



SENTINEL-3B COMMISSIONING PHASE

SRAL ALTIMETER CALIBRATION AND VALIDATION

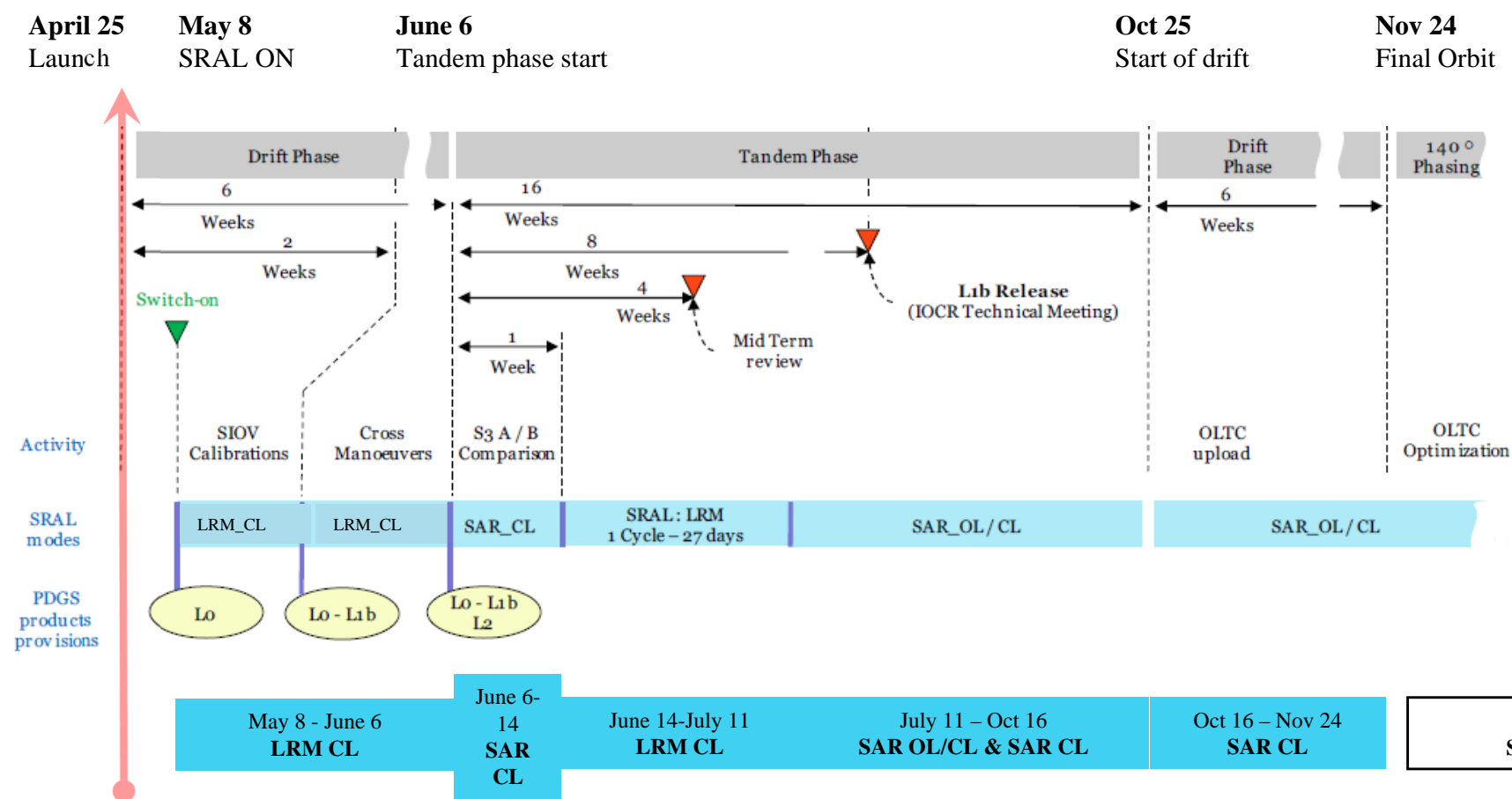
F. Boy, S. Le Gac, A. Guillot, N. Picot (CNES)
F. Borde, B. Seitz (ESTEC)
D. Blumstein, L. Lasson (LEGOS)
A. Houpert (TAS)
F. Piras, J.A. Daguzé, M. Raynal (CLS)
M. Verdier (NOVELTIS)



Sentinel-3A&B fly in tandem

- **Launched in 2016, Sentinel-3A has been measuring our oceans, land, ice with 100% SARM**
- **Its twin, Sentinel-3B, was launched in April 2018** and its instruments has been calibrated and commissioned for service.
- **Even though the two Sentinel-3 satellites are identical, there's a chance that their instruments could behave slightly differently.**
- **Need to understand the small differences** between each successive satellite instrument as these influence our ability to determine accurate climate trends.
- **S3B flew 4 months in tandem phase with S3A (30 sec separation) for commissioning.**
- Now Sentinel-3B is operational, the two satellites will orbit Earth 140° apart.

