



SARAL Project Status



*Prepared by Nadège Quéruel , CNES
With support of CLS, EUMETSAT, ISRO*

MAJOR EVENTS SINCE LAST OSTST

Major events since last OSTST (October, 2017)

Since 4th July 2016 SARAL still in Drifting Phase*

- Satellite major events
 - None
- Payload major events
 - None
- Ground major events
 - Migration on the CNES X-band network management **IDEFIX** (service d'Ingestion et de Diffusion Externe des Fichiers reçus en bande-X) performed successfully beginning of 2018.
 - Migration on the CNES High Rate Debit network for X-Band stations (HDX) performed successfully in Summer 2018

Current SARAL-Drifting Phase mission Status is OK
CNES, EUMETSAT approved SARAL mission extension till end of 2019
No concern on ISRO side for extending the mission

* Cf article : *The drifting phase of SARAL/AltiKa: securing a stable mesoscale sampling with an unmaintained decaying altitude*
Authors: Gerald Dibarbour * , Alain Lamy, Marie-Isabelle Pujol, Ghita Jetrou – April 2018

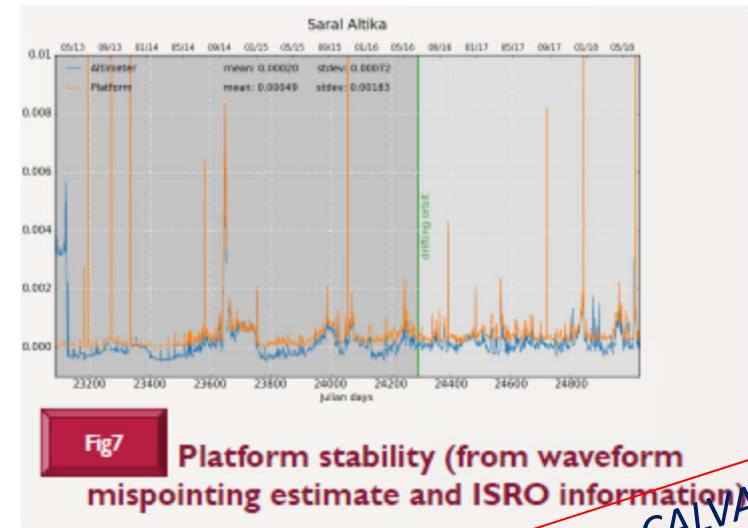
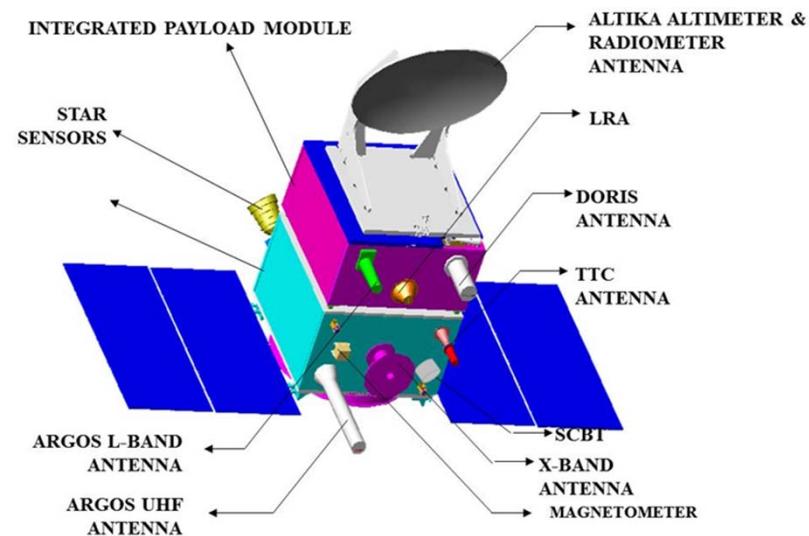
SPACECRAFT and GROUND SEGMENT STATUS

Platform Status

The SARAL satellite bus is **OK**

- Command / control , RF : **OK**
- Thermal aspects : **OK**
- Electrical aspects : **OK**
- AOCS (attitude and orbit control system) : **OK**
with some concerns on reaction wheels but stable and under control by ISRO since 2016

SARAL bus is operational after 5,5 years in orbit



See CALVAL poster
C5L_016

Payload Status since last OSTST (October, 2017)

- **99.998 % available**

- **AltiKa**

- routine calibrations PTR, LPF
 - quarterly CNG calibrations I^2+Q^2
 - specific calibrations over sea & ice (HD mode)

