



ESA-MOST Dragon Cooperation

中国科技部-欧洲空间局“龙计划”合作

2017 DRAGON 4 SYMPOSIUM

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2017年6月26-30日, 丹麦 哥本哈根

DRAGON-4 MIRSS-CAP MICROWAVE RS SENSOR CALIBRATION AND PRODUCT GENERATION

Chinese Partners:

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European partners:

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1: NSSC-CAS, Beijing, China

2: IECAS, Beijing, China

3: NSMC-CMA, Beijing, China

4: Vanderbilt University, Nashville, TN, USA

5: University of Wisconsin – Madison, WI, USA

6: Informus GmbH, Berlin, Germany

7: Collecte Localisation Satellites, Toulouse, France

Overview

- Objectives
- Details on Level 1 cal/val: illustration with MWR on-board altimetry missions
- Details on Level 2 product: illustration with EMIR products
- Timeline: 2017 to 2020

MIRSS-CAP Objectives

- Develop, improve, and validate algorithms for the calibration of microwave payloads
- Validate and inter-compare derived products such as water vapor, precipitation and snow.
- Training of young scientists via workshops, training programs, co-supervision and exchange

MIRSS-CAP Level 1 Cal/Val

Develop, improve, and validate algorithms for the calibration of microwave payloads:

- Thermal/vacuum calibration to ensure sensor performance meets specification requirements; derivation of calibration parameters and non-linearities.
- In-orbit cross-calibration and validation will be performed between various international passive microwave instruments including SUOMI ATMS, GPM-GMI, NOAA-AMSU-A/B, MHS, FY-3B/C MWHS, HY-2 ACMR, Jason-2,-3, Altika, Sentinel-3 and others

MIRSS-CAP Level 1 Cal/VaI

- Illustration of inter-calibration monitoring

MWR = lack of **absolute** natural reference target

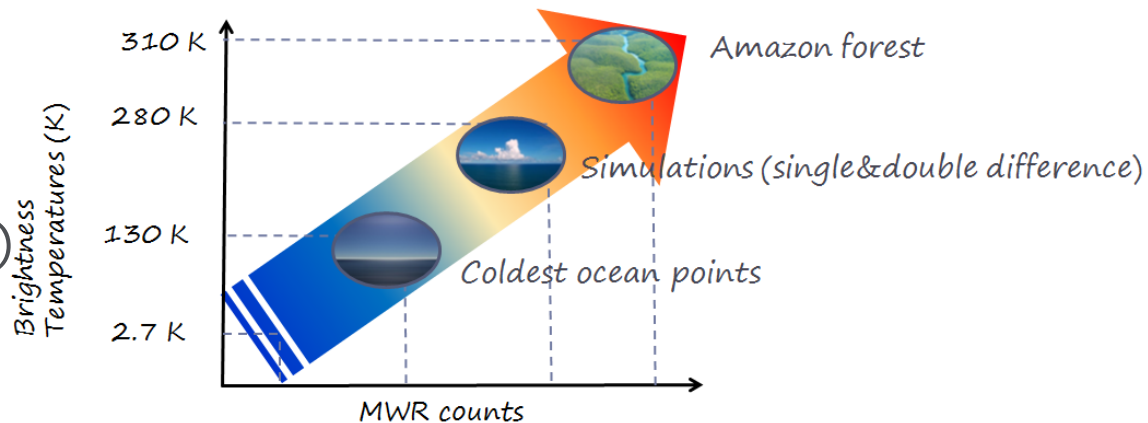
- ➔ Use of complex metrics based on a more than 15 years experience
- ➔ Multi-source (instr, model) Multi-processing (geo./stat. selection, Radiative Transfer Model),
- ➔ Multi instrumental: currently applied to S3-A, Altika + J2, AMSU-A

- MWR on-board altimetry missions:

Altika (CNES/ISRO)

Sentinel-3 (ESA/Eumetsat)

Jason-2 (CNES/JPL)



MIRSS-CAP Level 1 Cal/Val



Coldest ocean points

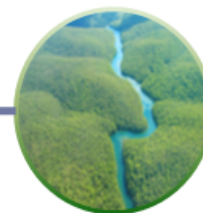
- Low winds, no clouds, minimal water vapor
- Statistical selection of coldest ocean TB over ocean
- Method developed by Ruf and updated by Eymard to detect and monitor drifts



Simulations

(single & double difference)

- Single difference: remove the impact of the instr. conf. & geophysic
- Double difference: assess the calibration difference between two radiometers



Amazon forest

- Natural target closest to a black body
- Weak dependency with the frequency, polarisation and incidence
- Editing and average of measurements over evergreen forest