Commissioning Timeline



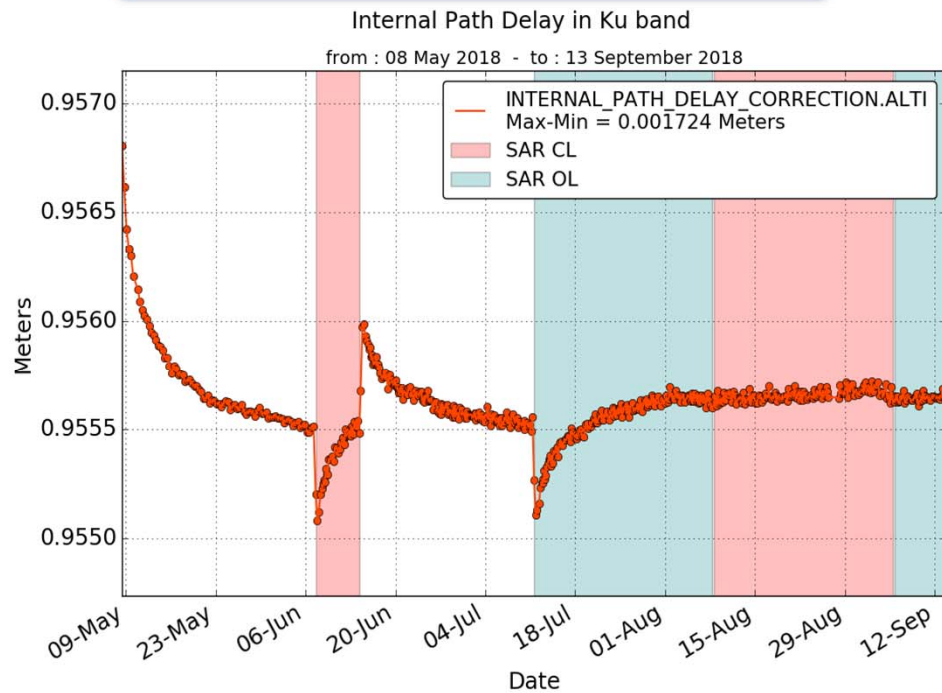
CAL1 SAR Ku Band



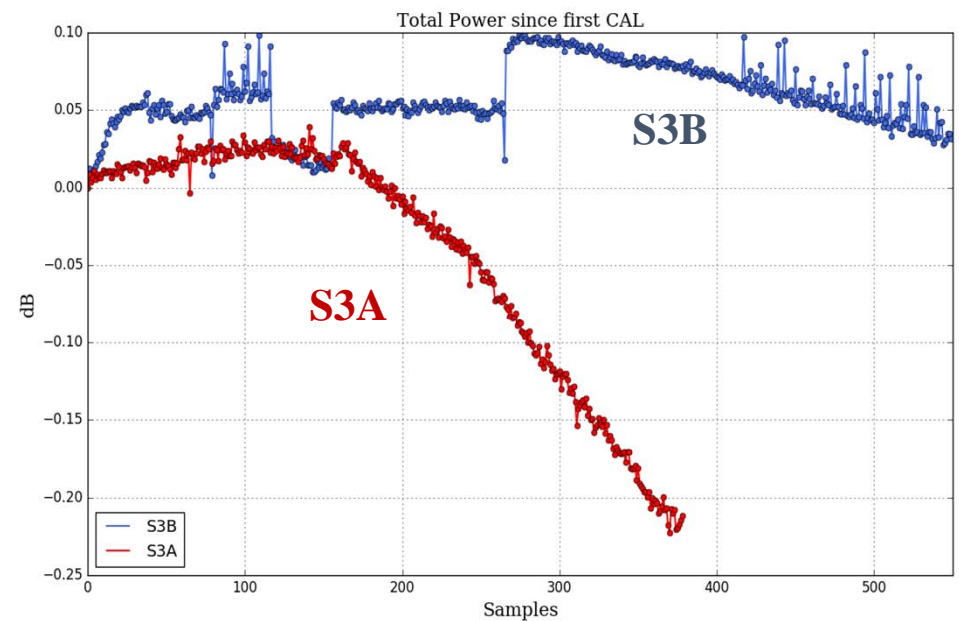
(CAL1-LRM-I2Q2, CAL1-LRM-IQ, CAL1-SAR, CAL2, ATT, Phase and Gain variation within bursts)

SRAL CALIBRATION – TOTAL POWER & IPD

Internal Path delay (Ku Band)



Total Power in Ku Band



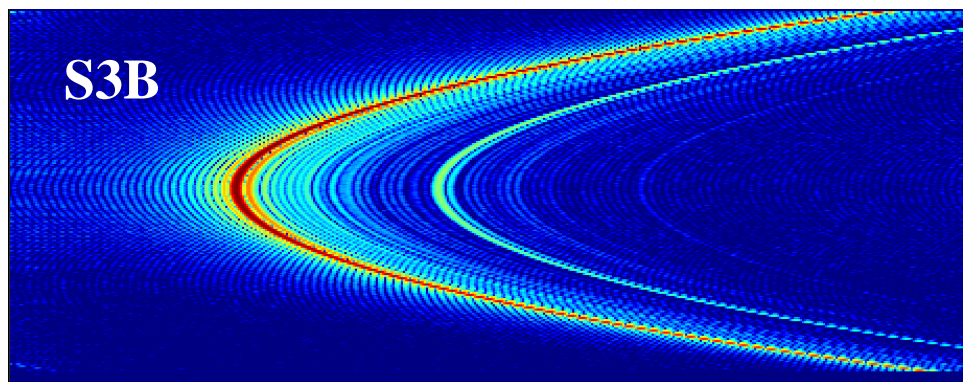
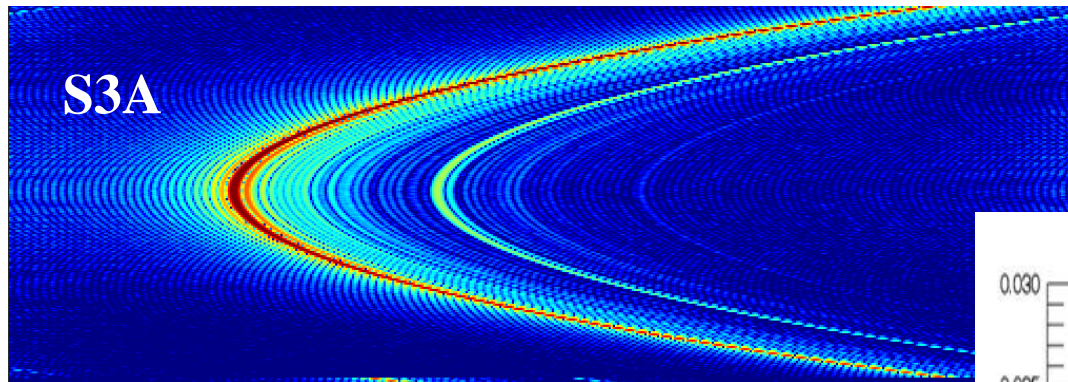
- **Excellent IPD stability**
- **Total power PTR drops, slower than S3A. But comfortable margins wrt most critical products.**

SENTINEL-3B COMMISSIONING PHASE

SRAL CALIBRATION – TRANSPONDER

June, 28th

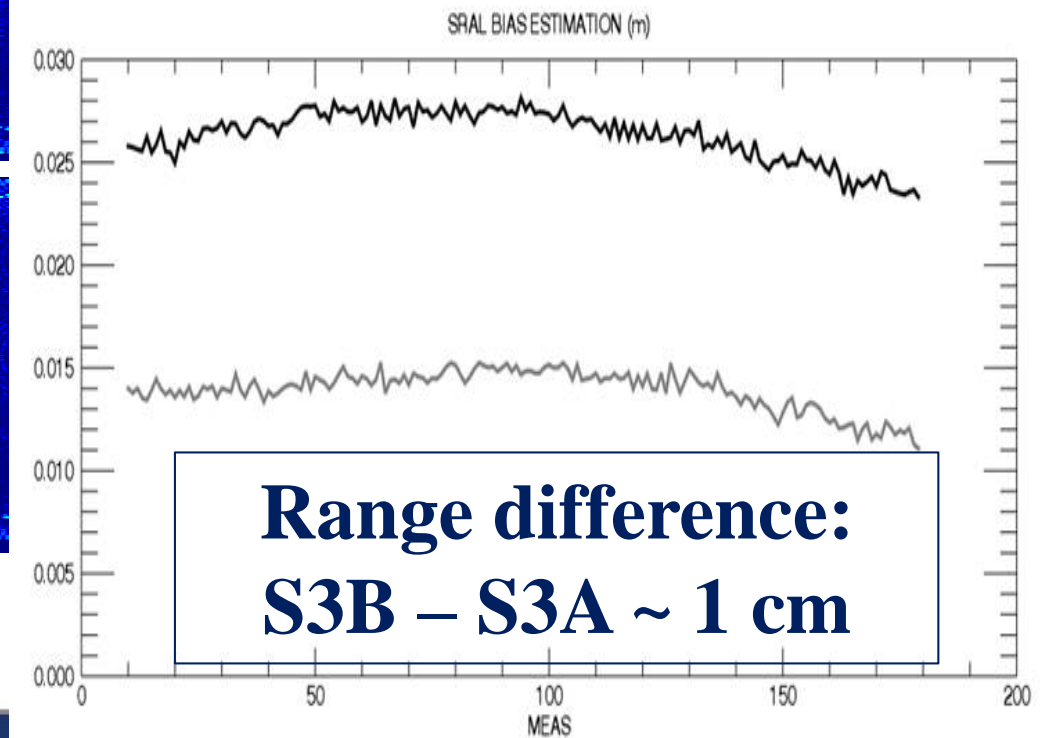
SAR Pulses Chronogram



Courtesy of Pr. Mertikas



Technical
University
of Crete



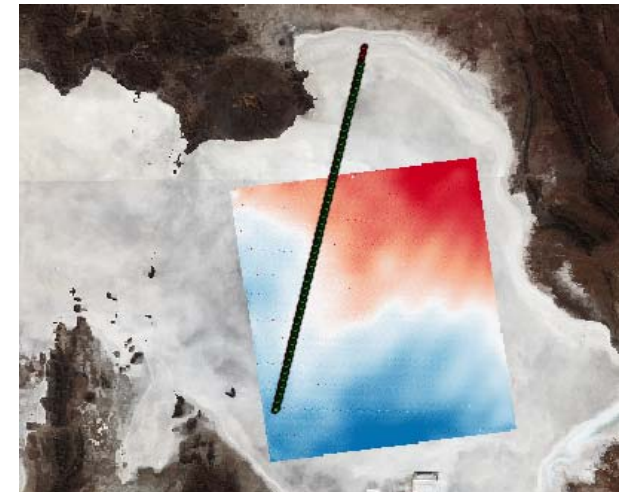
SRAL CALIBRATION – SALAR DE UYUNI

As an extremely broad (100km) and flat (1m/100km) terrestrial surface, **the salar de Uyuni is an ideal reference target for altimeters.**

