# First assessment of Sentinel-3B MWR: intercalibration and performance

ML. Frery (CLS), C. Goldstein (CNES)
M. Siméon (CLS), F. Borde (ESA), P. Féménias (ESA)

OSTST 27th-28th Sept. 2018

# Phase E1

- Study carried out for :
  - CNES in the context of the cooperation CNES/ESTEC, for Functional verification of MWR , Internal calibration verification, Vicarious calibration
  - S3/MPC for analysis of Level 2 products
- Benefits of the strong synergy between CNES and S3/MPC

**Launch**
25th April 2018
**SwitchOn**
7th May

# Overview

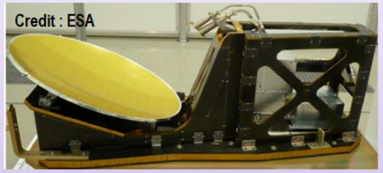
1 - Design

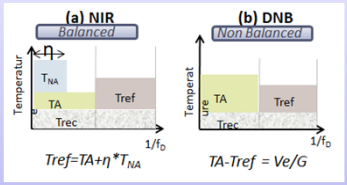
2 – S3BvsS3A

3 - Intercal

4 - Cold sky man.

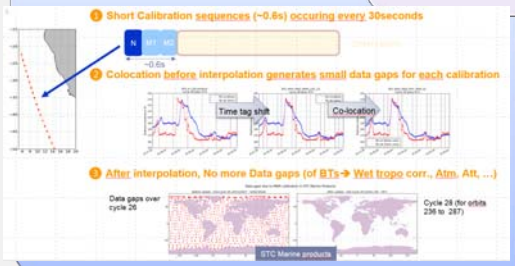
- Two channels 23.8GHz, 36.5GHz, resp. pointing backward and forward
- Calibration using dedicated sky horn and an internal hot load

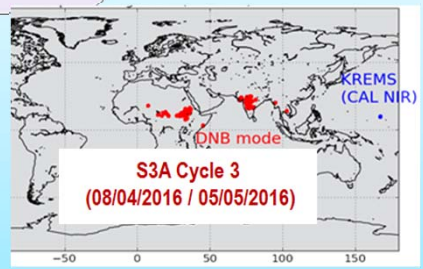



S3B=S3A

- Same Calibration timeline for S3A (updated 1st March 2018) and S3B (since 25 May 2018)