OK

- **Radiometer**

- Very good stability & sensitivity

OK

- **DORIS**

- Nominal

OK

- **ARGOS**

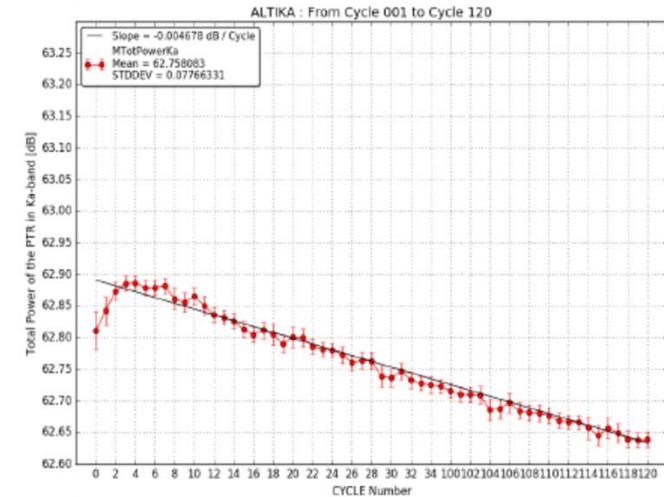
- Nominal; performance similar to other satellites

OK

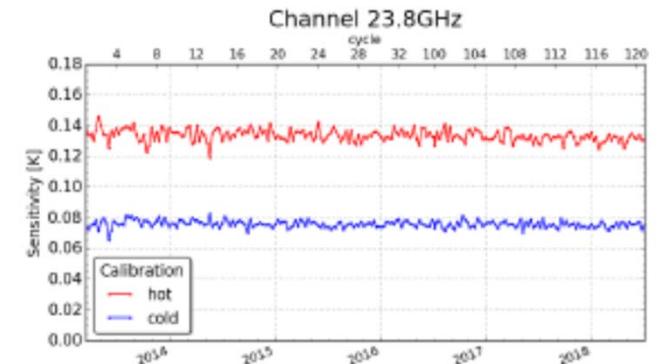
→ fully **OPERATIONAL**

SARAL status- OSTST AZORES - Septem

ALTIMETER total power of the PTR for Ka-band.



Radiometric sensitivity - Ch 23.8GHz



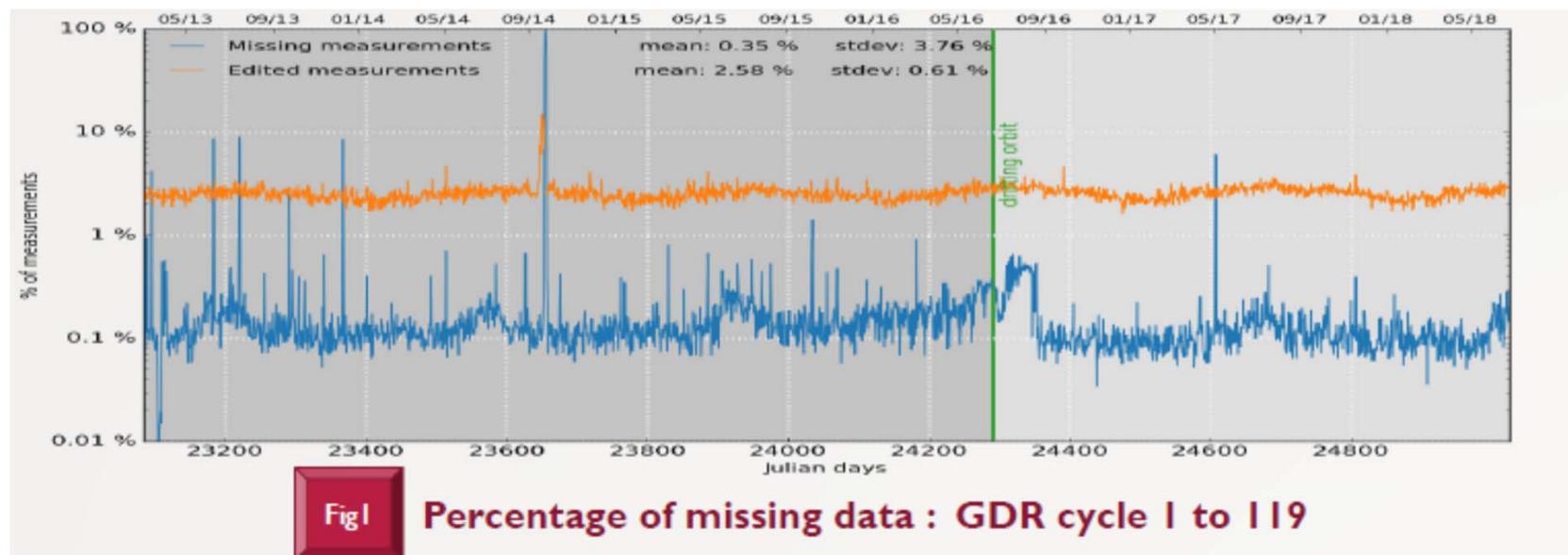
Ground & Operations - Status and performances