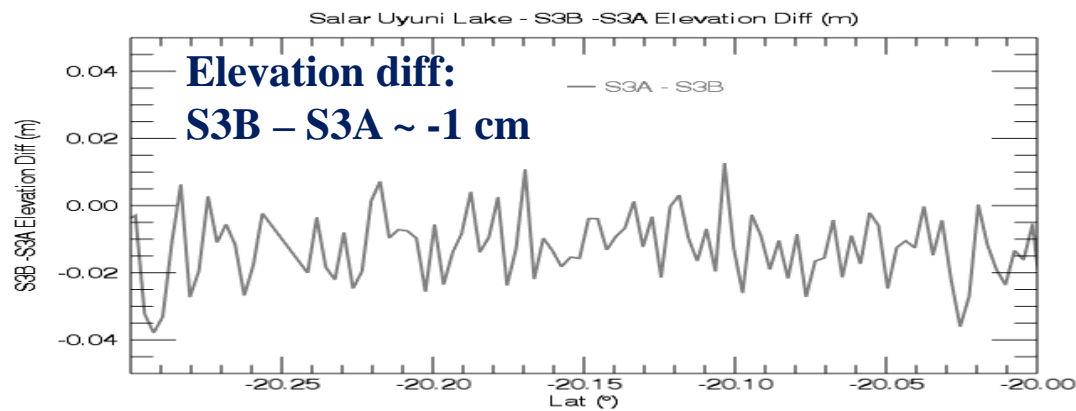
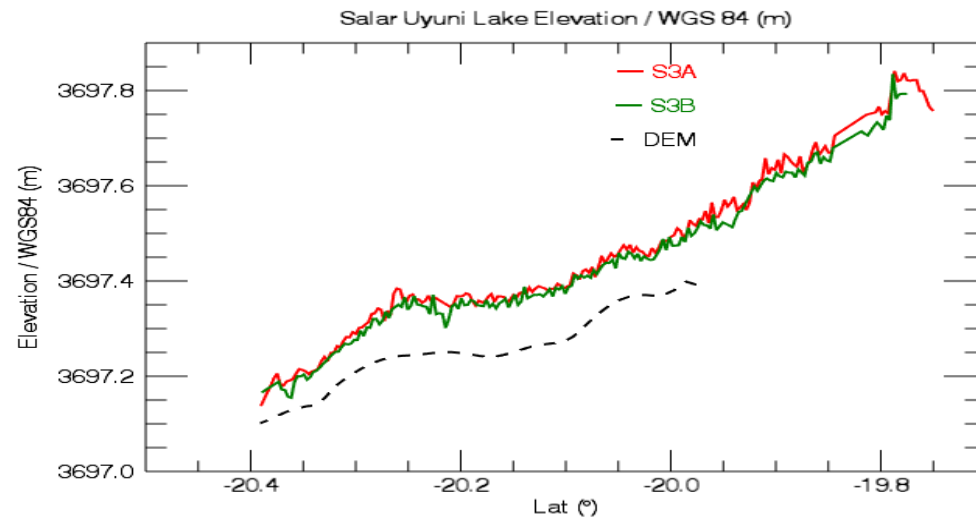
The topography is well known thanks to a GPS DEM computed by the Scripps.

Very peaky and sharp echoes due to the weak roughness of the surface (even more when the lake is flooded)

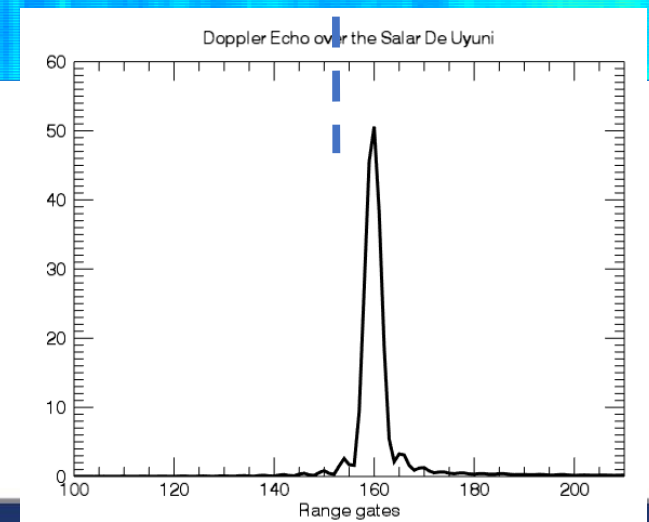
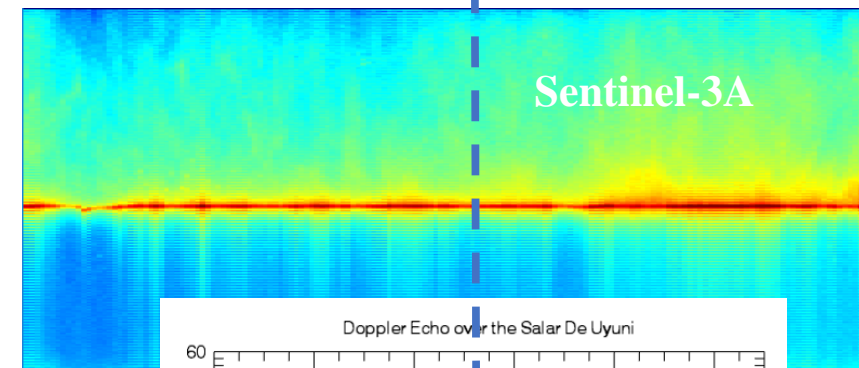
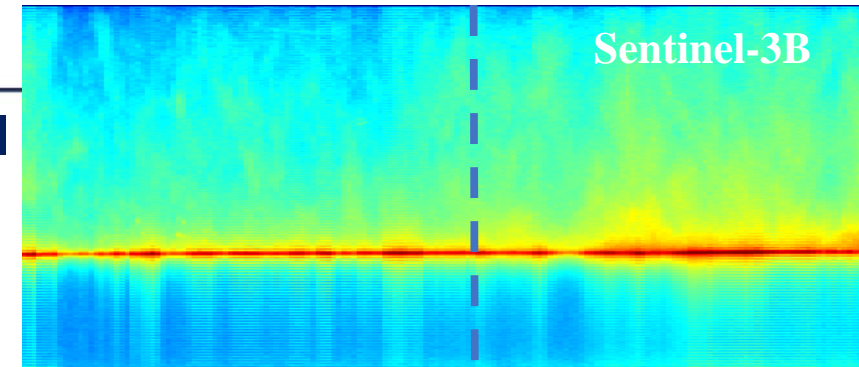
Sentinel-3A & Sentinel-3B collocated tracks allowing direct comparison.



