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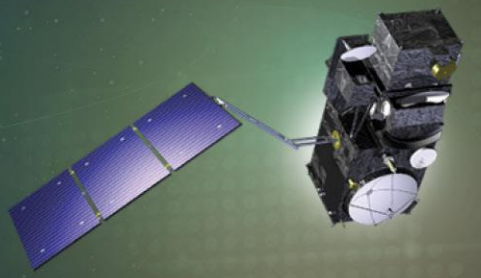


7th Sentinel-3 Validation Team Meeting 2022

18-20 October 2022 | ESA-ESRIN | Frascati (Rm), Italy

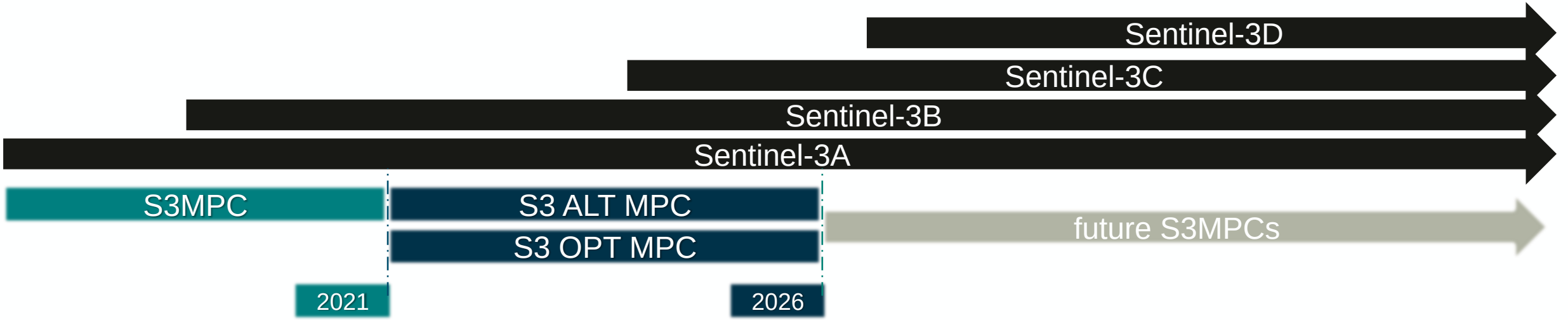
Latest improvement and Performance assessment of the Sentinel-3A STM Microwave Radiometer

ML. Denneulin , M. Mrad, G. Jettou, J. Aublanc (CLS)
P. Fémények (ESA)

Sentinel-3 Mission Performance Clusters

See G. Jettou talk

A Long story



In the Copernicus Ground Segment (CGS) the Mission Performance Cluster (MPC) main role is :

- to characterize the instrument with the aim to detect anomalies or degradation that may impact the data performance
- to ensure that the Copernicus user level data are in line with their specification in terms of characteristics, performance and accuracy
- To perform explorative activities aiming at improving the product characteristics or expanding the product family to stay on top of the Copernicus Services evolving expectations.

Copernicus Altimetry Service (COPAS) for the Sentinel-3 mission

See F. Nencioli talk

Regular monitoring of Sentinel-3 Surface Topography Mission (STM) performance over oceans

Guaranteed from beginning of S3A mission to present by two distinct projects

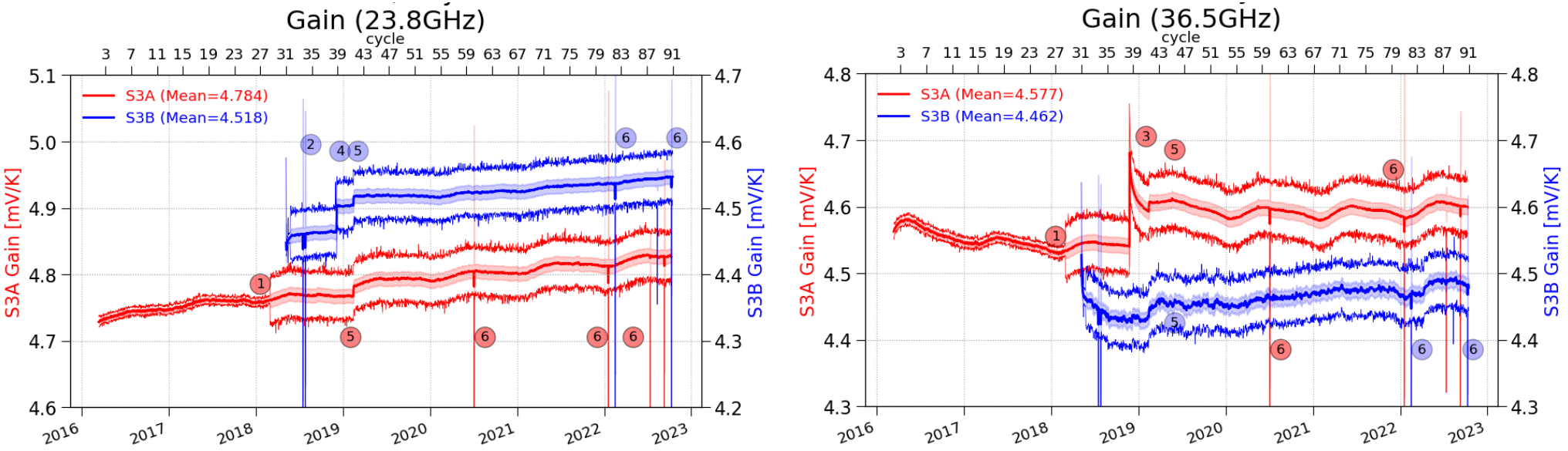
- S3-MPC (until December 2021)
- COPAS (from May 2022)