- Earth terminals :
 - ISRO band-S (Bangalore, Lucknow) OK
 - ISRO band-X (Shadnagar) OK
 - CNES band-X (Kiruna and Inuvik) OK
- Control Centers :
 - ISRO/ISTRAC Control center
SARAL spacecraft operations is handled from Alternate Spacecraft Control Center at **Lucknow** instead of Mission Operations Complex (MOX) at **Bangalore**, since November 2017
- Instrument Commanding and Monitoring Centers :
 - SSALTO for Altimetry OK
 - ARGOS PC for ARGOS OK

PERFORMANCES

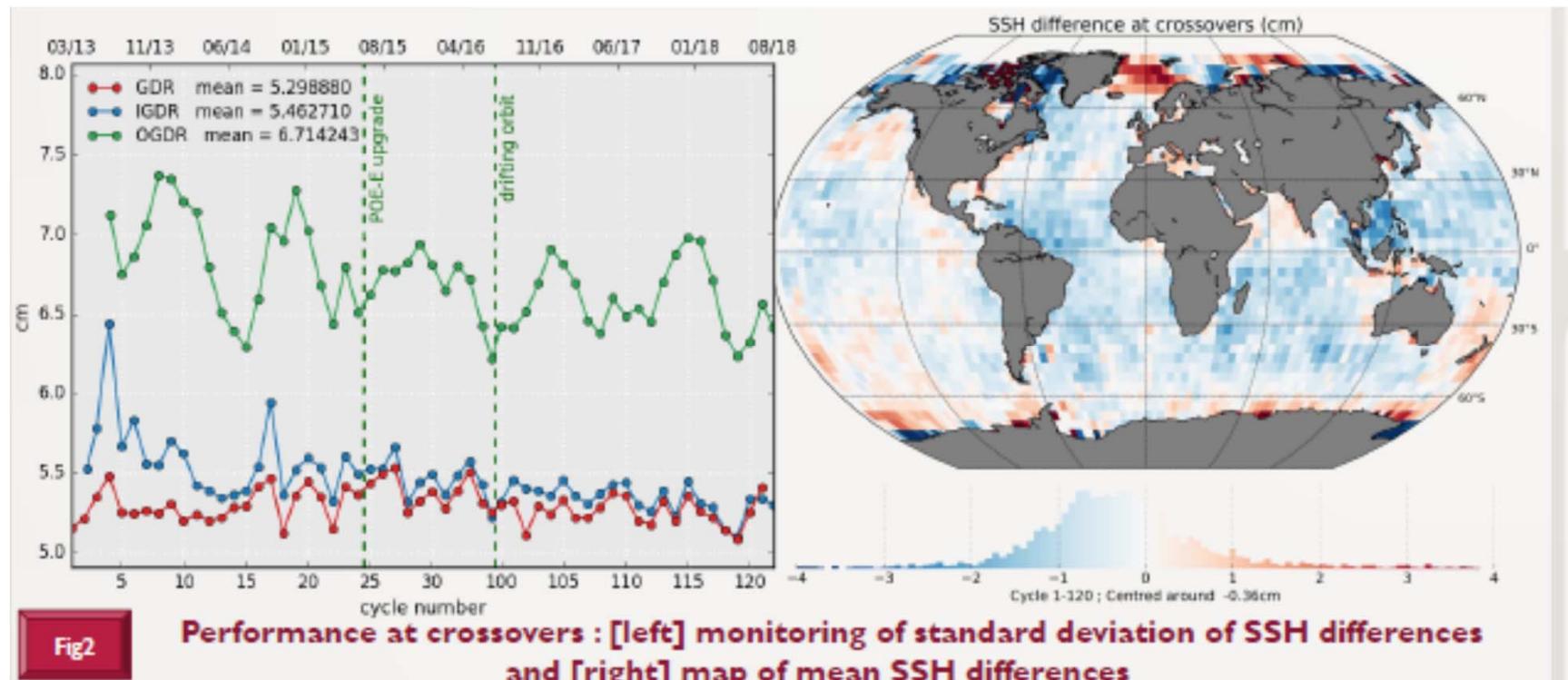
Performances : Data availability – ocean only

- Excellent Data availability over Ocean : **99.6%** of available data over oceans since no maneuvers