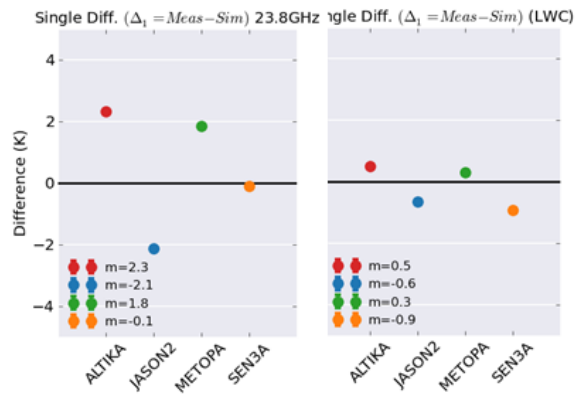
MIRSS-CAP Level 1 Cal/Val

Sentinel-3 in-flight performances, M-L Frery (CLS) et al, to be submitted



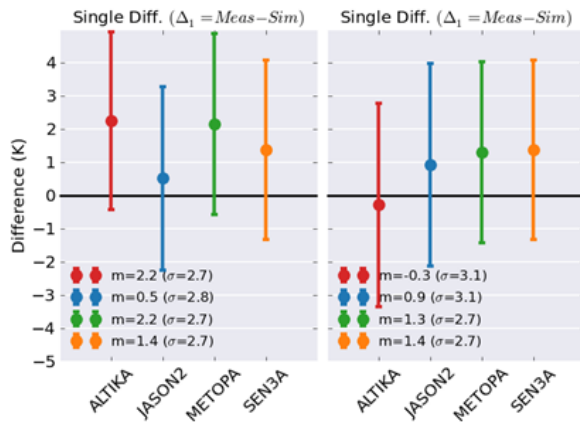
23.8GHz

Liq. Water



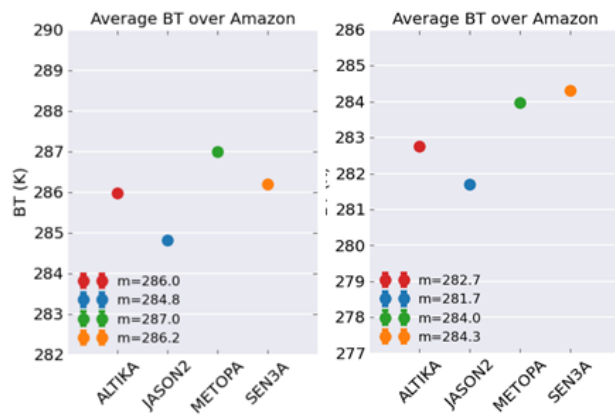
23.8GHz

Liq. Water



23.8GHz

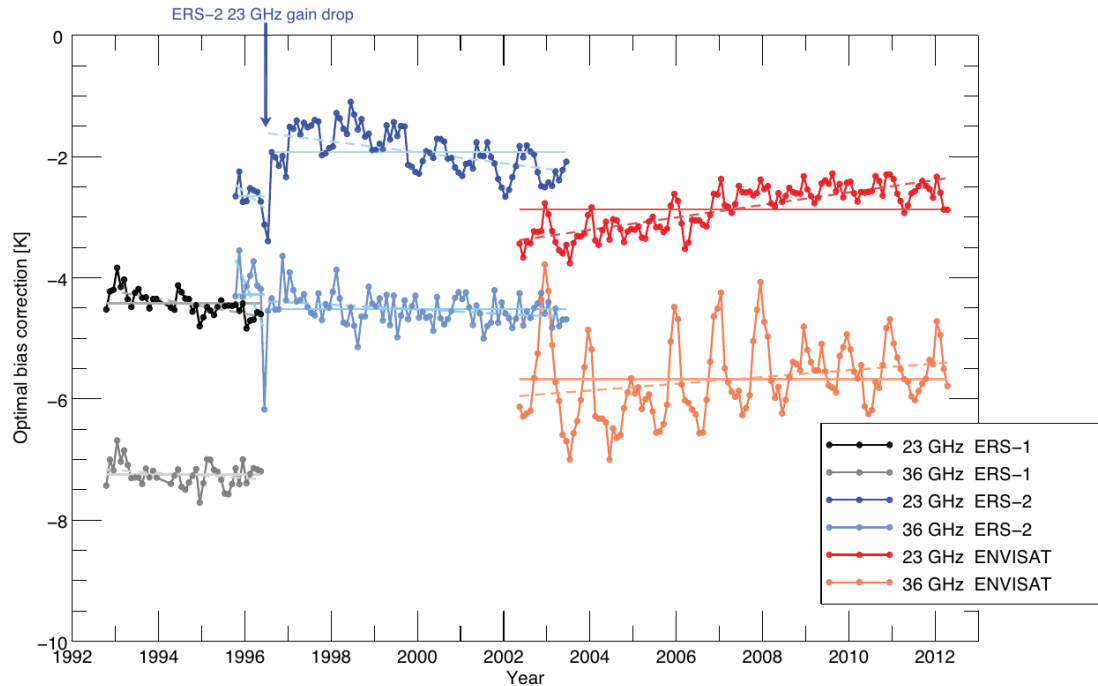
Liq. Water



MIRSS-CAP Level 1 Cal/Val

An intercalibrated dataset of total column water vapour and wet tropospheric correction based on MWR on board ERS-1, ERS-2, and Envisat, Bennartz et al., 2017