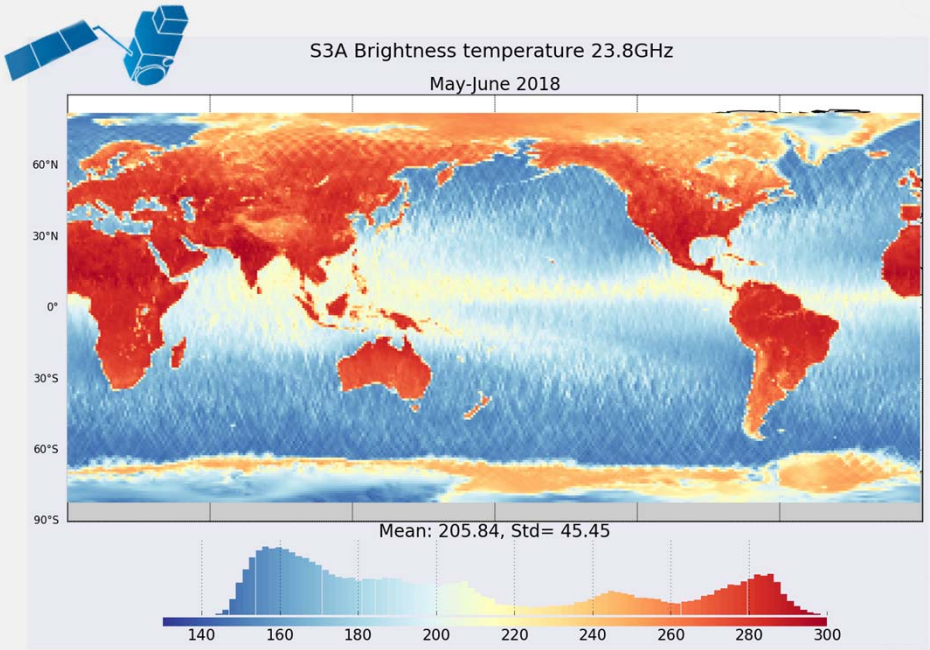


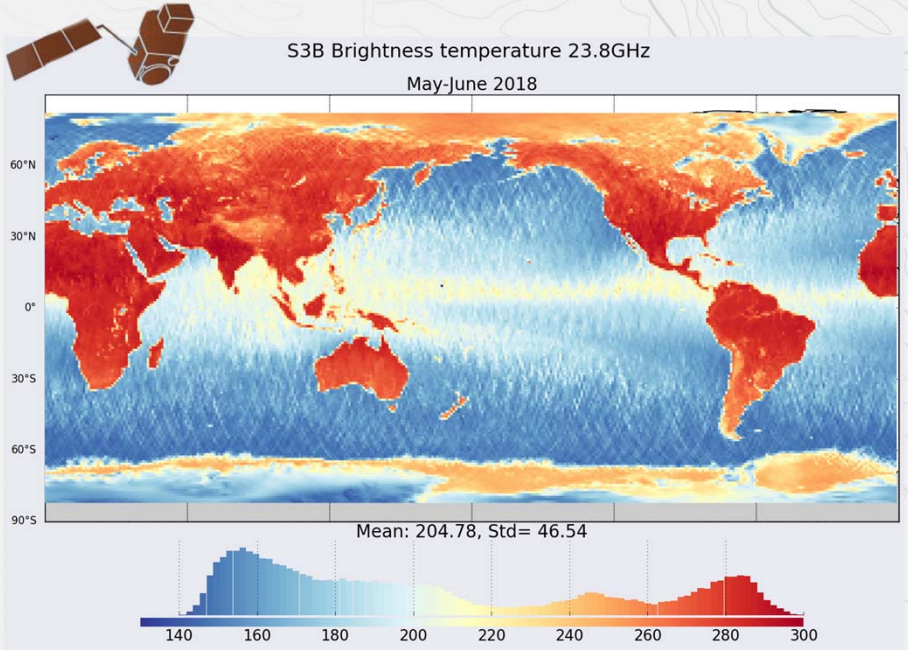




- Noise diode injection radiometer operating as a balanced Dicke radiometer
- Main operation : NIR (balanced)

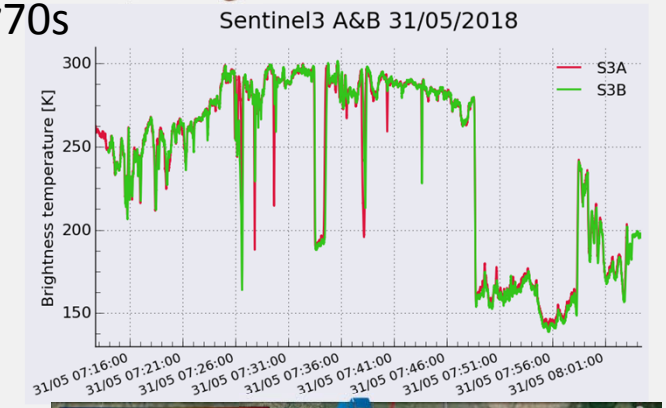
- Some points over land in unbalanced operation
- Overflight of KREMS facility (switch to calibration mode for protection)

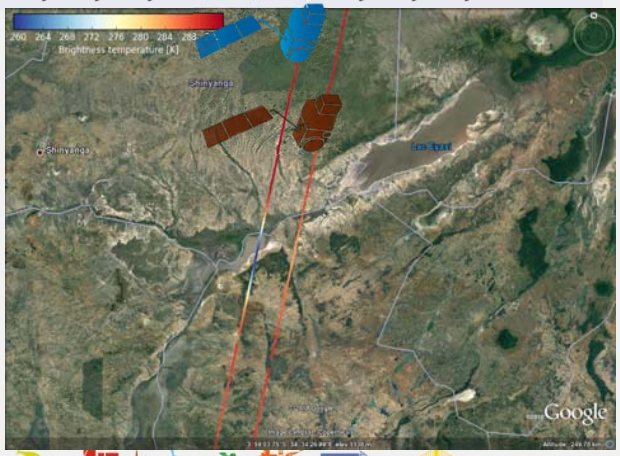
- Very good consistency at a first glance



