SARAL Version 'T' Geophysical Data Records: Public Release

Dear Altimetry Data Users,

We are pleased to provide this short synthesis of the SARAL IGDR-T products data quality assessment over oceans. CalVal analysis was performed on CNES and CLS side during past months using classical tools like Cross-Overs and SLA analysis. This memo provides early metrics computed on our side in order to ease the SARAL use. This is based on the analysis of IGDR and OGDRs data dated from mid March 2013 to end of June. The Calval analysis will continue with the assessment of the first GDRs cycles and the routine monitoring of OGDRs and IGDRs products.

We also like to mention that a patch has been prepared to correct for some anomalies and to account for the in-flight calibration data in the ground processing. The evolutions included in this patch are described in next page. This patch has been installed on IGDRs products on July 11st. It will be installed on OGDRs processing chains around July 17th. Regarding the IGDRs products, the first product generated with this patch is :

SRL_IPN/R/S_2PTP004_0395_20130710_235618_20130711_004636.CNES.nc

This is mentioned in the Netcdf product in the global attribute 'references'. This patch corresponds to the patch number 2 on the Level1B Scientific Library ; number 10 on the Level2 Scientific Library and number 9 on the Processing Pilot chain :

references = "L1 library=V3.1p1**p2**, L2 library=V4.2p1p6p9**p10**, Processing Pilot=V3-4-1p2p5p6p7p8**p9**" ;

Former values were:

references = "L1 library=V3.1p1, L2 library=V4.2p1p6p9, Processing Pilot=V3-4-1p2p5p6p7p8" ;

Best Regards,

On behalf of CNES SARAL project,

Amandine Guillot –SARAL CalVal Responsible
Nicolas Picot - SARAL Measurement System Engineer

Patch1

Altimeter calibration file :

The altimeter calibration stability has been analysed. Based on the actual data, we have implemented an averaging of the calibrations over a 7 days window for the low pass filter (identical to Jason-2) and 3 days for the internal path delay and total power (not used on Jason-2). This will slightly reduce the daily noise observed in the altimeter calibration data.

Altimeter characterization file :

We have updated the altimeter characterization file using the flight calibration of the gain values (4 calibrations performed). The impact is very small (of the order of 0.01 dB).

Retracking look-up tables :

We have updated the ocean retracking look-up tables using the flight calibration data (PTR). The impact is very small on the range and sigma0 values but of the order of 15 cms on SWH for low sea states.

MQE :

We have analyzed the altimeter flight data and based on the observed MQE values over ocean a threshold of 2.3E-3 (Jason-2 value is 8E-3) is used for the 1Hz data computation.

Neural network :

A first linear relation has been computed between the measured BT and the simulated one. This linear relation is applied on the 23.8 GHz only – the same analysis will be conducted on the 37 GHz and sigma0. This generates a bias on the radiometer wet tropospheric correction which is now much more consistent with the model one.

Atmospheric attenuation :

The value outputted by the neural algorithm is now recorded in the level2 products (it was set to 0 at the beginning of the mission).

Rad_water_vapor and rad_liquid_water:

The values have been corrected to comply with the actual unit in the level2 products ("kg/m^2"). But the rad_liquid_water remains not reliable as an anomaly has been noticed in the neural network.

SSHA :

The radiometer wet tropospheric correction is now used to compute this value (the model value was used at the beginning of the mission).

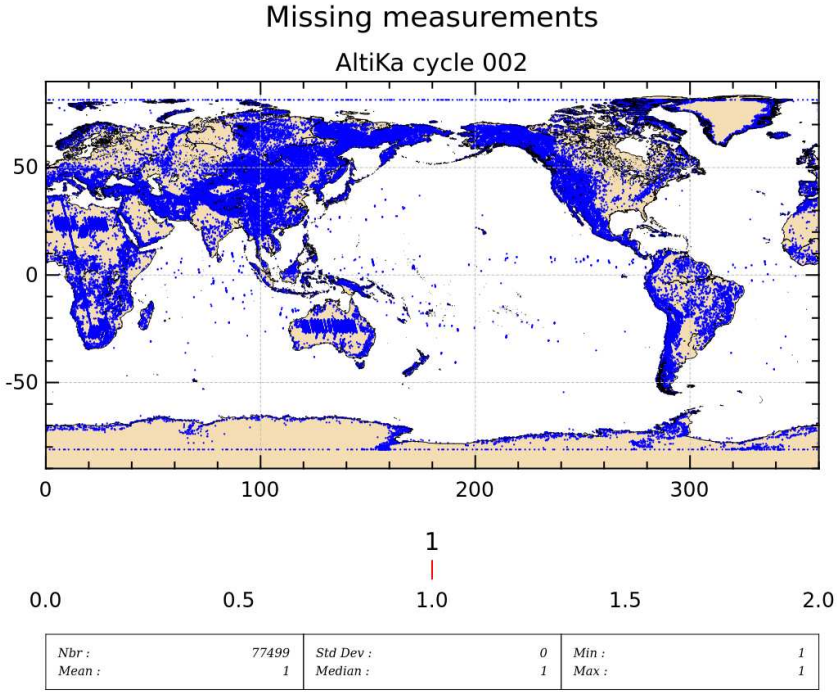
Controls parameters :

