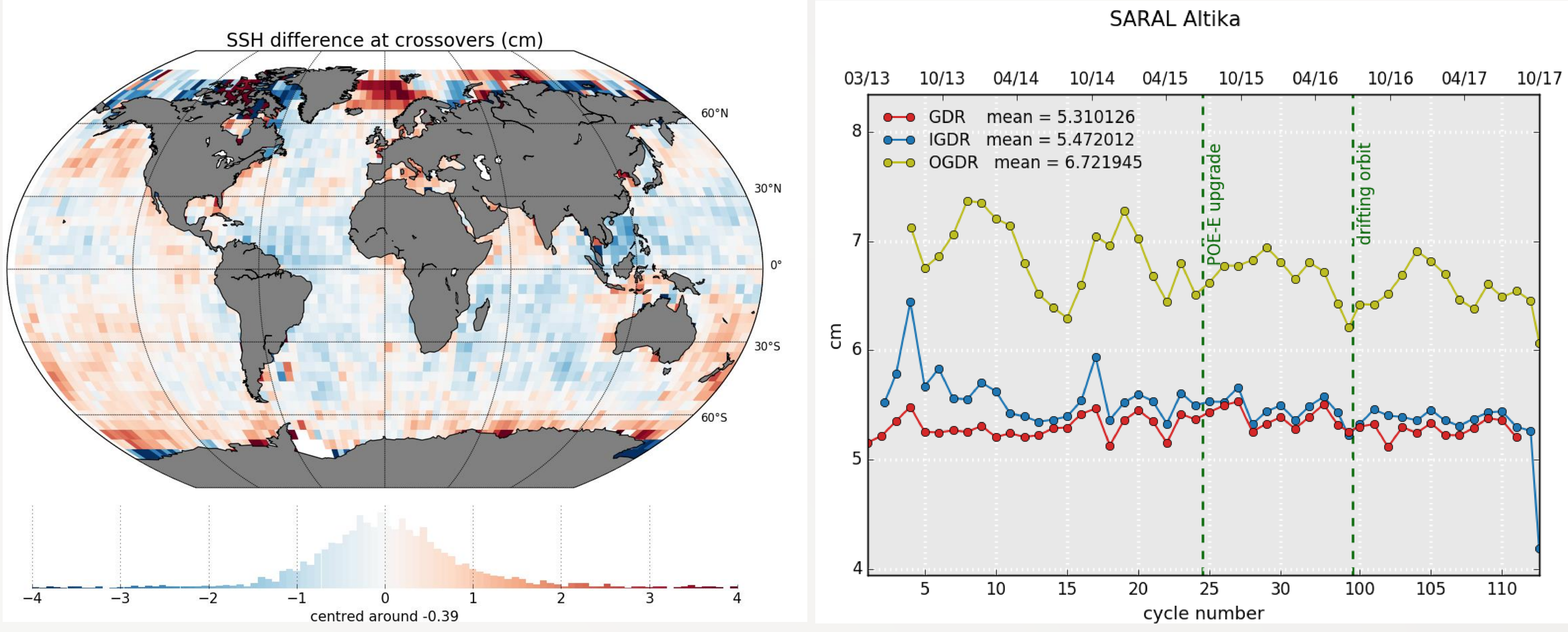


Fig6 Performance at Xovers: [left] monitoring of standard deviation of SSH differences and [right] map of mean SSH differences

Comparison to other mission

SARAL/AltiKa's Ka-band frequency allows it to restitute smaller scales than Ku missions such as Jason-2, and even doppler SAR processing missions such as S3.

Thanks to its higher rate of 40 Hz and a smaller and statistically more homogeneous footprint than a Ku frequency instrument, its noise level is lower than Jason-2/3.

Provided a dedicated editing (for 20 Hz measurements) based on the SLA coherence of consecutives measurements (V0) -along with the Zaron method (V1) to reduce correlated noise between altimeter range and SWH - smaller ocean scales are observable, notably around 35km where the spectral "bump" is reduced.