Illustration of BT bias correction based on comparison to ERA-interim, used for the generation of long term stable timeseries



MIRSS-CAP Product Validation

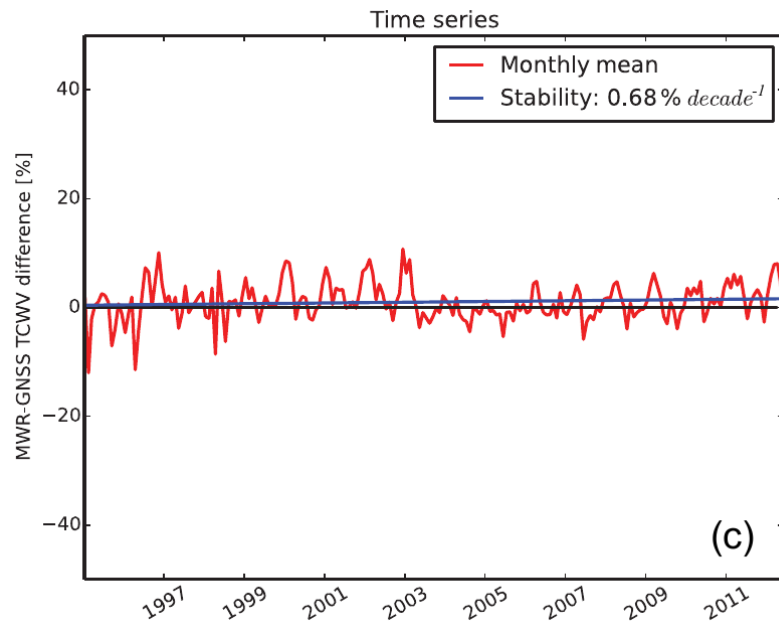
Validate and inter-compare derived products such as water vapor, precipitation and snow.

- Focus on the validation/intercomparison of existing retrieved geophysical quantities, such as water vapor, precipitation, and cloud liquid water.
- Activities will be tied in with other ongoing international efforts, such as assessments performed within the framework of GEWEX (<http://gewex-vap.org>) as well as current ESA-funded efforts, such as LTDP-EMIR (<http://esa-mwr.org>).

MIRSS-CAP Product Validation

An intercalibrated dataset of total column water vapour and wet tropospheric correction based on MWR on board ERS-1, ERS-2, and Envisat, Bennartz et al., 2017

Illustration of long term drift of the resulting L2 TCWV product (after bias correction): comparison to GNSS



MIRSS-CAP Time Line

1st year: 07/2017 - 06/2018

- Carry out **the literature review** of calibration, validation and retrieving of microwave radiometers.
- **Collect and collate** remote sensing and ground data, and complete pre-processing of microwave radiometers.
- **Continuously exchange** scientists, expertise and know-how between European and Chinese partners.
- Develop plans and initiate visiting scientist studies for dedicated research projects.
- Write deliverables, preparing for 2017 “DRAGON 4 Programme” phase report.

MIRSS-CAP Time Line

2nd year: 07/2018- 06/2019

- Carry out microwave sensor **calibration test**.
- **Data processing and calibration accuracy analysis** for microwave calibration data.
- Continuously exchange scientists, expertise and know-how between European and Chinese partners.
- Continue dedicated visiting scientist studies for dedicated research projects.
- Write deliverables, preparing for 2018 “DRAGON 4 Programme” phase report.

MIRSS-CAP Time Line

3rd year: 07/2019- 06/2020

- Carry out microwave **product validation analysis and cross-comparison**.
- **Retrieving of water vapor**, precipitation and snow products and validation with real-time measurement data and other relevant products.
- Continuously exchange scientists, expertise and know-how between European and Chinese partners.
- Continue dedicated visiting scientist studies for dedicated research projects.
- Write deliverables, preparing “DRAGON 4 Programme” phase report.

MIRSS-CAP Time Line

4th year: 07/2020- 06/2021

- The cal/val procedure and analysis will be **optimized and concluded** by MIRSLAB as well as by European partners.
- The water vapor relevant products will be **generated** and try to analysis the extreme weather and climate research.
- Continuously exchange scientists, expertise and know-how between European and Chinese partners.
- Continue dedicated visiting scientist studies for dedicated research projects.
- Prepare the final project report.

Conclusion

The DRAGON-4 MIRSS-CAP framework is a very good opportunity for exchange scientists, expertise and know-how between European and Chinese partners

It will undoubtedly benefit to the quality of present and future missions, both European and Chinese

We looking forward to start working together !

Thank you !