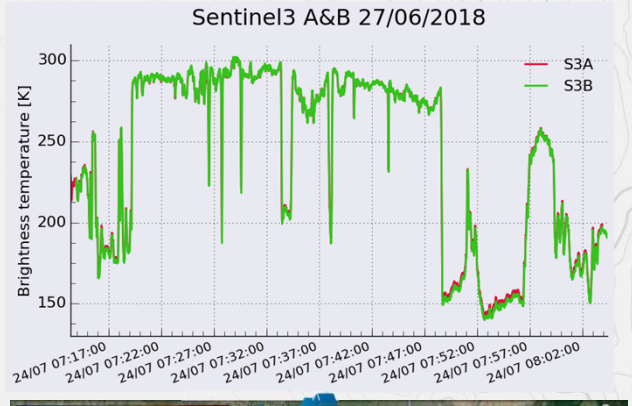



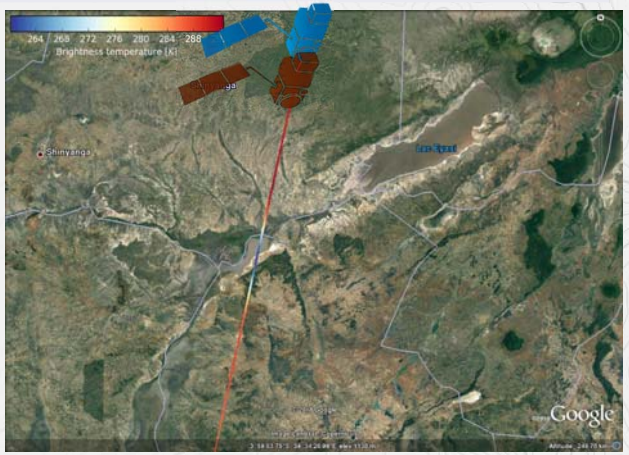
~70s


Sentinel3 A&B 31/05/2018
Brightness temperature [K]
300
250
200
150
S3A
S3B
31/05 07:16:00
31/05 07:21:00
31/05 07:26:00
31/05 07:31:00
31/05 07:36:00
31/05 07:41:00
31/05 07:46:00
31/05 07:51:00
31/05 07:56:00
31/05 08:01:00