SRAL CALIBRATION – SALAR DE UYUNI

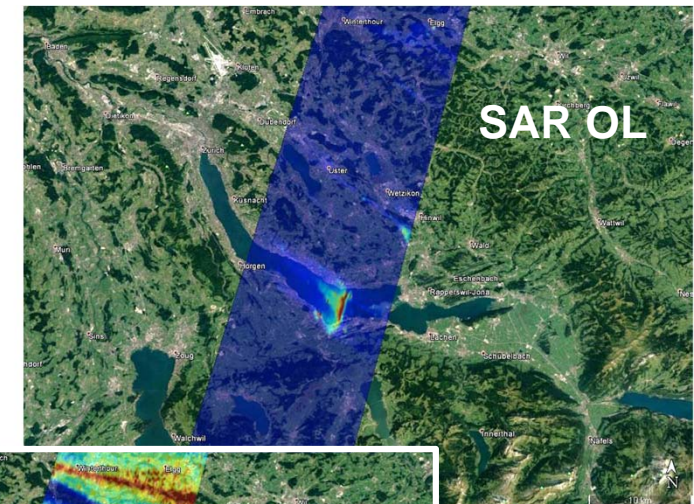
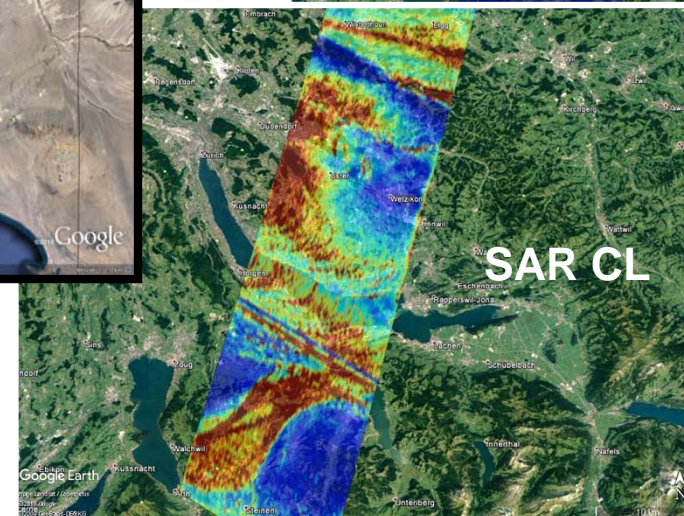
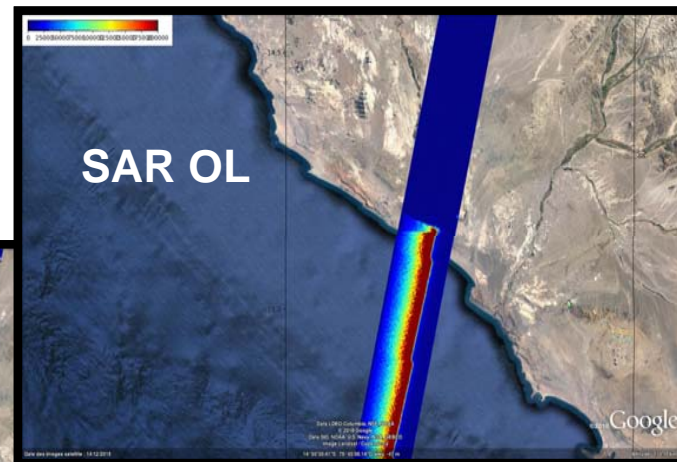
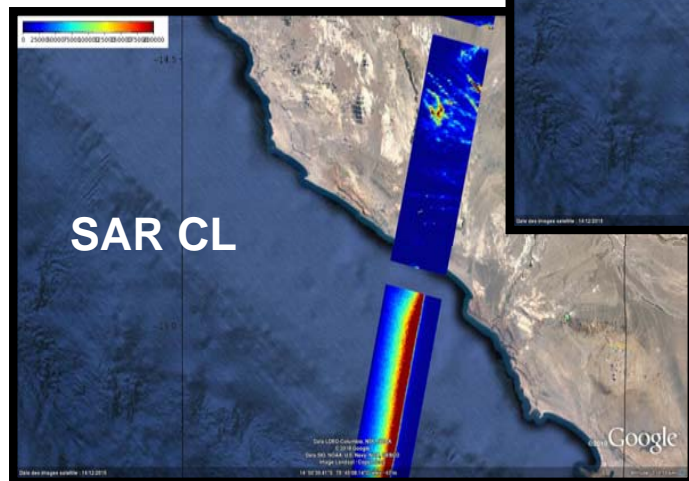


Elevation diff:
S3B – S3A ~ -1 cm



TRACKING – CL & OL VALIDATION

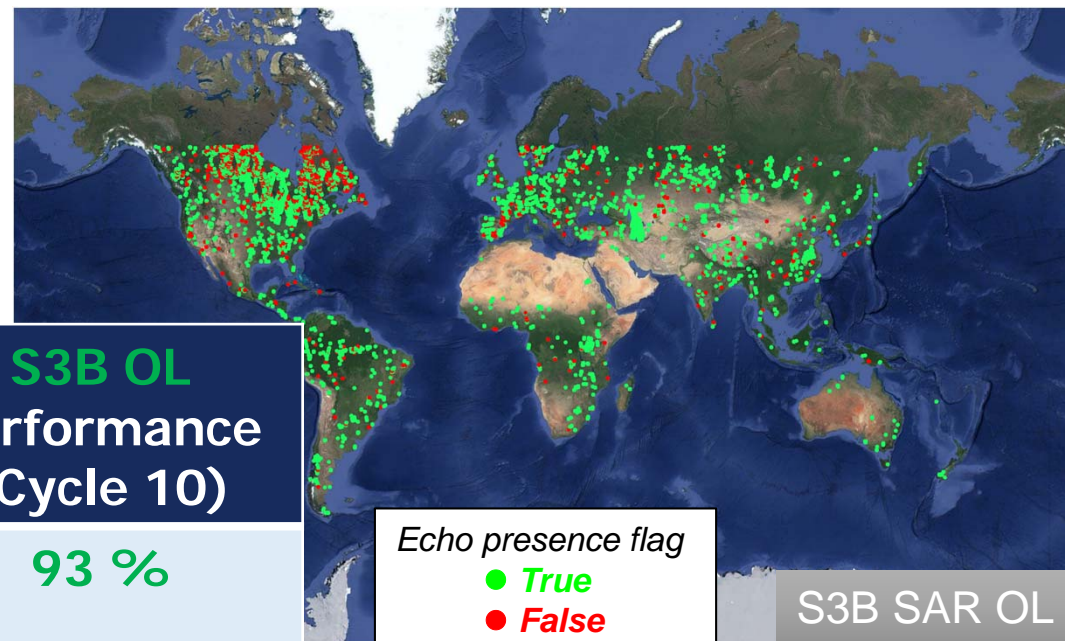
- CL & OL tracking mode - **nominal ATT and H0** commands behavior over ocean
- **OLTC** improves data acquisition **approaching the coast** and over **small inland waters**



TRACKING – CL & OL VALIDATION

OLTC Global Validation

Target type	S3B CL performance (Cycle 9)	S3B OL performance (Cycle 10)
HydroWeb (large lakes)	90 %	93 %
GLWD (small lakes)	67 %	84 %
Rivers	63 %	83 %



SENTINEL-3B COMMISSIONING PHASE

Sentinel-3B OLTC Upgrade

NEW!



**32515 virtual stations
defined under S3B final orbit**

- 15500 lakes and reservoirs
- 17000 rivers
- 23 glaciers

**New OLTC tables, computed for the final orbit, will be uploaded
during drift phase**

**Operational
on NOV 25!**

Google

You can contribute!