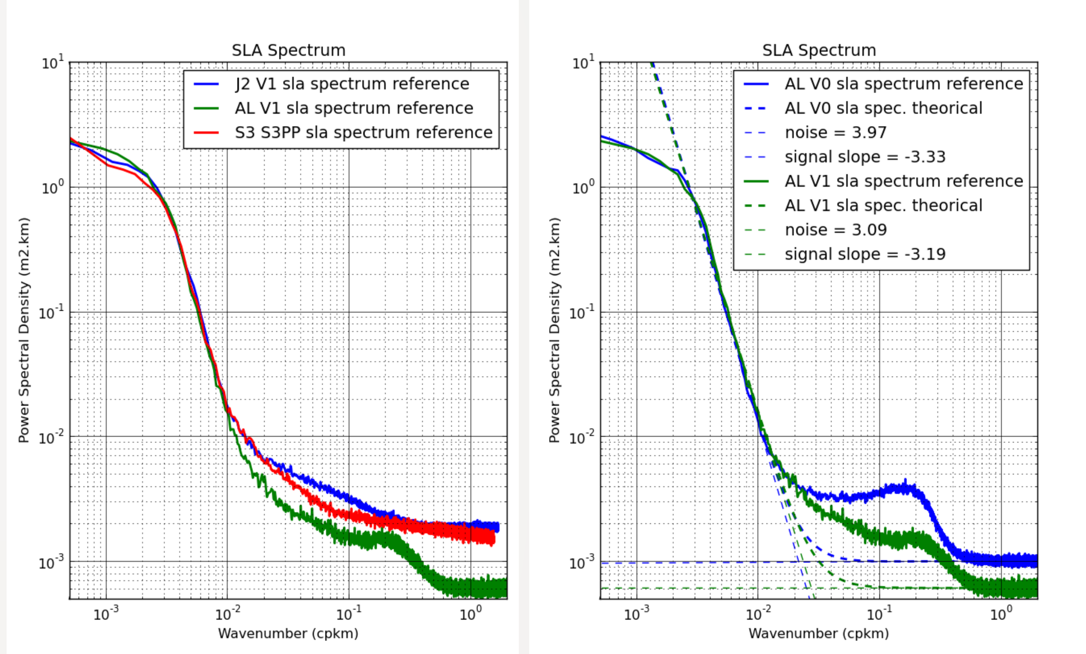


Fig7 [left] SLA power spectrum for Jason-2, SARAL/AltiKa with new editing + Zaron and Sentinel-3 data and [right] the impact of editing solutions + Zaron [green] wrt standard editing solutions [blue] on SARAL/AltiKa's SLA power spectrum.

In terms of performance for mesoscale restitution, variance at crossovers, shows that SARAL/Altika mission, corrected for its radiometer wet tropospheric correction is slightly better than the reference mission Jason2 (Fig8-red and blue curve).