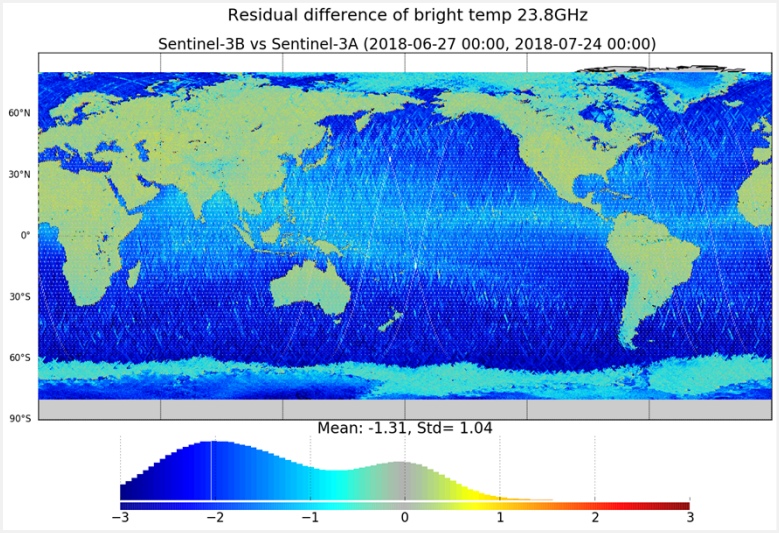

Brightness temperature [K]
Google

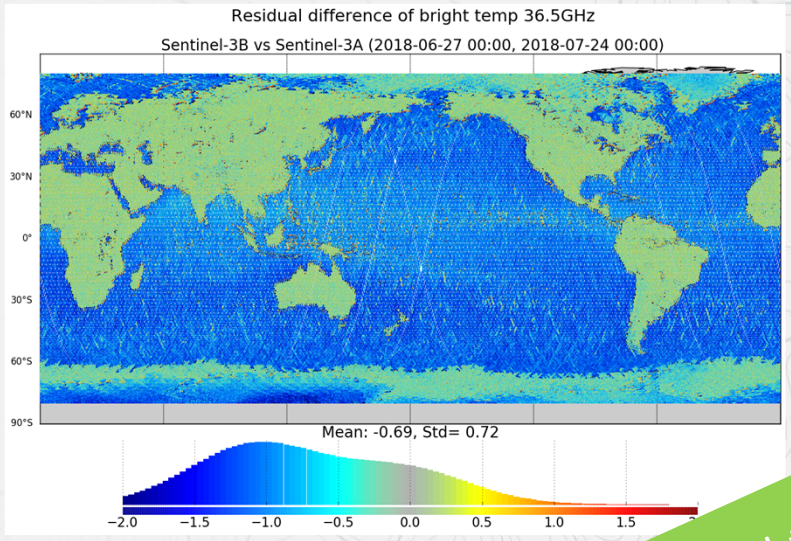
~30s


Sentinel3 A&B 27/06/2018
Brightness temperature [K]
300
250
200
150
S3A
S3B
24/07 07:17:00
24/07 07:22:00
24/07 07:27:00
24/07 07:32:00
24/07 07:37:00
24/07 07:42:00
24/07 07:47:00
24/07 07:52:00
24/07 07:57:00
24/07 08:02:00


Brightness temperature [K]
Google

o Residual differences **Brightness Temperatures** S3B-S3A for cycle 10 of S3B (cycle 32 of S3A)