The monitoring activities in both projects includes:

- Calibration and characterisation of S3 altimeter (SRAL) and **microwave radiometer (MWR)** performance
- Validation of the ground processing and final products
- Assessment of the overall mission performance
- Support for the continuous improvement of the S-3 STM performance

MWR Monitoring

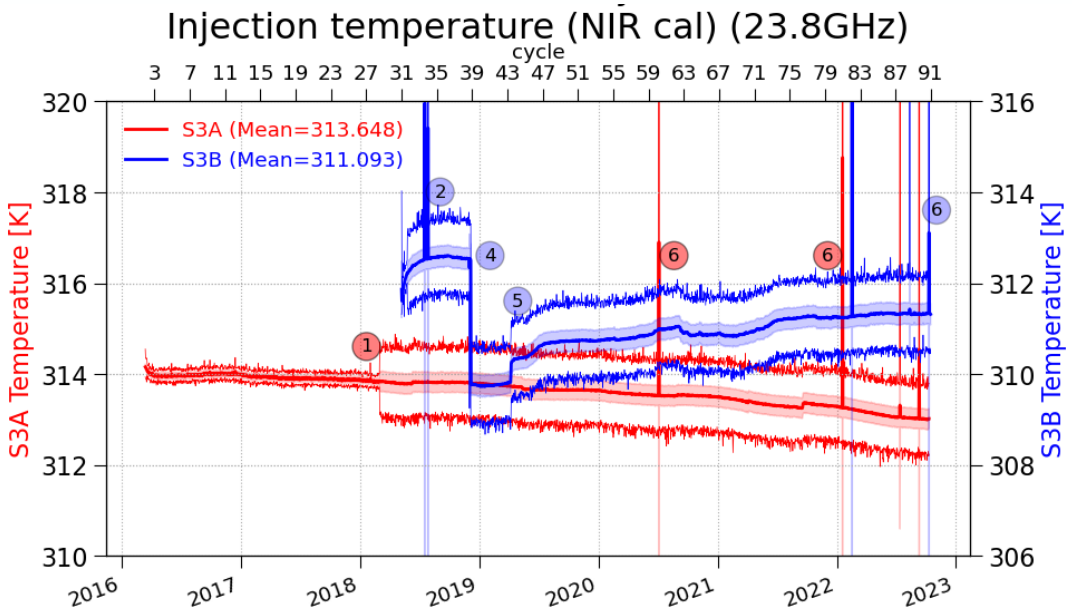
MPC data

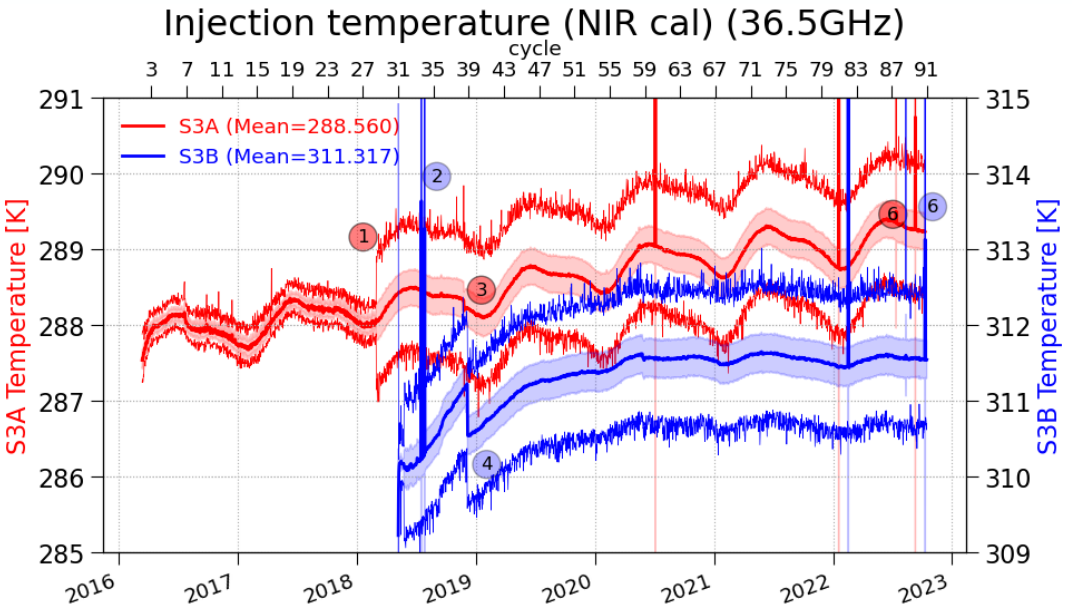


#	Comments
①	Update of calibration timeline 1st March 2018 ➔ increase of Level 2 data availability
②	Sky and Moon maneuvers
③	@36.5GHz RFI with KREMS radar