See CALVAL poster
CVL_016
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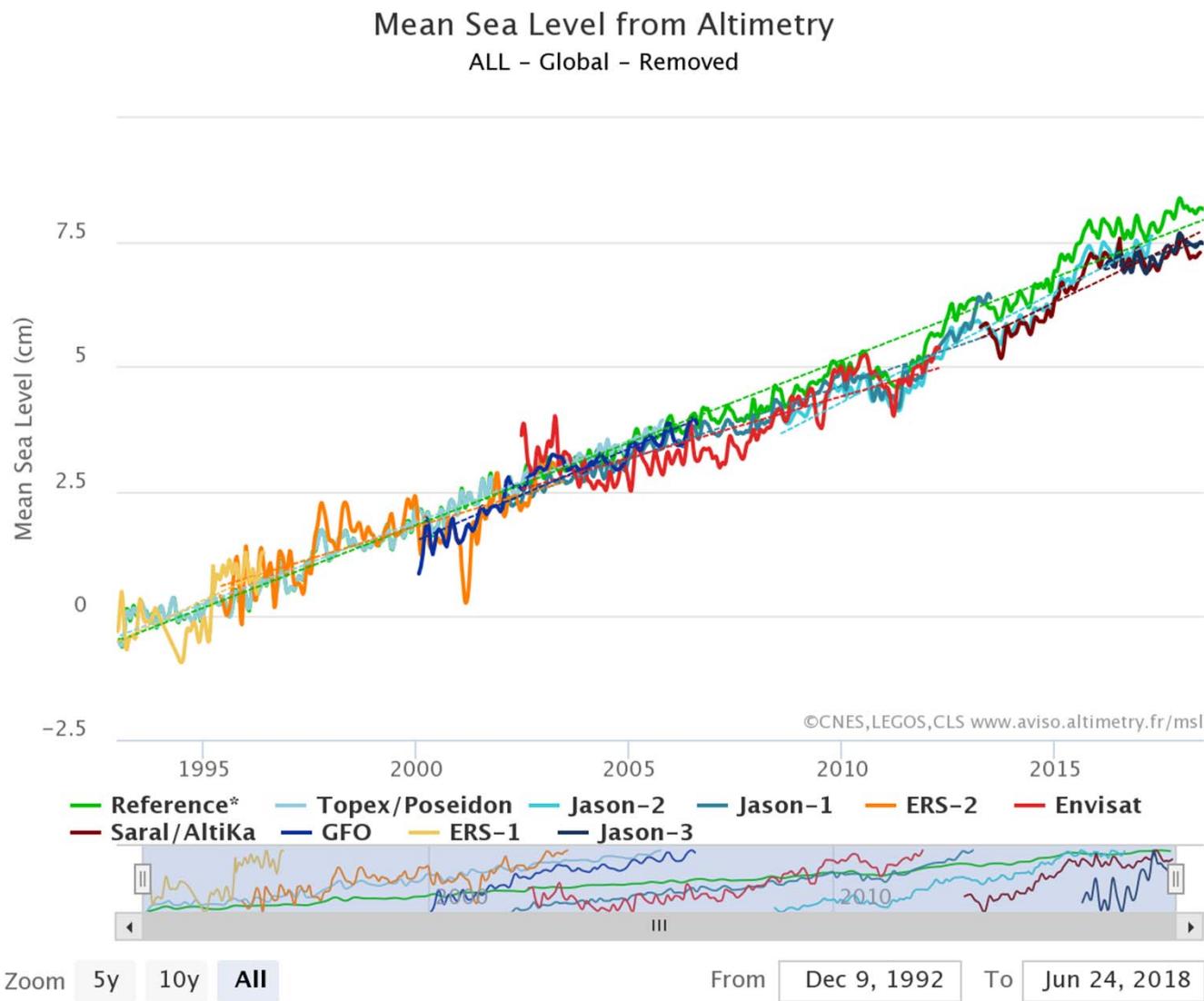
Performances : Xover - 5.3 cm for GDRs