The threshold values have been updated with the flight data. This is a first tuning – additional work is necessary.

SARAL IGDR-T early CalVal analysis

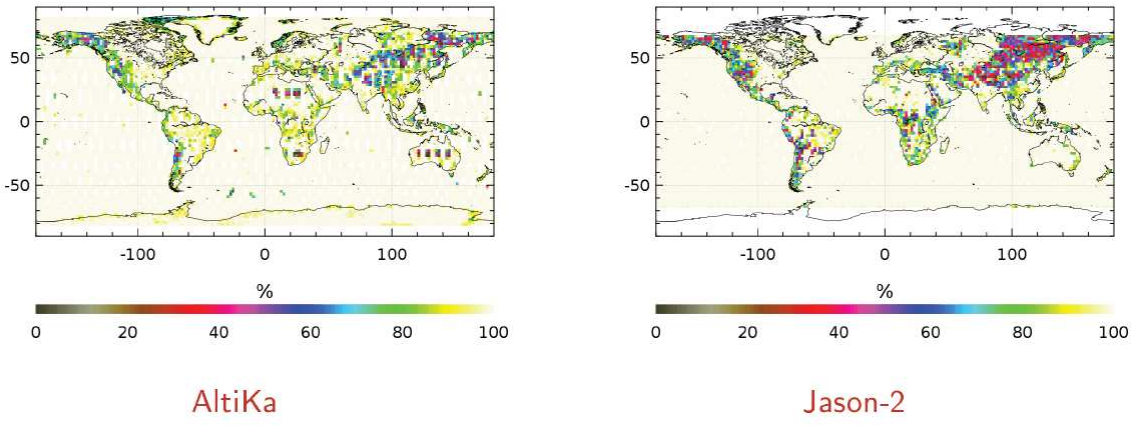
Missing measurements:

The map below displays the missing measurements over cycle 002 (as an example, the same behavior is obviously observed on other cycles). Data return is remarkably high with a very few missing data over ocean.



Missing 1Hz measurements – this is computed with a theoretical ground track.

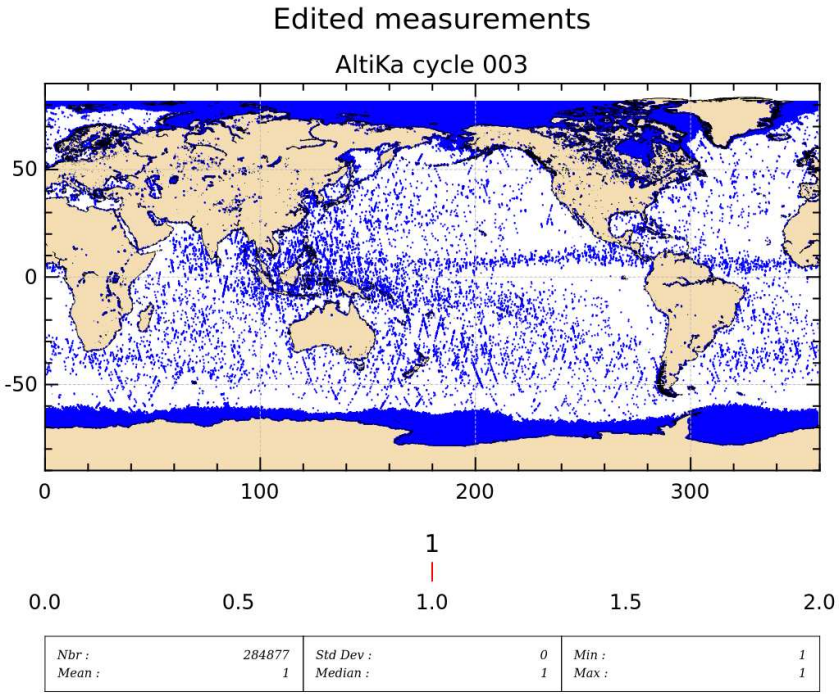
The tracking performances over land are also very good – thus providing a large number of data for inland water, ice studies. Over land surfaces the SARAL data return exceeds the one of Jason-2 (3% of missing data for SARAL over all surfaces, 4.1% for JA2).