④	Update of MWR characterisation parameters file (intercalibration of brightness temperatures wrt S3A)
⑤⑤	S3A & S3B: IPF update (correction of gain computation) (negligeable impact on the BT.)
⑥⑥	special operation for OLCI

MWR Monitoring

MPC data



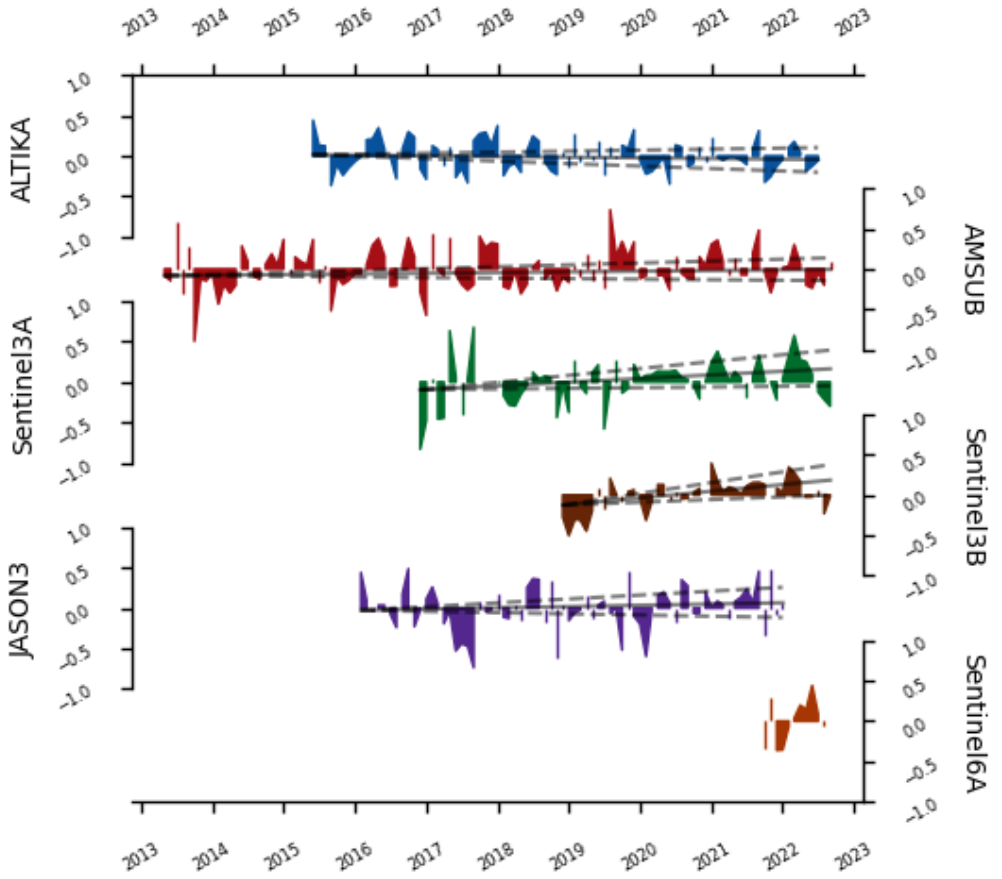


#	Comments
①	Update of calibration timeline 1st March 2018 ➔ increase of Level 2 data availability
②	Sky and Moon maneuvers
③	@36.5GHz RFI with KREMS radar
④	Update of MWR characterisation parameters file (intercalibration of brightness temperatures wrt S3A)
⑤	@23.8GHZ, under investigations
⑥⑥	special operation for OLCI