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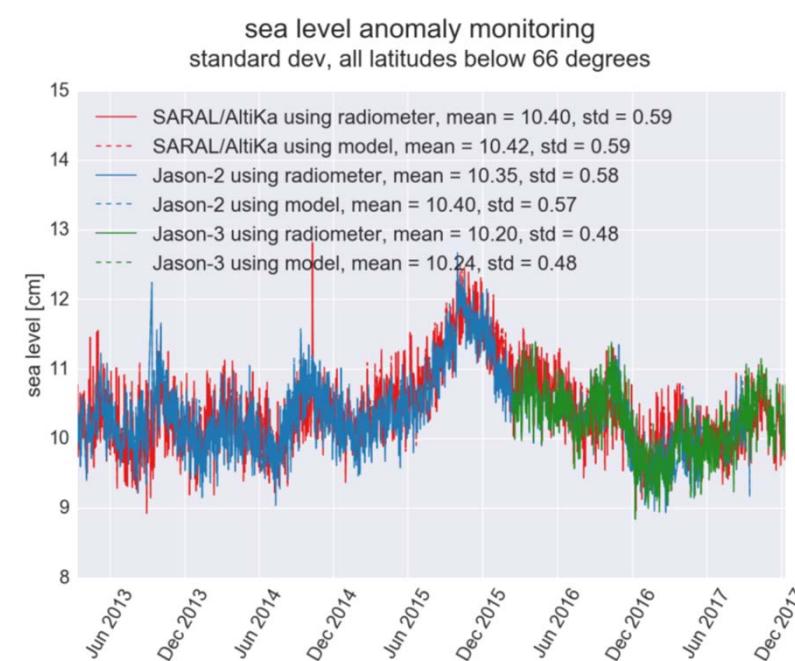
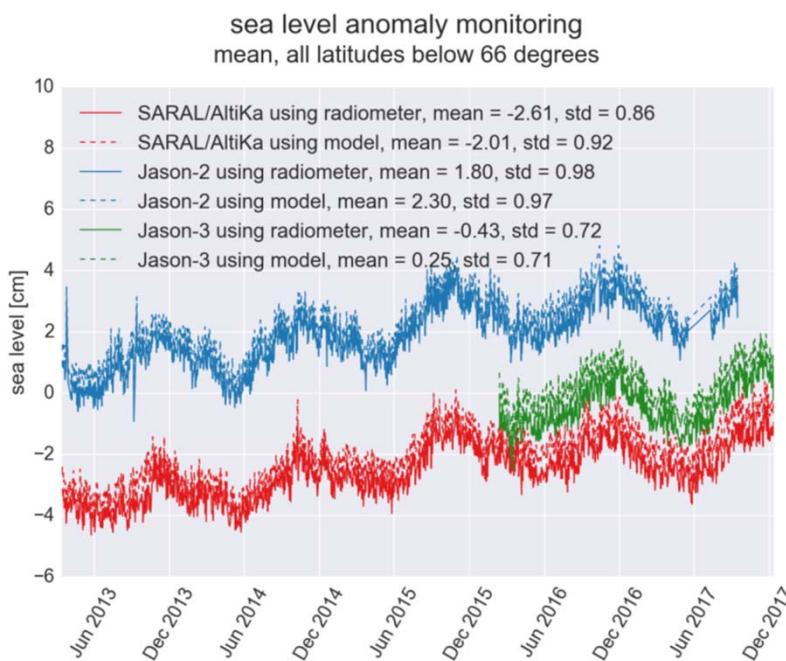
Mean Sea Level

same pattern as Jason-2 (before change of orbit) and Jason-3



Sea-level anomaly performances (Altika vs Jason-2 & 3)

SARAL/AltiKa Jason-2 and Jason-3 daily mean of SLA show similar signals and evolution. The standard deviation of daily averages of SLA differences is below 5 mm.