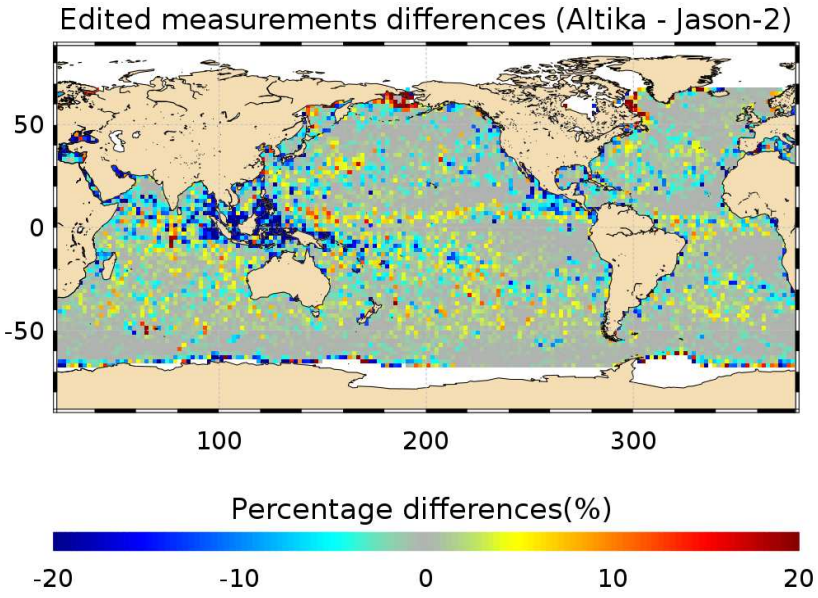
Number of missing 1Hz measurements averaged per box – this is compared with the theoretical ground track figures.

Editing with CalVal criteria:

Data editing has to be performed in order to remove degraded measurements which may occur in case of rain, sigma0 bloom, … Map below displays the measurements edited over cycle 003 using standard CalVal metrics. This is very comparable to Jason-2 mission with a slight increase in the area of high rain probability (as expected due to the Ka band sensitivity), but compared to Jason-2 mission we can notice that the SARAL provides a larger number of valid data, even if the area of high rain probability. This is related to the altitude of the 2 satellites and to the antenna footprint size. SARAL flies at an altitude of 800 kms, thus the altimeter antenna footprint is lower than the one of Jason-2 at 1330 kms. And in addition the Ka band footprint is narrower.



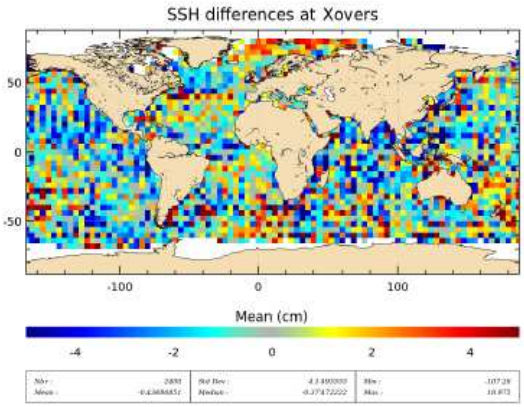
Number of edited 1Hz measurements with the CalVal criteria mentioned in the User Handbook.