Vicarious calibration

Coldest ocean temperatures

MPC data



Residuals

Obtained by removal of seasonal signal, estimation of the slope + 95% confidence interval

Removal of seasonal signal reduces the confidence interval

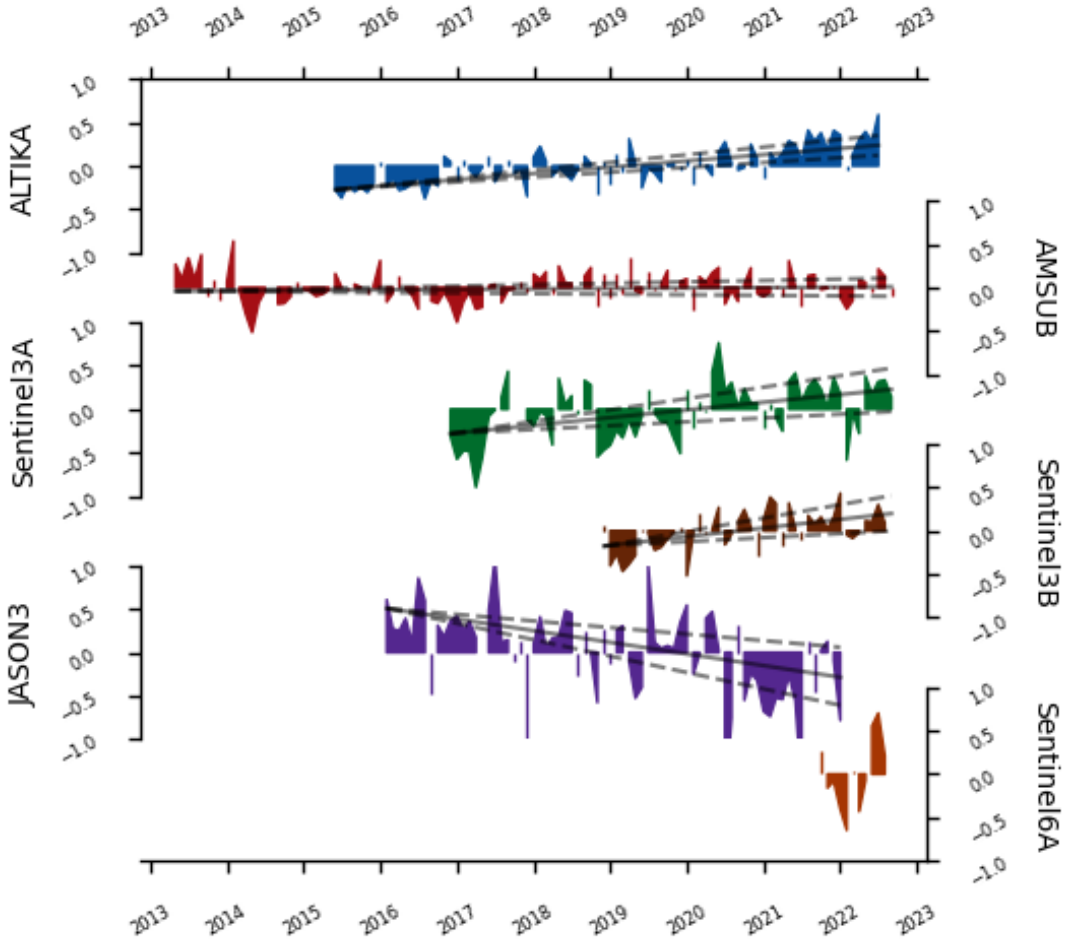
Low level of noise (residuals close to MWR sensivities)

Trend (K/yr)	AltiKa	AMSU	S3A	S3B	J3	S6A
23.8GHz	-0.01 (-0.03/0.01)	0.01 (-0.01/0.02)	0.05 (0.01/0.09)	0.08 (0.03/0.13)	0.02 (-0.01/0.05)	not estimated

Vicarious calibration

Coldest ocean temperatures

MPC data



Residuals

Obtained by removal of seasonal signal, estimation of the slope + 95% confidence interval