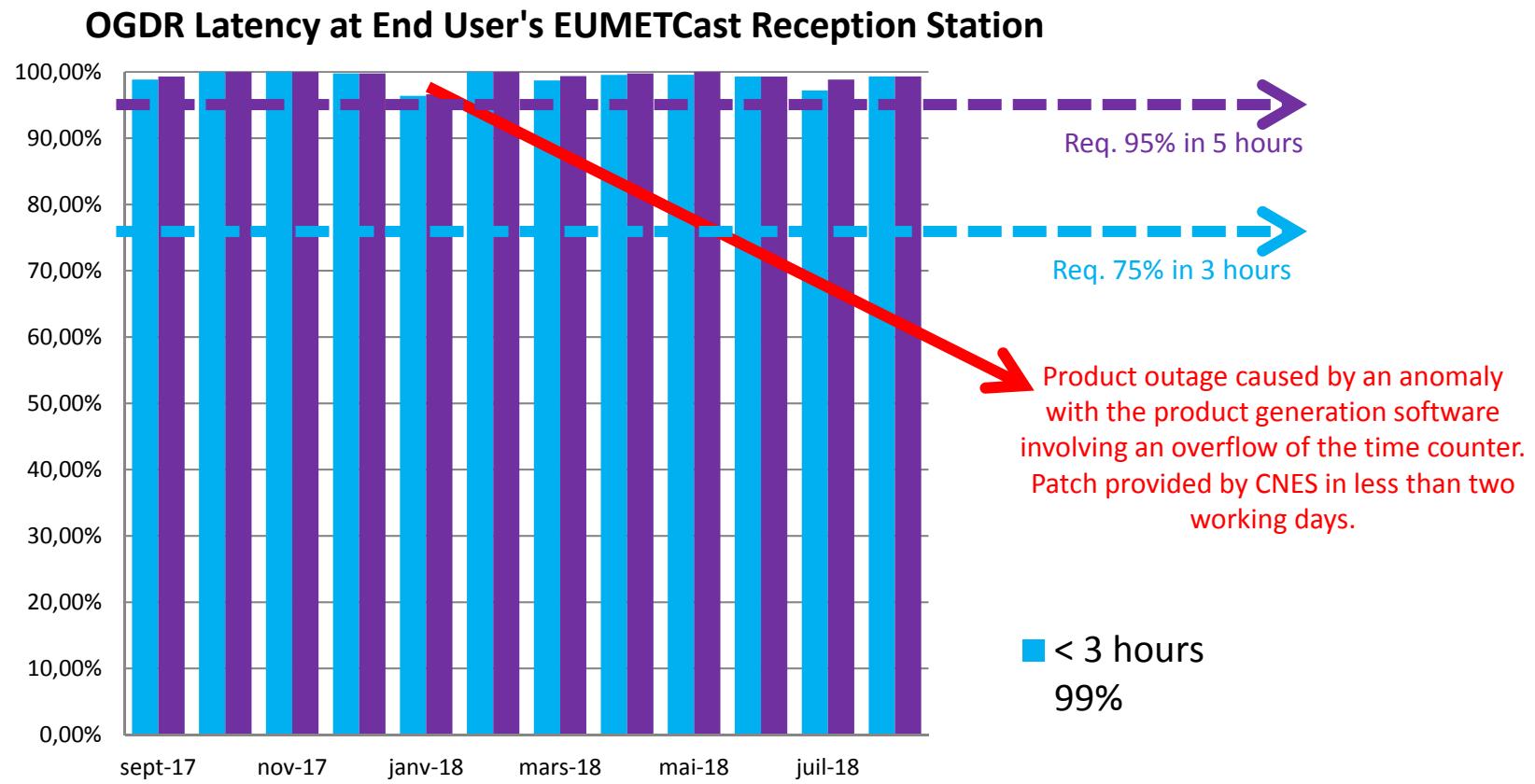


Monitoring of daily mean (left) and daily standard deviation (right) of SLA of GDR data using the radiometer (plain lines) and the model (dotted lines) wet tropospheric corrections.
Global statistics are estimated for all latitudes between -66° and 66°

See CALVAL poster
CVL_016
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DATA PRODUCTS

SARAL OGDR Latency at EUMETCast



Input from EUMETSAT

SARAL/ALTIKA Products latency

IGDR (Interim Geophysical Data Record) from 01/09/2017 to 01/09/2018

IGDR

Requirement < 3 days
 (objective : 1 or 1,5 days max)

From 1/10/2015 to 30/9/2016

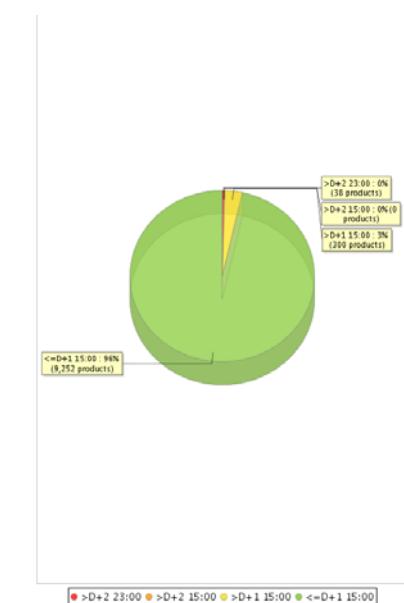
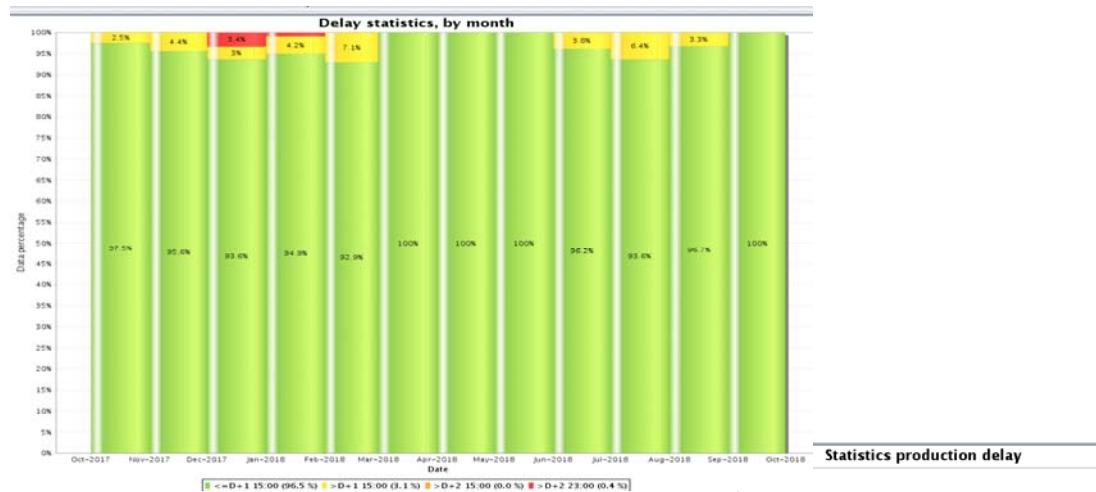
- 99,5% < 3 days