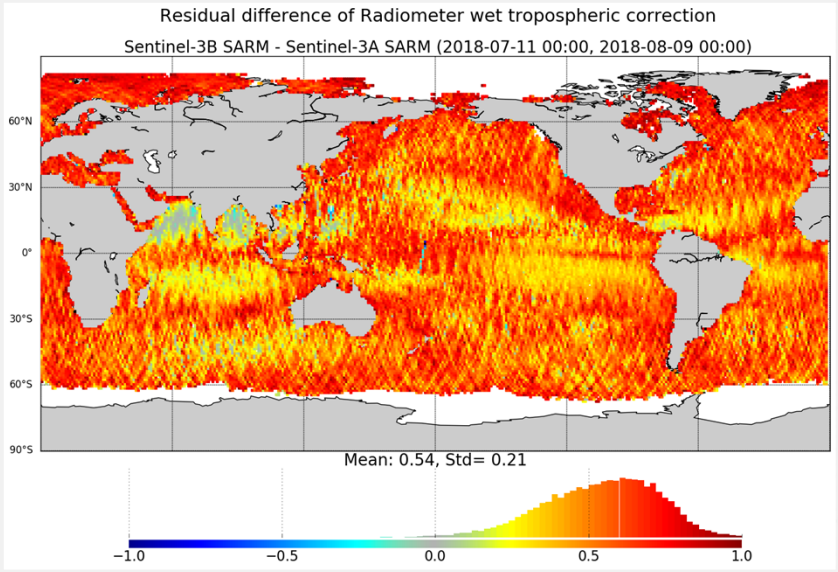


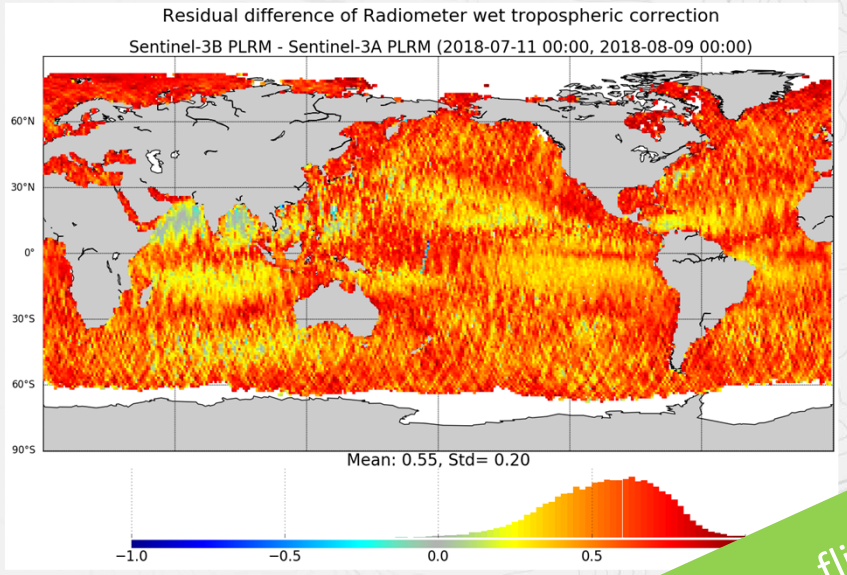




➔ Clear dependancy of S3B-S3A difference wrt BT :
Higher differences for coldest BT, lowest differences for hottest BT

Before in-flight calibration

o Residual differences S3B-S3A of **Wet Tropospheric Correction** for cycle 10 of S3B (cycle 32 of S3A)



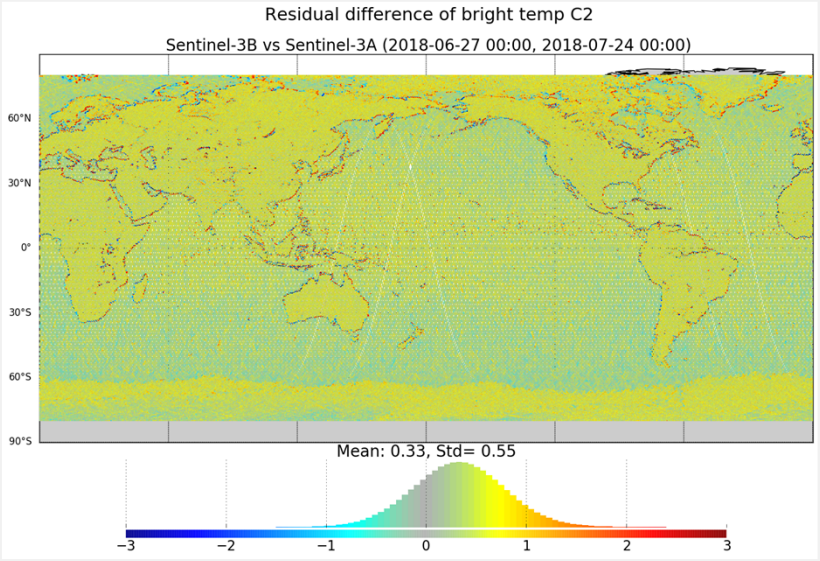



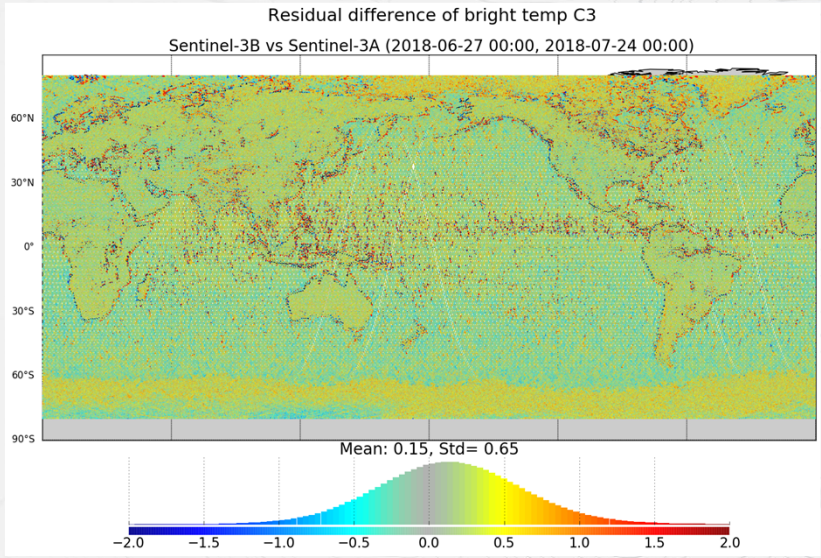

➔ Clear dependancy of WTC difference S3B-S3A wrt WTC (BT) : Patterns consistent with observed Sigma0 and BT patterns