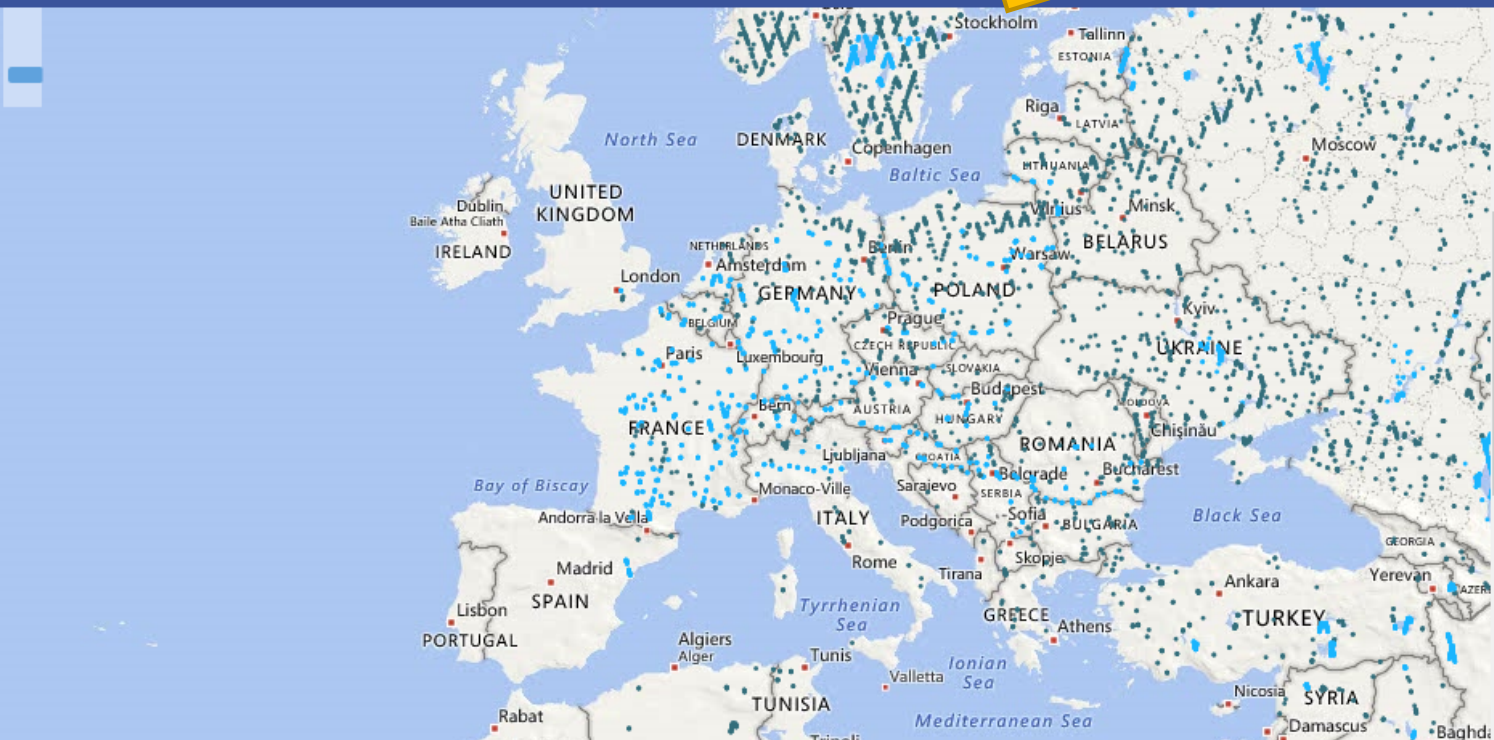
<https://www.altimetry-hydro.eu>



Altimeter Open Loop Tracking Command for Hydrology Monitoring

OSTST poster
APOP_005

Configurations



BaseMap

- ☐ Aerial
- ☒ Road

Layers

- ☒ Satellite Pass
- ☐ Areas of interest

LEGEND : On-board elevations

- Hydrology DB
- ACE-2 DEM

MISSION :

Sat. : s3a
DEM : v4_1
Ref. : geoid

CHANGE CONFIG

ToolBox

Attributes

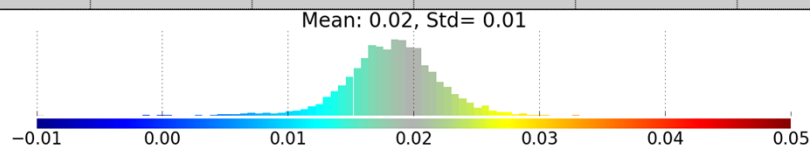
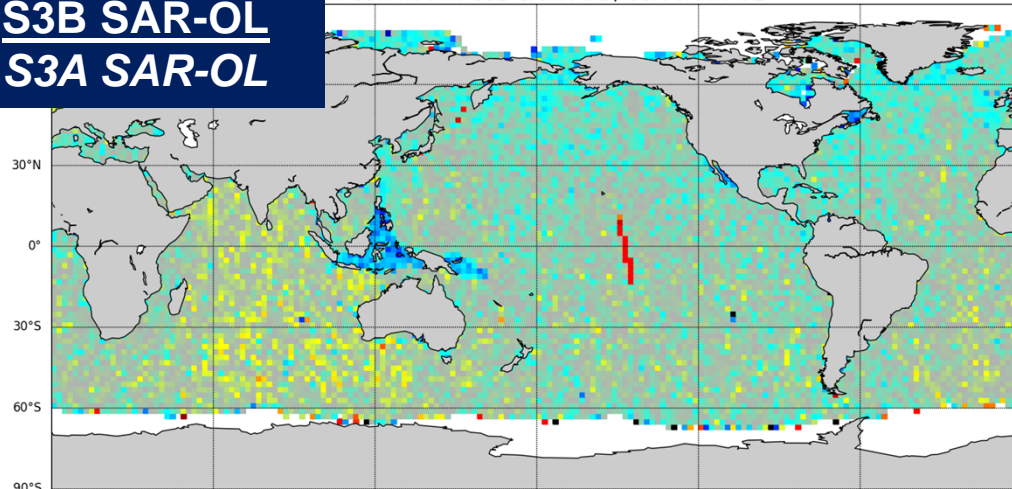
Contribute

SENTINEL-3B COMMISSIONING PHASE

S3B CALVAL – SEA LEVEL ANOMALY

S3B SAR-OL
S3A SAR-OL

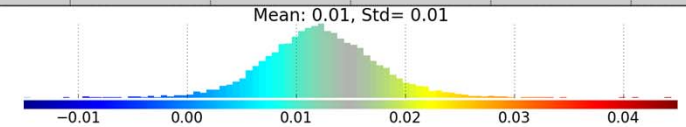
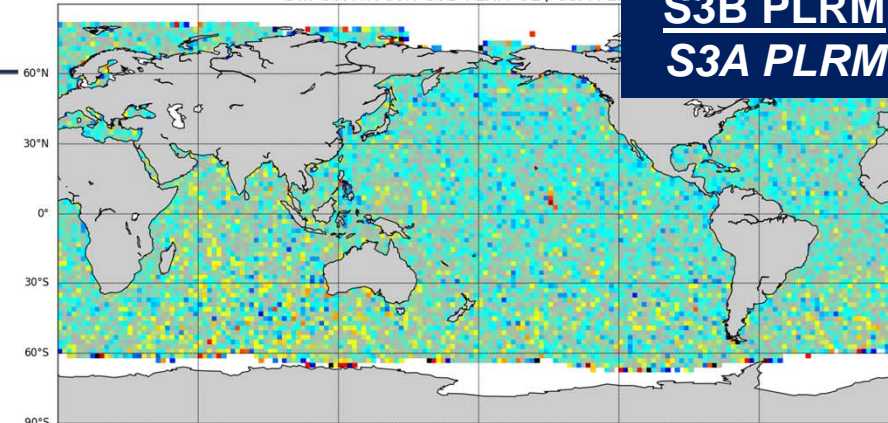
Diff SSH noCorr S3B SARM OL / S3A SARM OL



- ~2cm bias (in line with TRP calibration)
- Excellent agreement between S3B and S3A whatever the measurement mode is.