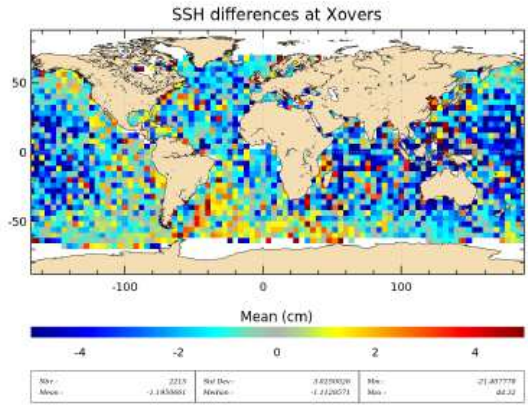
Number of edited 1Hz measurements averaged per box and compared to the one obtained on Jason-2 mission.

Crossover performances:

The standard deviation of SSH differences is comparable to the one obtained on Jason-2 mission and we do not observe any significant geographical patterns.
Note that Crossovers are only selected for open ocean (latitude less than 50°, bathymetry less than -1000 m and oceanic variability less than 20 cm).

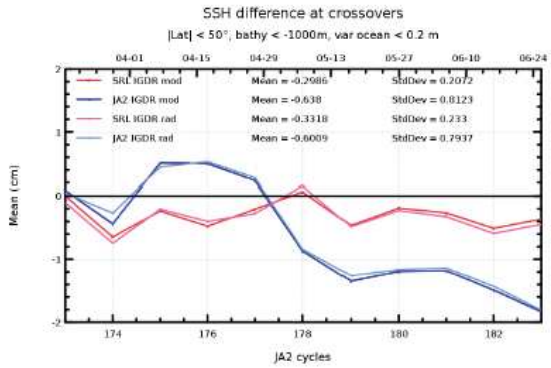


IGDR Altika last 35 days

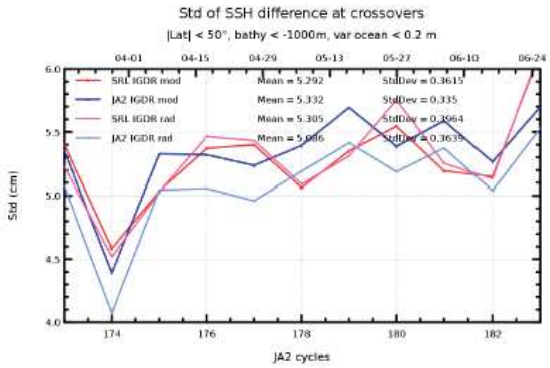


IGDR JA2 same period

CrossOver mean differences for SARAL and Jason-2 over the same period.