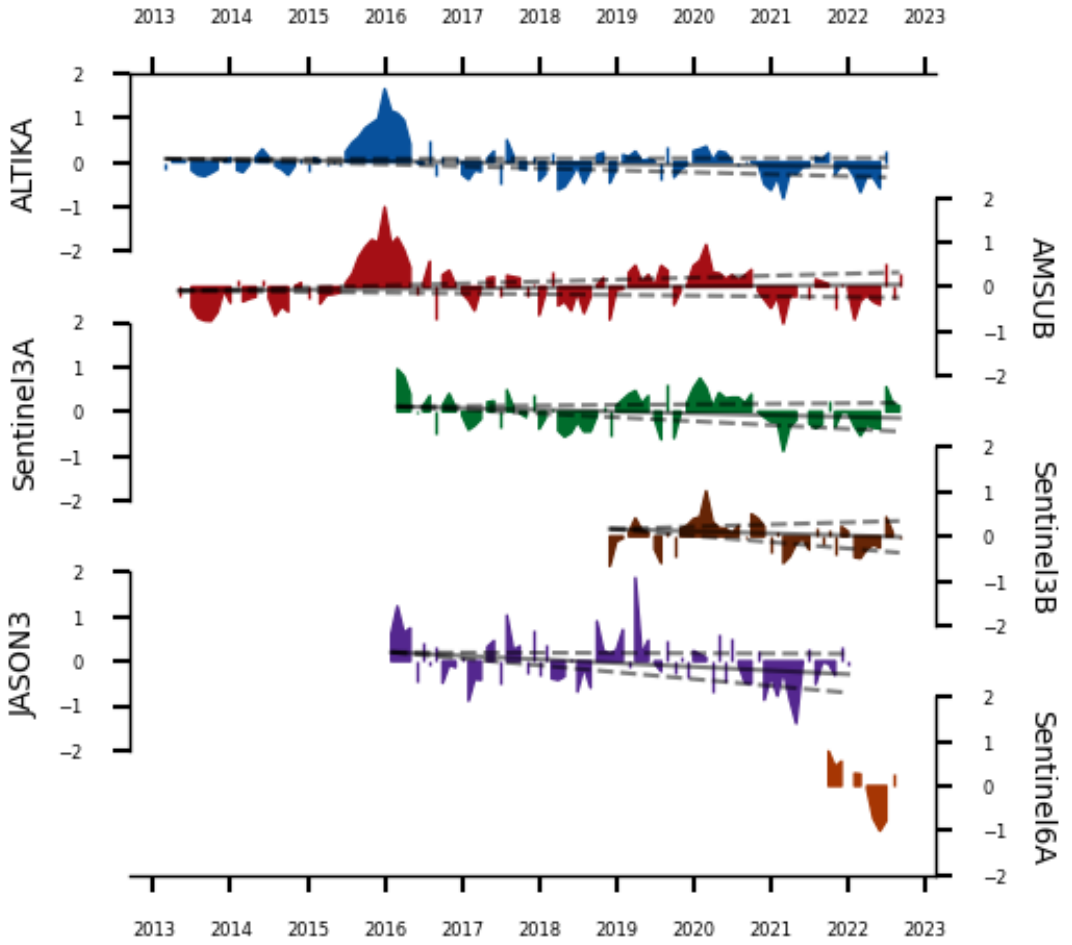
Removal of seasonal signal reduces the confidence interval

Low level of noise (residuals close to MWR sensivities)

Trend (K/yr)	AltiKa	AMSU	S3A	S3B	J3	S6A
Liq. Water Chan	0.07 (0.06/0.09)	0.01 (-0.01/0.02)	0.09 (0.04/0.13)	0.10 (0.05/0.15)	-0.13 (-0.19/-0.08)	not estimated

Vicarious calibration

MPC data



Amazon forest hottest temperatures

Residuals

Obtained by removal of seasonal signal, estimation of the slope + 95% confidence interval