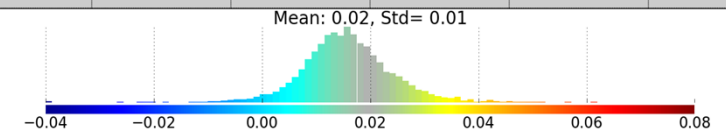
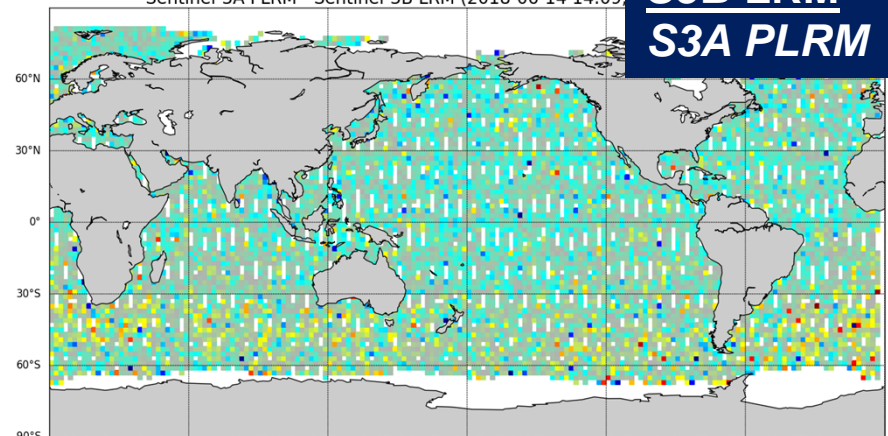
S3B PLRM
S3A PLRM

Diff SSH noCorr S3B PLRM OL / S3A PLRM OL



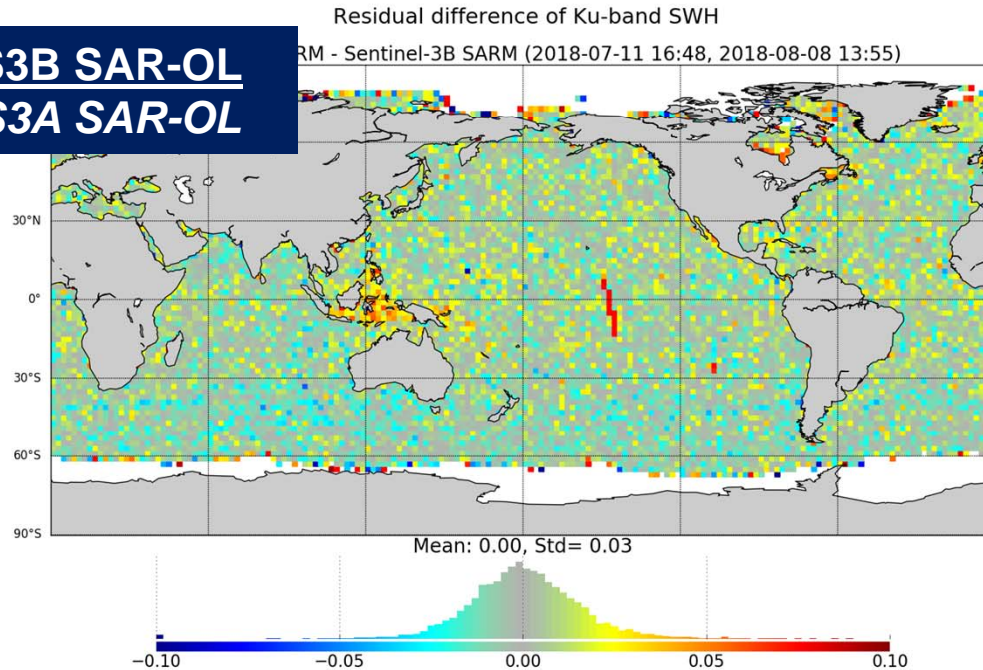
S3B LRM
S3A PLRM

Residual difference of SLA without correction
Sentinel-3A PLRM - Sentinel-3B LRM (2018-06-14 14:09)



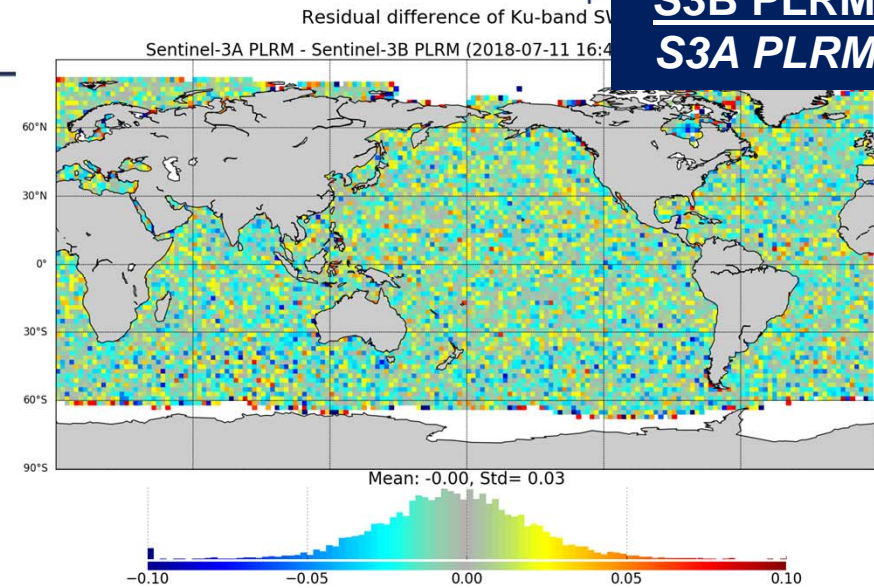
S3B CALVAL – SWH

S3B SAR-OL
S3A SAR-OL

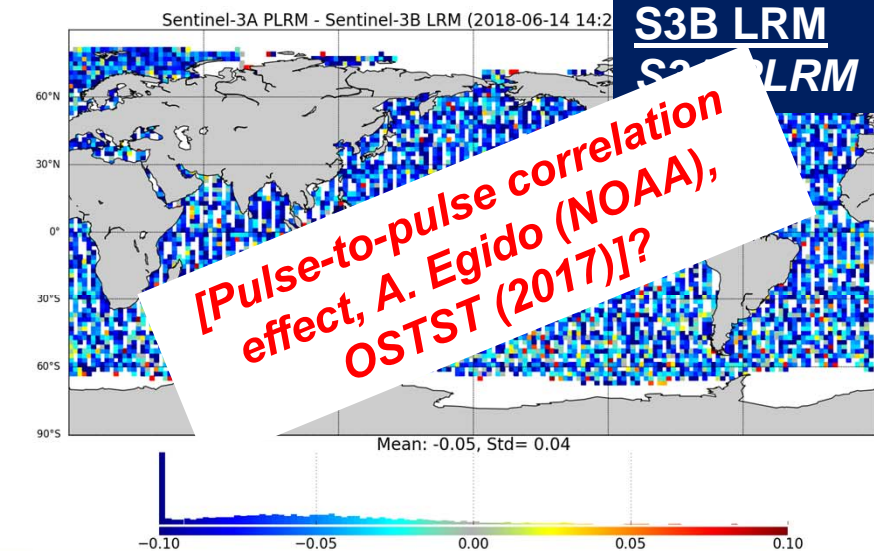


- Very good agreement for SAR and PLRM
- Bias between LRM and P-LRM ~ -5 cm (S3B LRM > S3A P-LRM) without clear SWH dependency