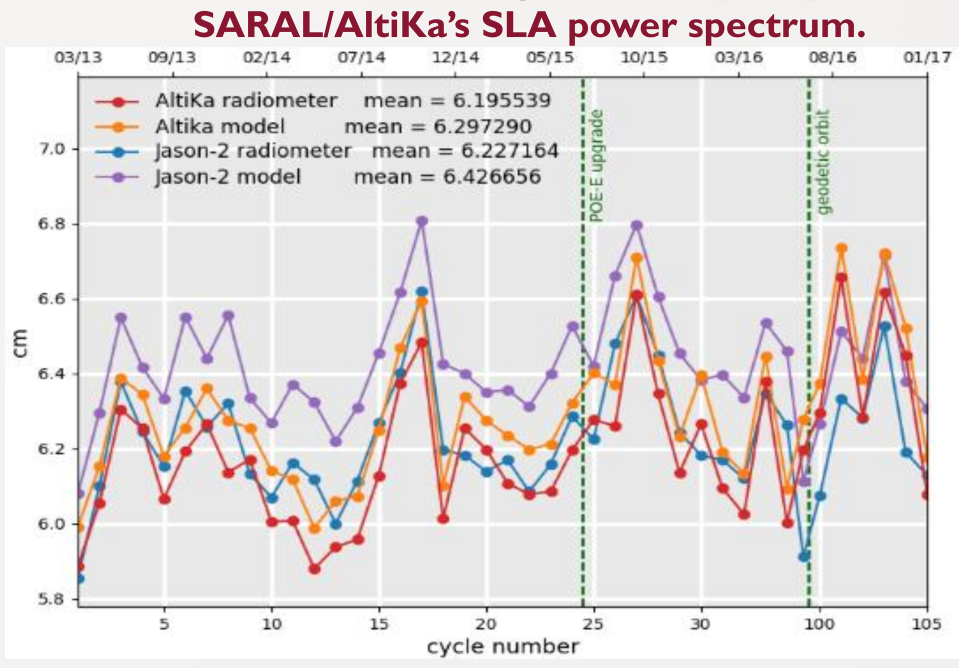


Fig8 Standard deviation of SSH crossovers differences for Jason 2 and Altika

In terms of geographical patterns, good consistency is observed (Fig9) with the reference mission J2, with slight differences in small waves areas (Indonesia) and in the Atlantic where orbital features remain under investigations.

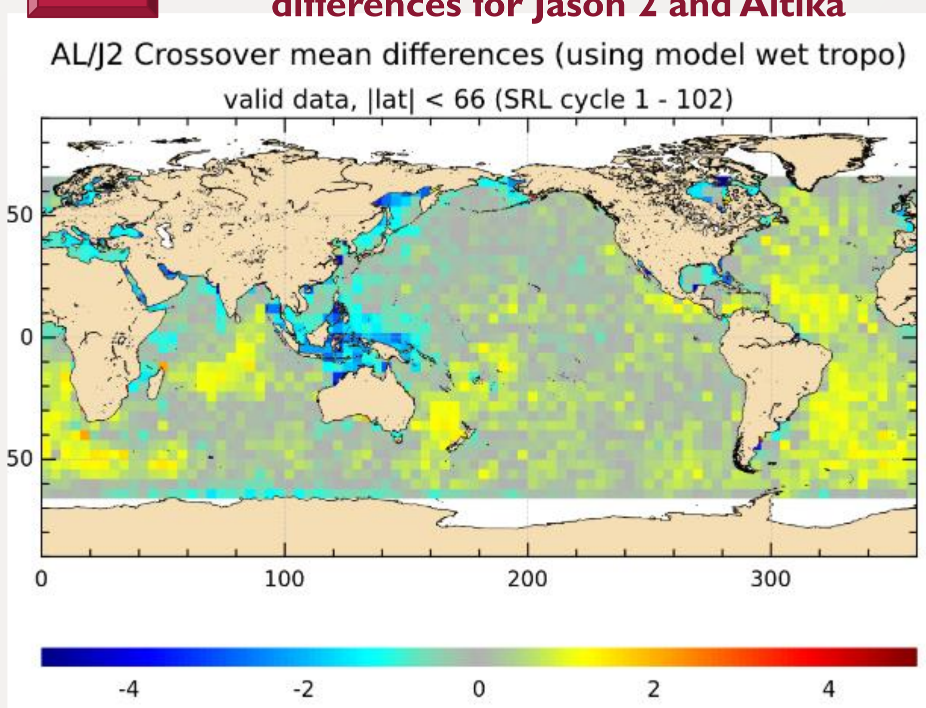


Fig9 AL/J2 crossover mean differences using wet tropospheric models

Conclusions and perspectives

➢ The SARAL/AltiKa mission is now in the middle of its fifth year. The drifting phase of the mission has begun on July 4th, and the spacecraft is no longer maintained on its nominal ground track. These geodetic cycles are numbered from 100 onwards.
➢ Mission performance remains excellent, compared to Jason-2, Jason-3 and Sentinel-3, from fine scale ocean dynamics to long-term stability.
➢ SARAL/AltiKa data undergo a complete Cal/Val process: instrumental parameters, products status and mission performance metrics are routinely checked by Cal/Val teams.
➢ Several updates of geophysical corrections are getting ready for the future reprocessing (GDR-E) planned for 2018.

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