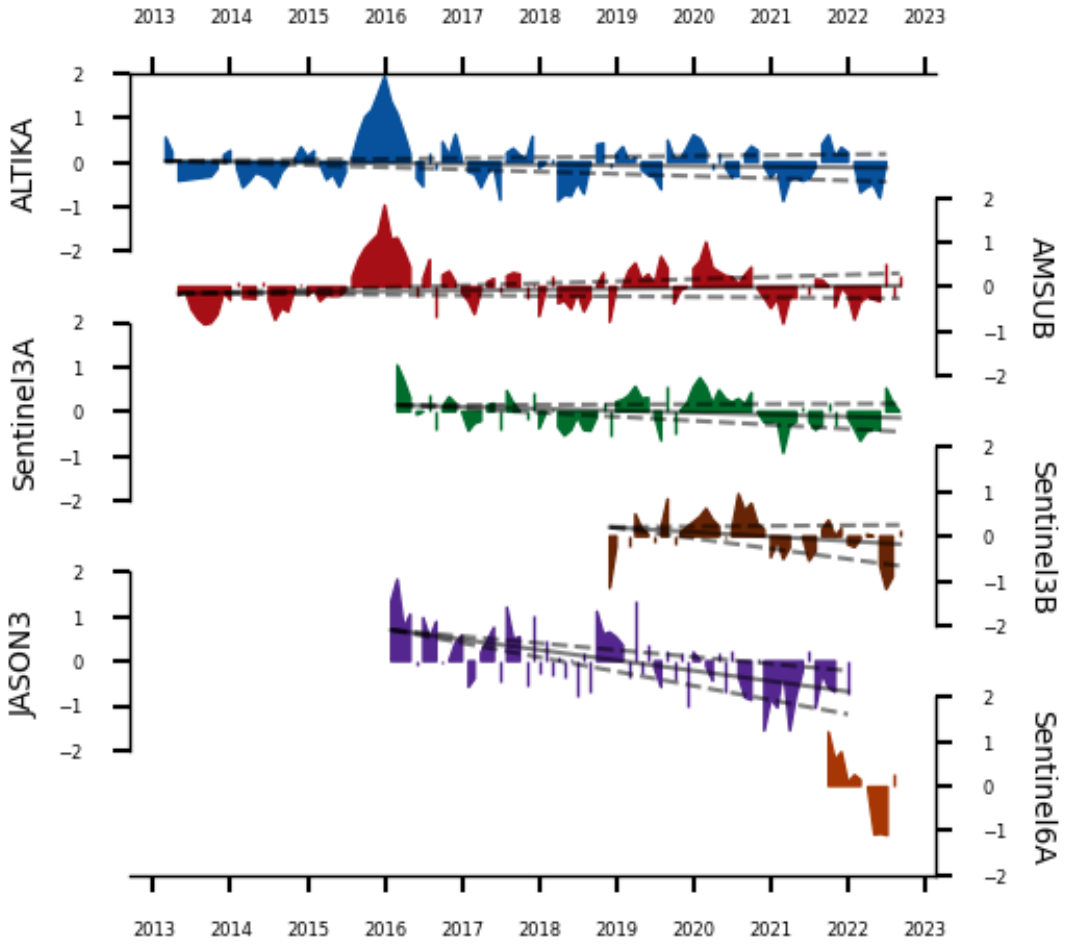
Clear signature of El Nino (2016) (anomaly of water vapor over Amazon forest)

Residuals follow same patterns

Trend (K/yr)	AltiKa	AMSU	S3A	S3B	J3	S6A
23.8GHz	-0.02 (-0.04/0.00)	0.01 (-0.02/0.04)	-0.04 (-0.09/0.01)	-0.05 (-0.14/0.05)	-0.08 (-0.15/-0.01)	not estimated

Vicarious calibration

MPC data



Amazon forest hottest temperatures

Residuals

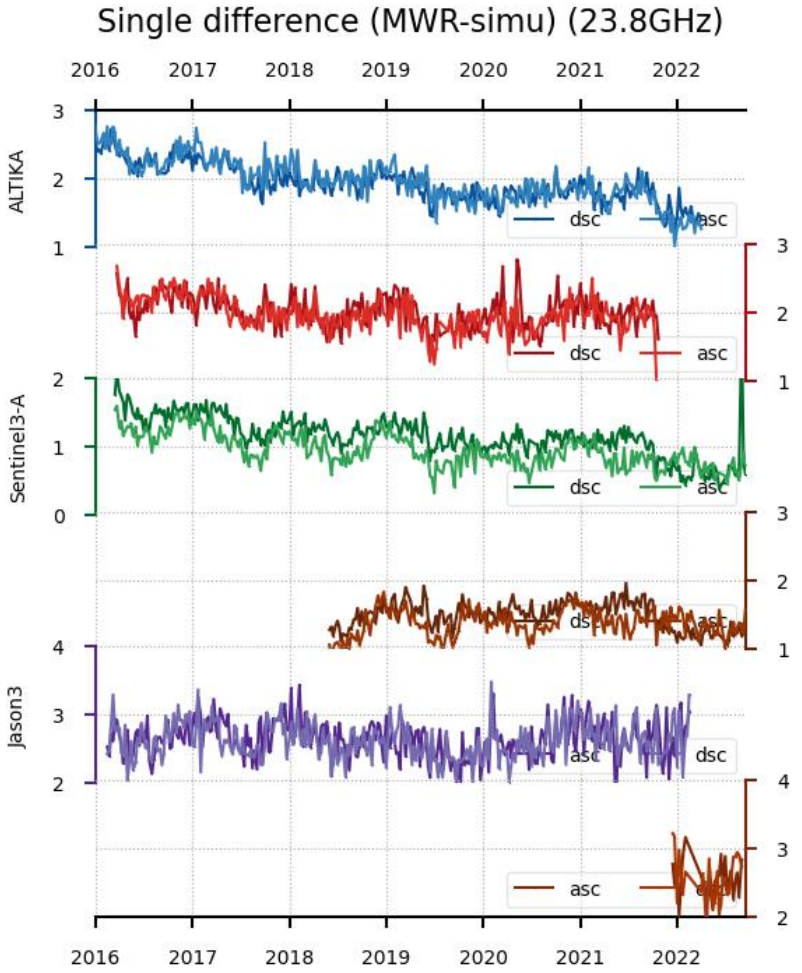
Obtained by removal of seasonal signal, estimation of the slope + 95% confidence interval