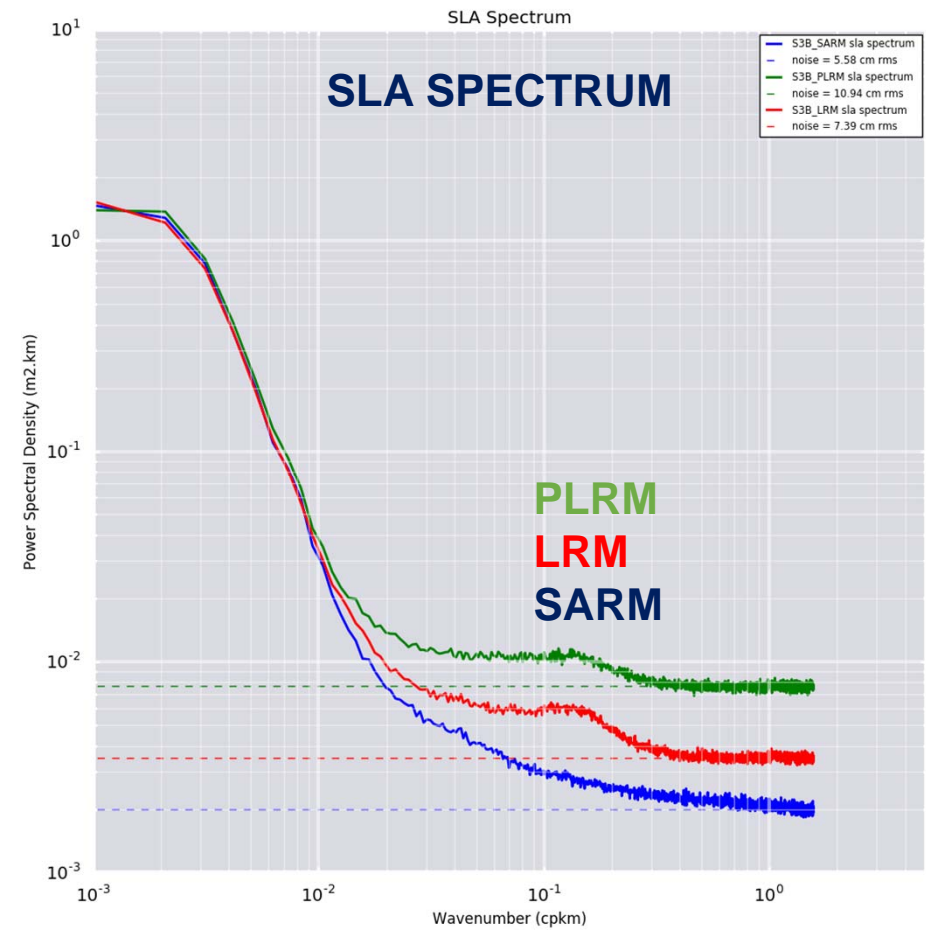
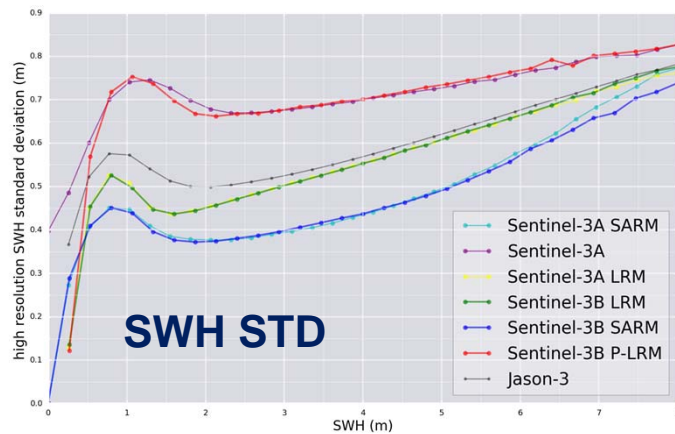
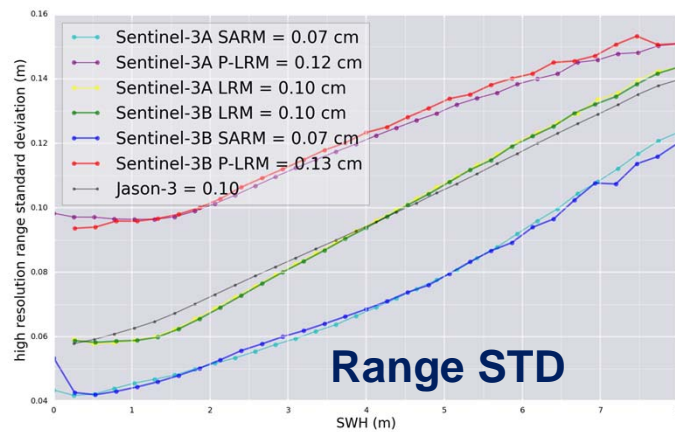
S3B PLRM
S3A PLRM



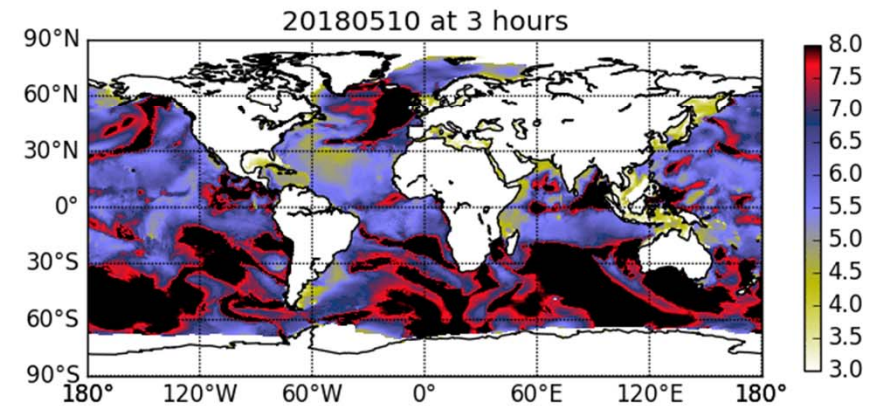
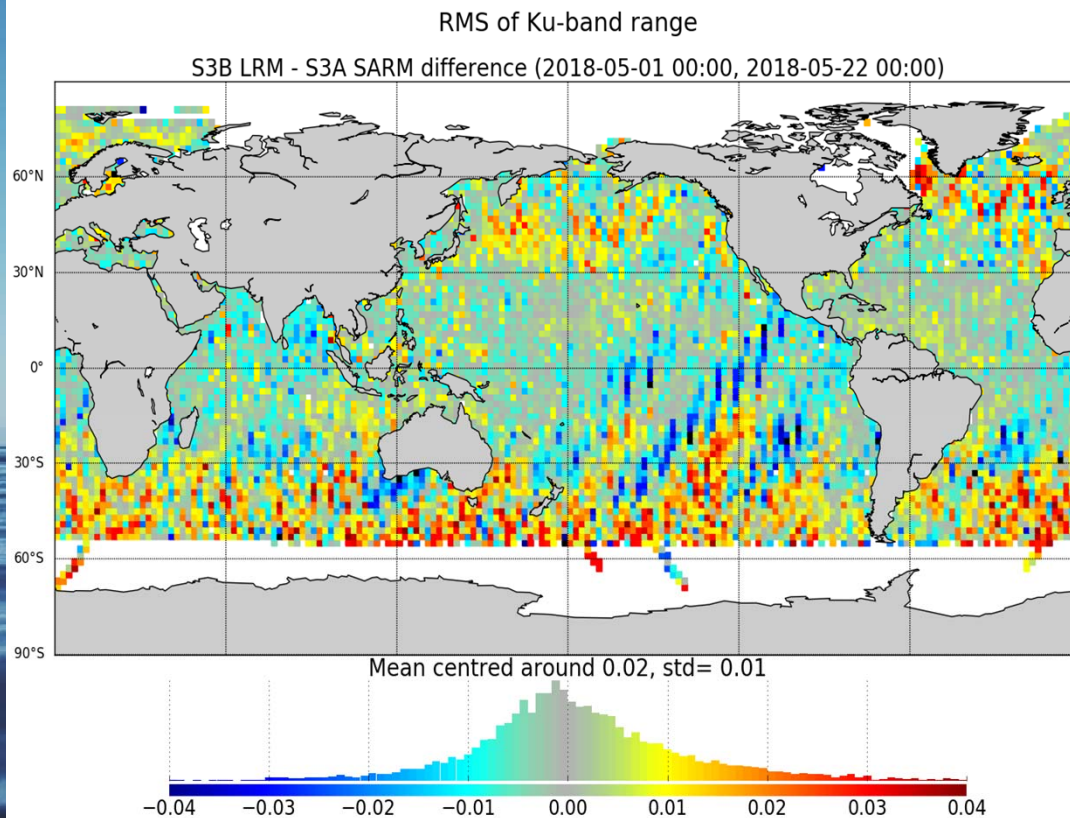
S3B LRM
S3A LRM