Mean

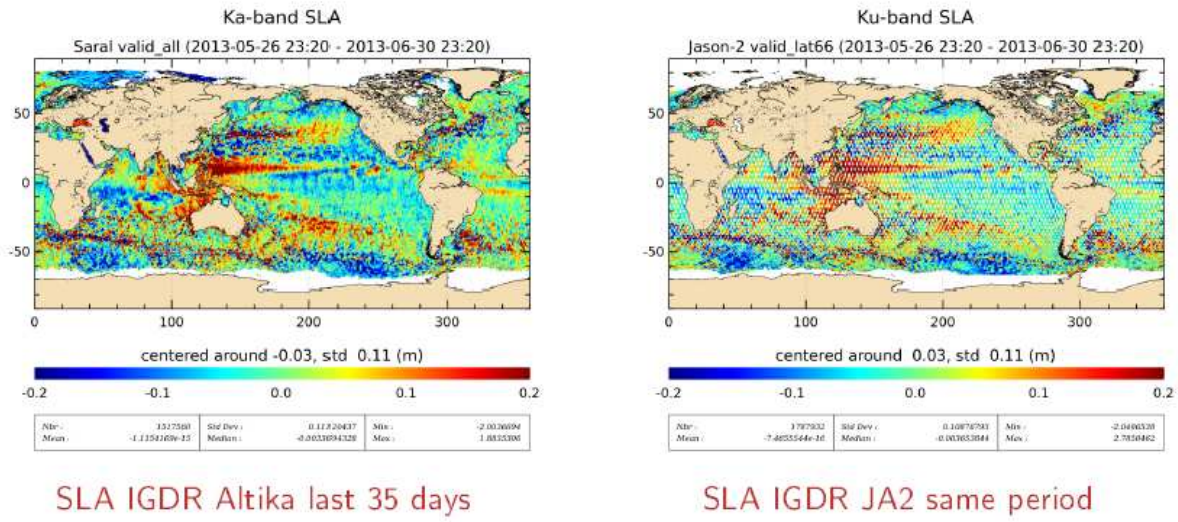


Standard deviation

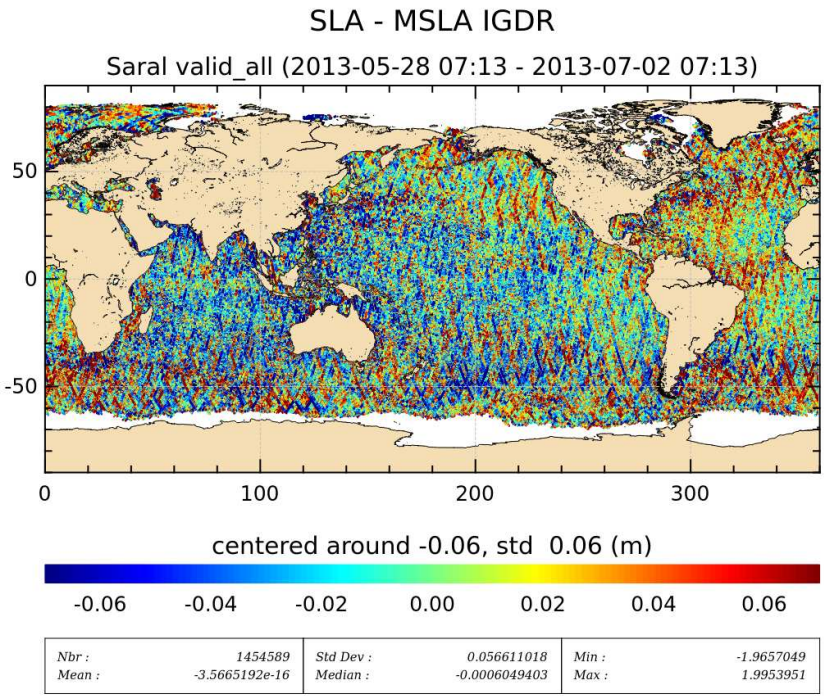
CrossOver differences (mean and rms) for SARAL and Jason-2.

SLA performances:

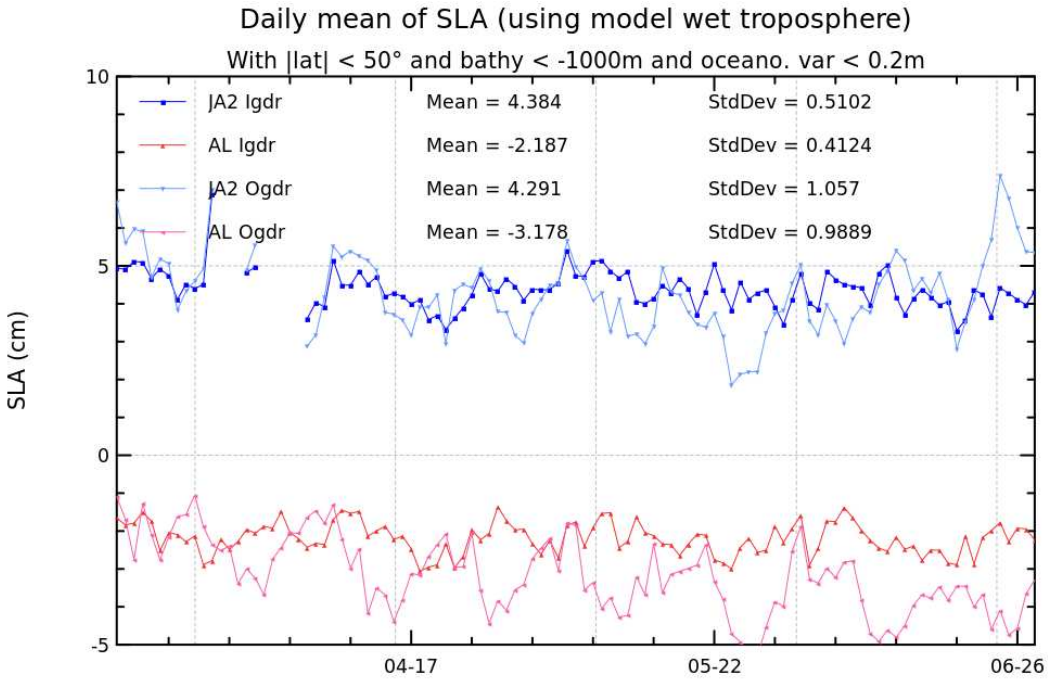
The SLA maps obtained on SARAL mission is very close to the obtained on Jason-2 mission. Compared to the DUACS maps, the agreement is also very good with a mean bias of the order of 6 cms (using the model wet tropospheric correction and the SSH model provided in the IGDR products). This bias value needs to be confirmed with other means (in situ sites, …). It is also worth to remind that the SSB solution used is fully empirical (SSB = 3.5% * SWH) and will be tuned on this Ka band mission in the coming months.