Clear signature of El Nino (2016, 20) (anomaly of water vapor over Amazon forest)

Trend (K/yr)	AltiKa	AMSU	S3A	S3B	J3	S6A
Liq. Water Chan	-0.02 (-0.05/0.02)	0.02 (-0.01/0.05)	-0.04 (-0.09/0.01)	-0.10 (-0.23/0.01)	-0.23 (-0.32/-0.15)	not estimated

Vicarious calibration

EUM data



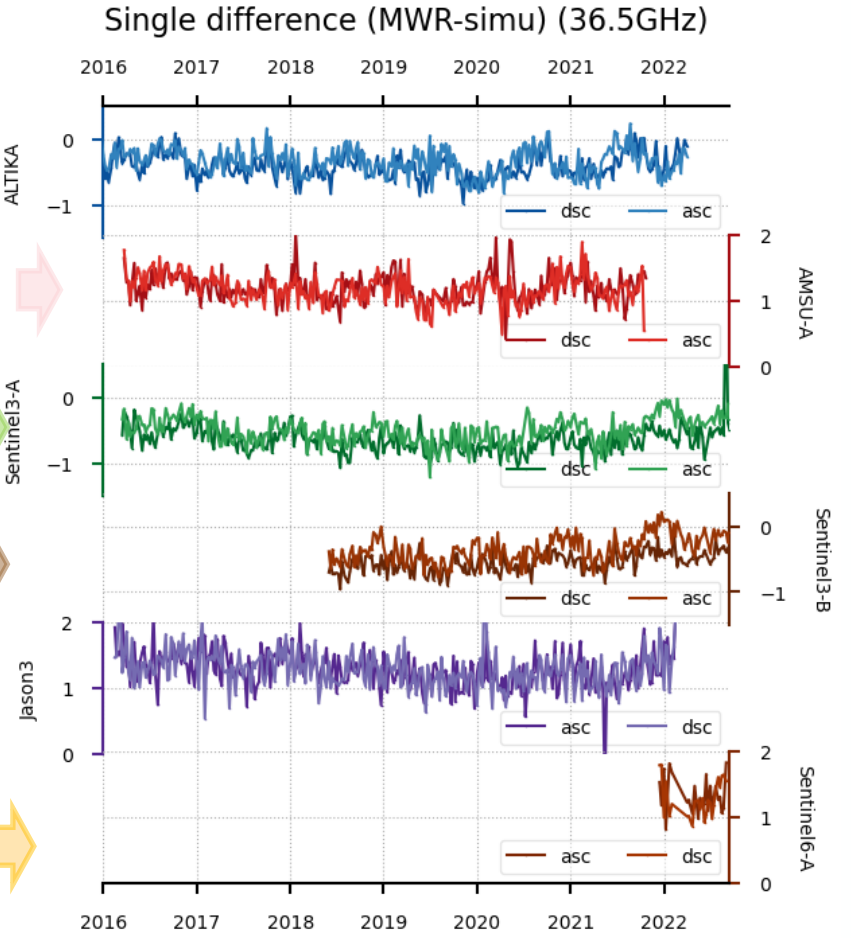
To be replaced by Metop01

ASC/ DSC signal

Corrected

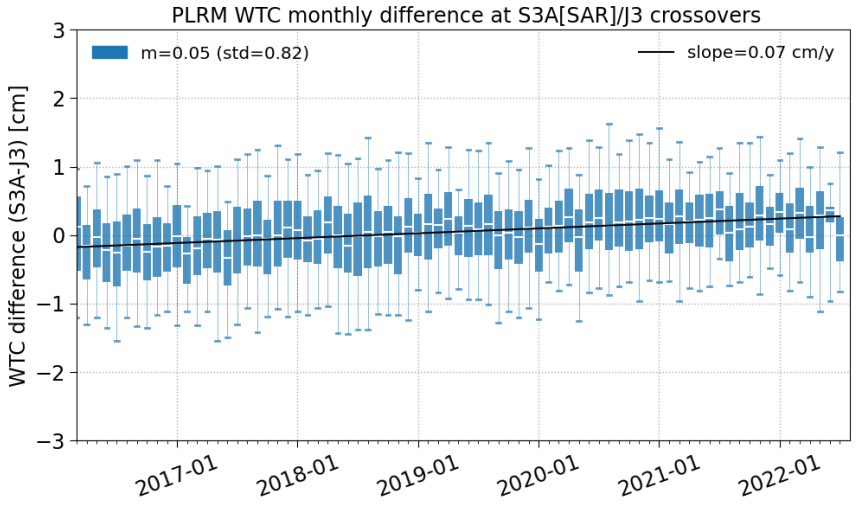
ASC/ DSC signal appearing ?