Performances



Swell impact on SARM Range RMS



Clear evidence of swell impact!

Strong wave period and direction // to the ground track → S3A SARM range noise is higher than the LRM S3B range noise.

With LR-RMC, no swell.

CONCLUSION

Now it's time to reach the Rabbit...

Very good data quality few months after the launch

- Whatever the mode is, **the S3B data quality is well within the requirements.**
- **The tandem phase provides a high wellness of information** and allowed to pinpoint new observations (PLRM SWH error?)
- **Direct comparison with S3A shows a high agreement (mode vs mode)**
- **Good consistency between S3PP and PDGS products.**
- Sig0 bias observed between S3A and S3B, but understood and being corrected in future
- **New OLTC tables will allow monitoring more than 30,000 rivers & lakes**
- **The overall agreement is much better than JA2/JA3 at the same time into the tandem phase**
- **We thus expect an easy S3B integration in MyOCEAN and other operational systems**

MORE INFORMATION

Tomorrow!

11:15-11:30 Sentinel-3B commissioning: first results from the Level 2 Marine Products

Remko Scharroo (EUMETSAT, Germany), Cristina Martin-Puig (EUMETSAT, Germany), Carolina Nogueira Loddó (EUMETSAT, Germany), Bruno Lucas (HE Space Operations, Germany), Salvatore Dinardo (HE Space Operations, Germany)

11:00-11:15 A first assessment of Sentinel-3B Microwave Radiometer: intercalibration and performance

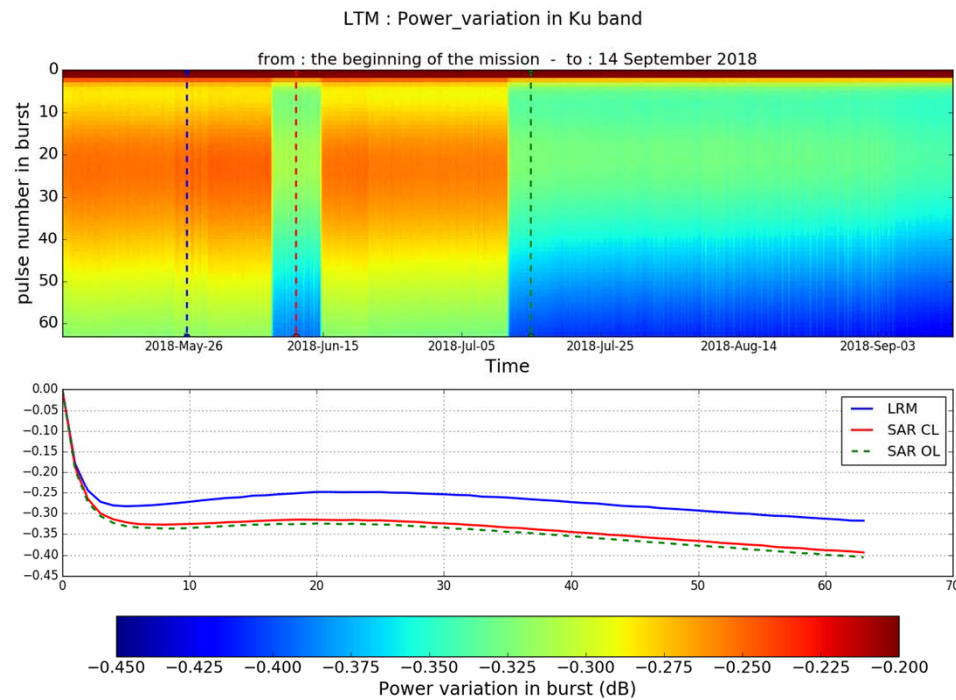
Marie-Laure Frery (CLS, France), Mathilde Siméon (CLS, France), Christophe Goldstein (CNES, France), Franck Borde (ESA, Netherlands), Pierre Féménias (ESA, Italy)



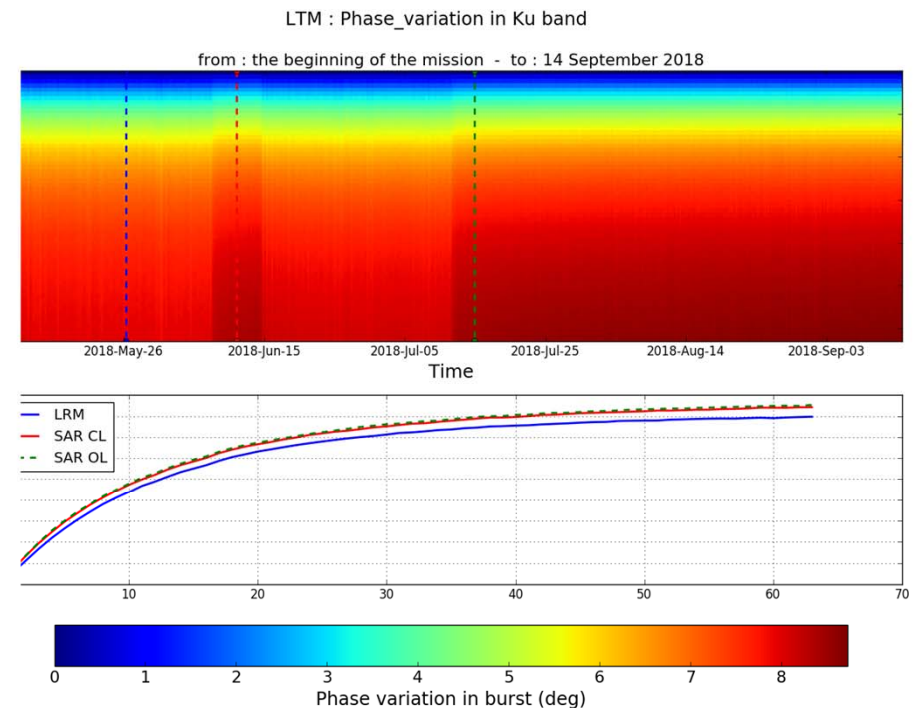
THANK YOU!

SRAL CALIBRATION – PHASE & GAIN PROFILE

Power variation within the burst



Phase variation within the burst



- **Phase&Gain variation within burst has been calibrated and monitored**
(important feature for SAR processing)
- Slight variability to measurement mode (thermal effect)