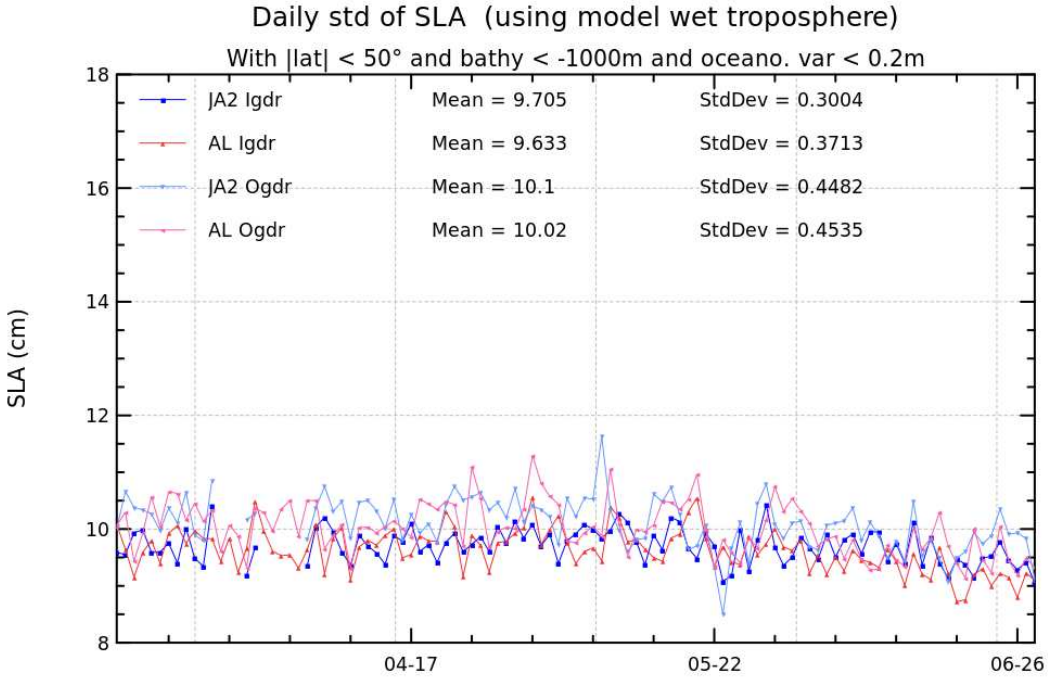
SLA differences for SARAL and Jason-2.



SLA – DUACS MSLA for SARAL.



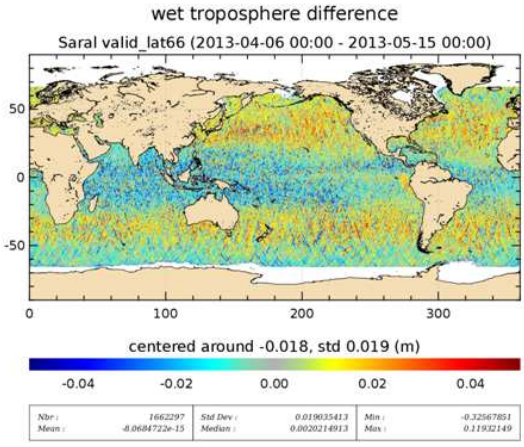
Daily mean of SLA using model wet tropospheric correction for SARAL and Jason-2 OGDRs and IGDRs products.

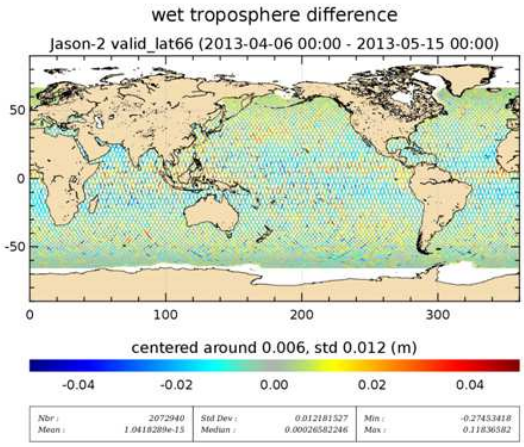


Daily rms of SLA using model wet tropospheric correction for SARAL and Jason-2 OGDRs and IGDRs products.