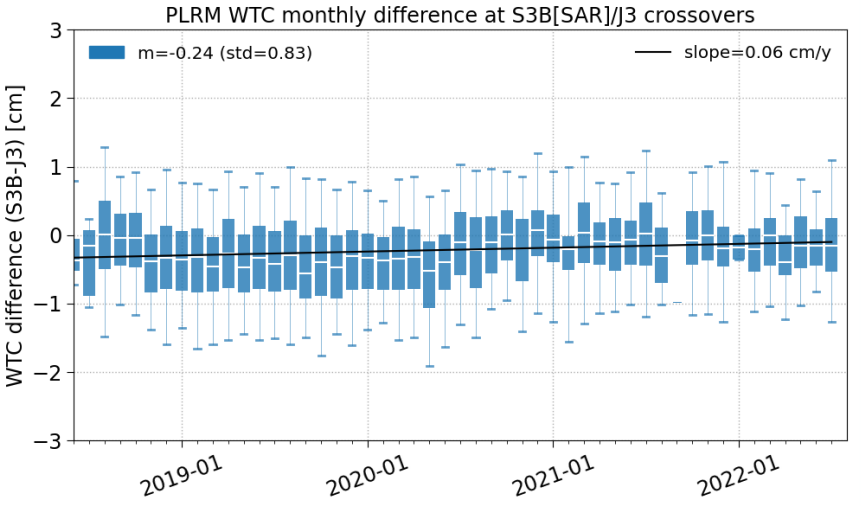
Processing on-going for S6

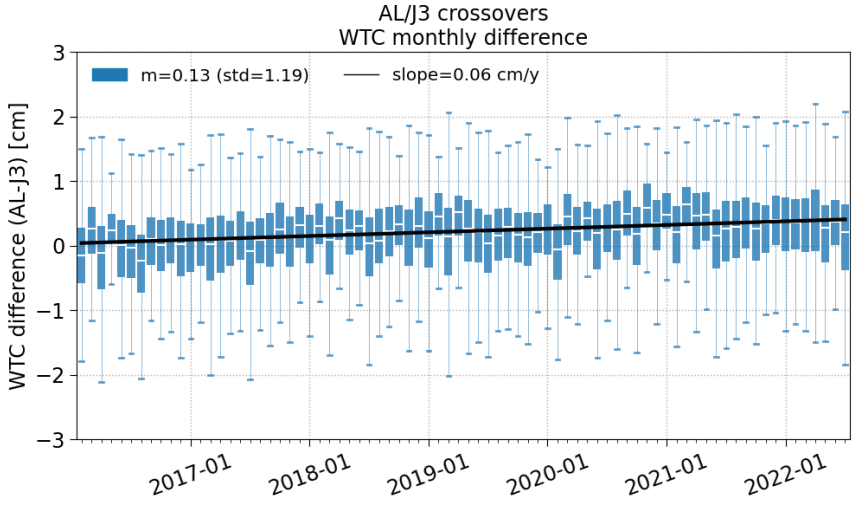


Crossover points

EUM data







GDR data for J3 and AltiKa

NTC data for S3A/S3B

- Same drift wrt J3 is observed for three missions
- Unlikely than 3 instruments would drift similarly
- No drift assigned to Sentinel-3

Instrument monitoring

- Both instruments are in good health

Stability of Sentinel 3A MWR assessed

From brightness temperatures using vicarious calibrations

- No drift identified so far

➔ 36,5GHz to be analysed

From crossover points

➔ Same drift wrt J3 for S3A/S3B/AL

Coldest ocean points

~5 years	S3A	S3B
23.8 (K/yr)	0.05 (0.01 / 0.09)	0,08 (0,03/0,13)
Liq. wat/. (K/yr)	0.09 (0.04 / 0.13)	0,10 (0,05/0,15)

Amazon forest

~5 years	S3A	S3B
23.8 (K/yr)	-0.04 (-0.09 / 0.01)	-0,05 (-0,14/0,05)
Liq. wat. (K/yr)	-0.04 (-0.09/0.01)	-0,10 (-0,23/0,01)