From 1/10/2016 to 30/9/2017

- 99.7 % < 3 days
- Mean delay : 1.4 days

From 1/10/2017 to 01/09/2018

- 96,5 % < 3 days
 - Mean delay : 1.4 days
- (but 100% of IGDR available after last replay)



SARAL/ALTIKA Products latency GDR (Geophysical Data Record)

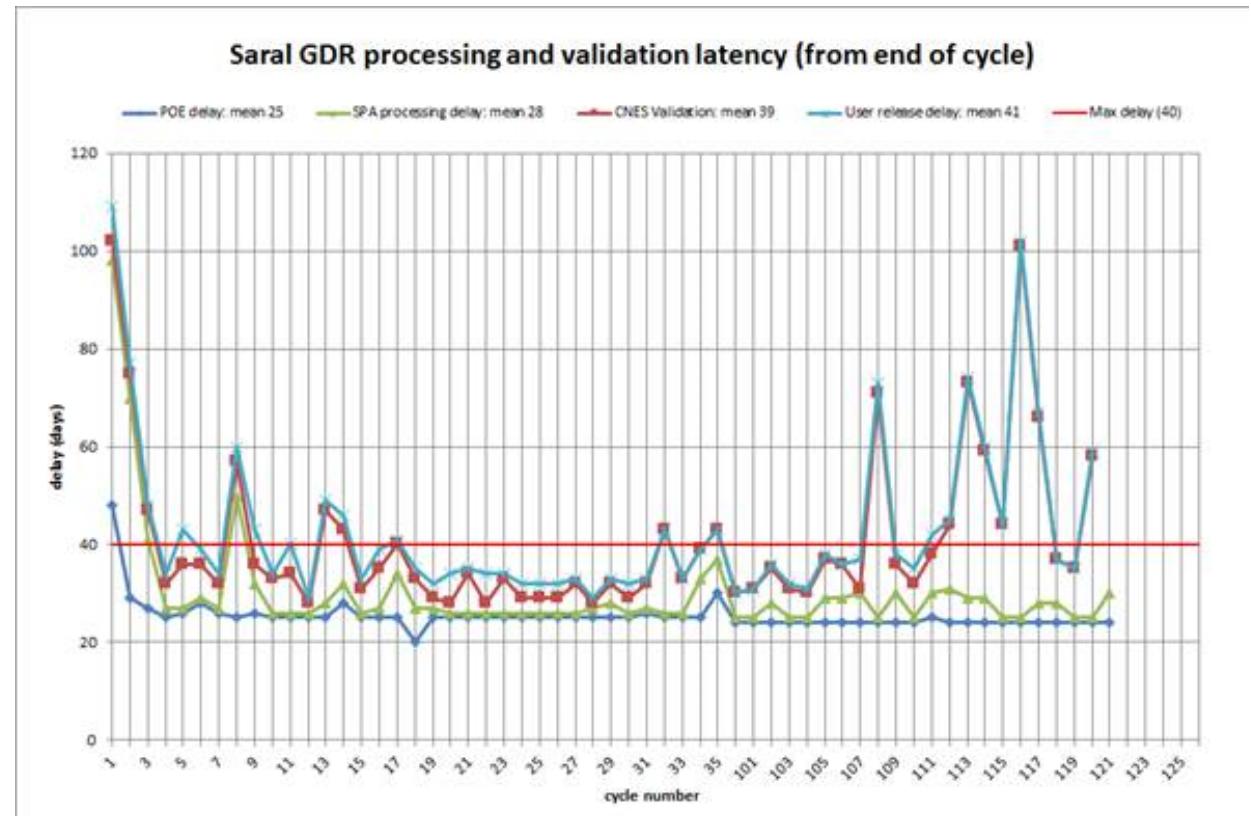
GDR

Requirement ~40 days

From 01/10/2015 to 30/09/2016
compliant (average: 34 days)

From 01/10/2016 to 30/09/2017
compliant (average: 29.5 days)

From 01/10/2017 to 01/09/2018
compliant (average: 29.6 days)



SARAL GDR-E standard – OSTST 2017 recommendation

- **GDR-E configuration is currently being finalized for SARAL mission, it will include (among other ...about 60 Change Requests) :**
 - Ice2 retracking accounting for the actual altimeter antenna aperture
 - Updated altimeter calibration scheme (CAL2 normalization, CAL1 not corrected by CAL2, updated gains values)
 - SSB based on 3D approach (SWH, wind and swell)
 - New Radiometer processing algorithm, developed by CLS in 2017 – performances are similar to Jason-2/3 methods (refer to CLS presentation)
 - Wet & Dry tropospheric correction based on 3D ECMWF fields
 - Updated geophysical correction (FES2014, GOT4.10, R. Ray internal tide model, S. Desai pole tide with new IERS linear mean pole, 2013 MDT)
 - Atmospheric correction derived from ECMWF fields
 - Platform mispointing angles
 - Netcdf v4 product format
 - Etc ...