Radiometer wet tropospheric correction:

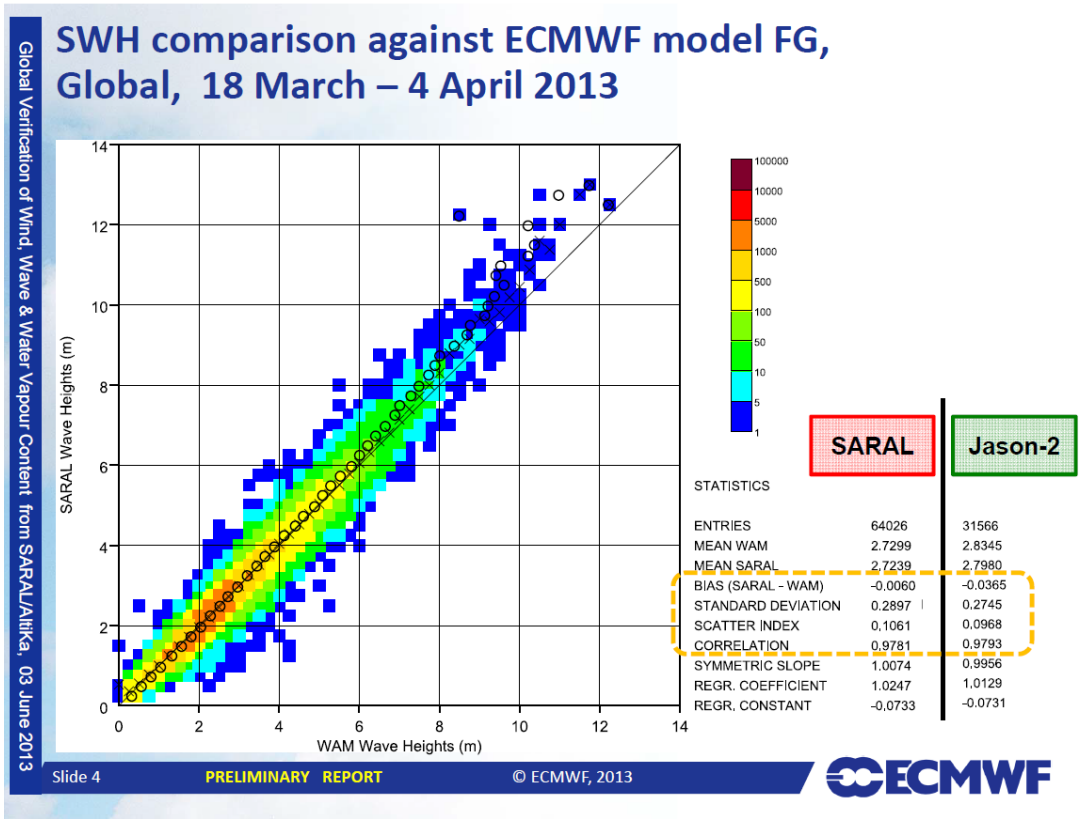
The radiometer wet tropospheric correction displays regional biases which are not visible on the Jason-2 mission. This is under analysis by the radiometer processing experts. A first explanation is linked with a mismatch between the actual instrument brightness temperatures, and the one simulated to generate the neural algorithm network. As this neural network is used to perform the inversion from the instrument brightness temperatures, any mismatch will generate a bias on the wet tropospheric correction.





Wind and waves parameters:

SARAL waves estimates have been validated by different groups (ECMWF, MeteoFrance, Ifremer). As an example, the following graph displays the comparison toward the ECMWF model (courtesy S. Abdallah) which demonstrates that SARAL SWH have the same level of quality than Jason-2.



We remind that the wind speed currently provided in the product is NOT to be considered as we are using the Jason-1 look-up table. This Jason-1 table is applicable to Ku band altimeter and not to Ka band. Analysis is ongoing to derive suitable table to compute wind from Ka band sigma0 values.