Before in-flight calibration

- Objectives: Align S3B BT on S3A BT
- Inputs:
  - MWR characterisation parameters from on-ground characterisation used since switch-on
- Testing:
  - using CLS mockup of ground processing to compute antenna temperature, and brightness temperature from raw counts

o Residual differences **Brightness Temperatures** S3B-S3A for cycle 10 of S3B (cycle 32 of S3A)



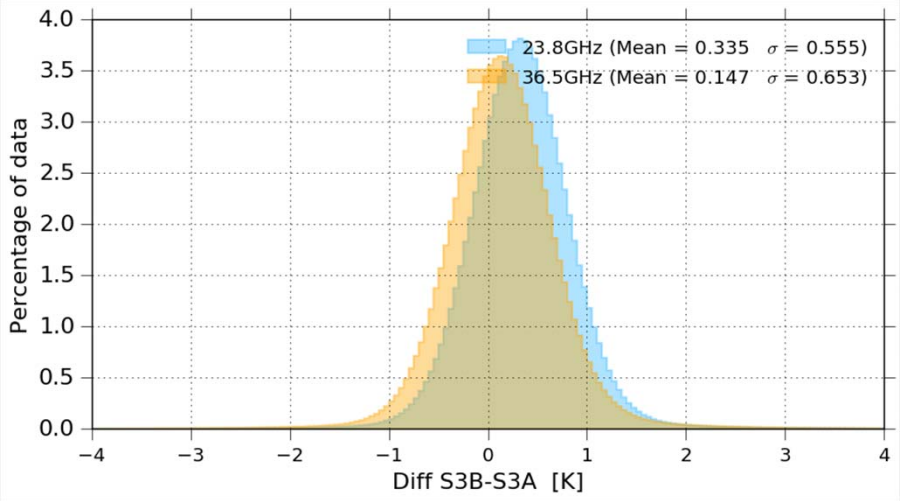




➔ Very good agreement between S3A and S3B after intercalibration :

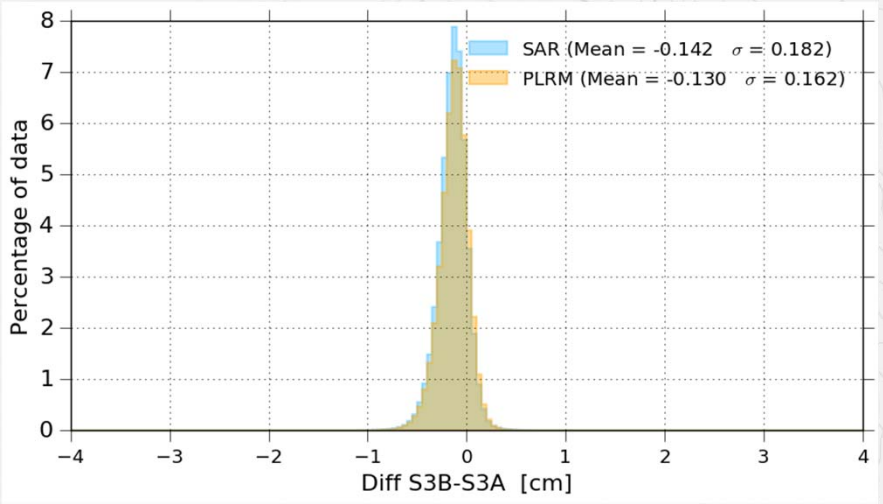
➔ Still a small signal depending of the BT