SARAL GDR-E standard – implementation status

GDR-E implementation for SARAL mission started in 2018

Tentative schedule :

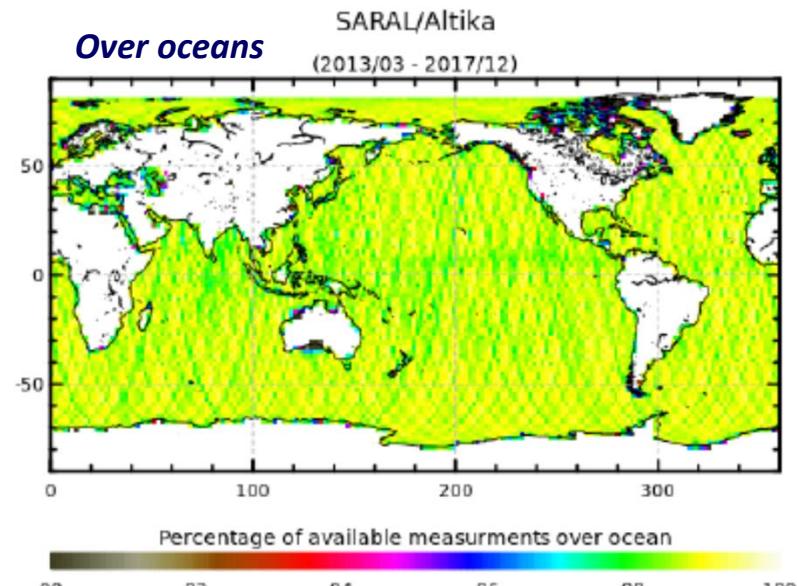
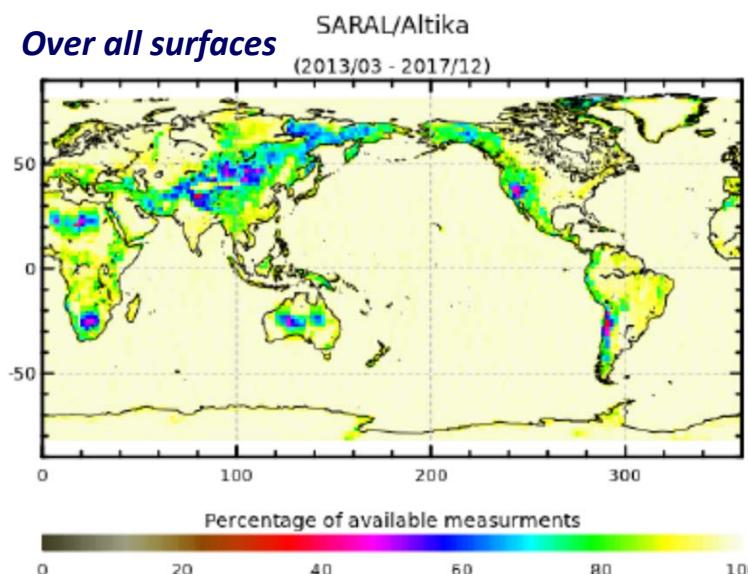
- 3 cycles processed and almost validated by CAL/VAL
 - ✓ **Cycle 7 (10-10-2013 - 14-11-2013) :**
Cycle on nominal ground track, during HOT COUNT saturation and after, no mispointing.
 - ✓ **Cycle 17 (25-09-2014 - 30-10-2014) :**
Cycle with mispointing and SHM on the period
2 processes: one with LUTs and platform mispointing, one with LUTs and no mispointing
 - **Cycle 31 (28-01-2016 - 03-03-2016) :**
Cycle post SHM on drifting orbit for a global check, no mispointing
- If CALVAL OK, the year 2015 will be reprocessed for SSB computation; will use orbits with POE-F standard
- Implementation for routine processing at CNES, EUMETSAT and ISRO
- Full re-processing (2013-2019) planned in 2019

System Requirements and Performances

From October 2017 until September 2018

⇒ satellite unavailability	~0 %	< 4% req
bus : 0%	altimeter & radiometer : 0.002%	Doris : 0%
⇒ ground unavailability	~0 %	< 1% req

→ Global SARAL system availability : 99.9 %



GDR data availability vs theory 95% (from 2017 annual CALVAL report)

All surfaces : 96.7 % (96.7% in 2016)

Over Ocean : 99.6 % (99.6% in 2016)

SARAL status- OSTST AZORES - September 2018

Conclusion

- SARAL/ALTIKA is performing excellently
- GDR-E processing ongoing and should be released in 2019



INDIA

*!! Thank you for your attention and ...
also to all the contributors*

*ISRO team
EUMETSAT team
CLS team
CNES Team*