- Residual differences **Brightness Temperatures** S3B-S3A for cycle 10 of S3B

## Brightness temperatures @7Hz



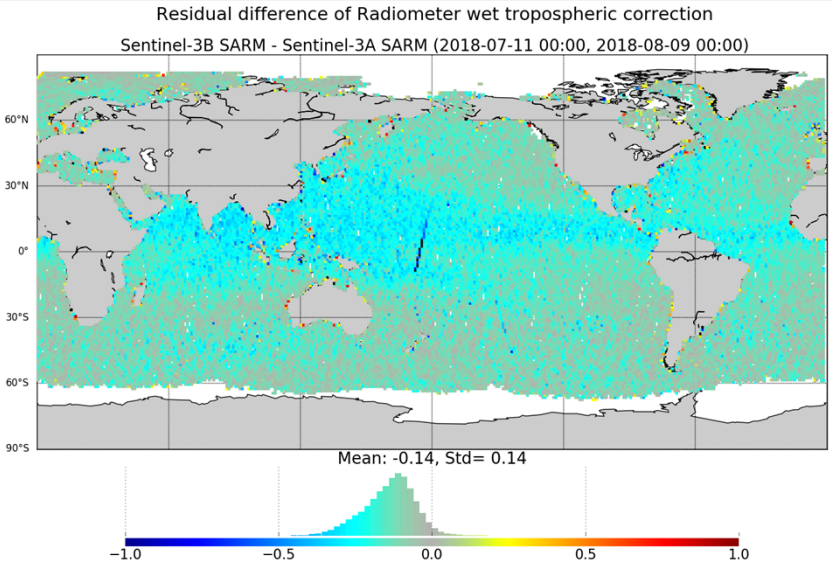

## Wet Troposphere Correction

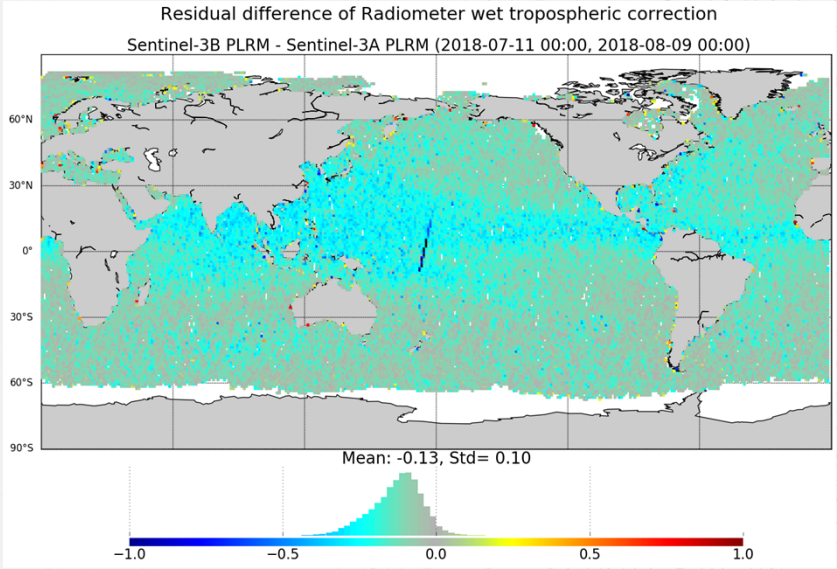



Theoritical difference Std :
0.42K @23.8 (sensitivity 0.3K)
0.45K @36.5 (sensitivity 0.32K)

➔ Very good results

o Residual differences S3B-S3A of **Wet Tropospheric Correction** for cycle 10 of S3B (cycle 32 of S3A)




➔ Very good agreement between S3A and S3B WTC after intercalibration :

➔ Still a small signal (2-3mm) depending of the WTC (BT)

- Moon calibration was performed for OLCI
- Very good opportunity for MWR as the main antenna will look at cold sky (and the moon). This will allow an absolute calibration for the MWR
- Operations
  - **Test maneuver** 17 July : Only cold sky
  - **Moon calibration** 27 July: Moon calibration
- Analysis of data is on-going. Will provide a new set of characterisation parameters to be tested.

- S3B MWR is performing very well
  - Quick thermal stabilization
  - Estimated sensitivity consistent with on-ground tests

- Intercalibration is on-going: direct comparison with S3A thanks to the tandem phase. A very good oppportunity to perform the intercalibration
  - Cold sky maneuver will provide very useful information to complete the intercalibration

# Thank you!