Evaluation of AMSR3 precipitation-sensitive observations

IPWG-12, KRAKÓW, 7-10 July 2026

Elisa Chardon--Legrand, Alan Geer, David Duncan, Tracy Scanlon, Niels Bormann

Scientist (EUMETSAT Fellowship), ECMWF

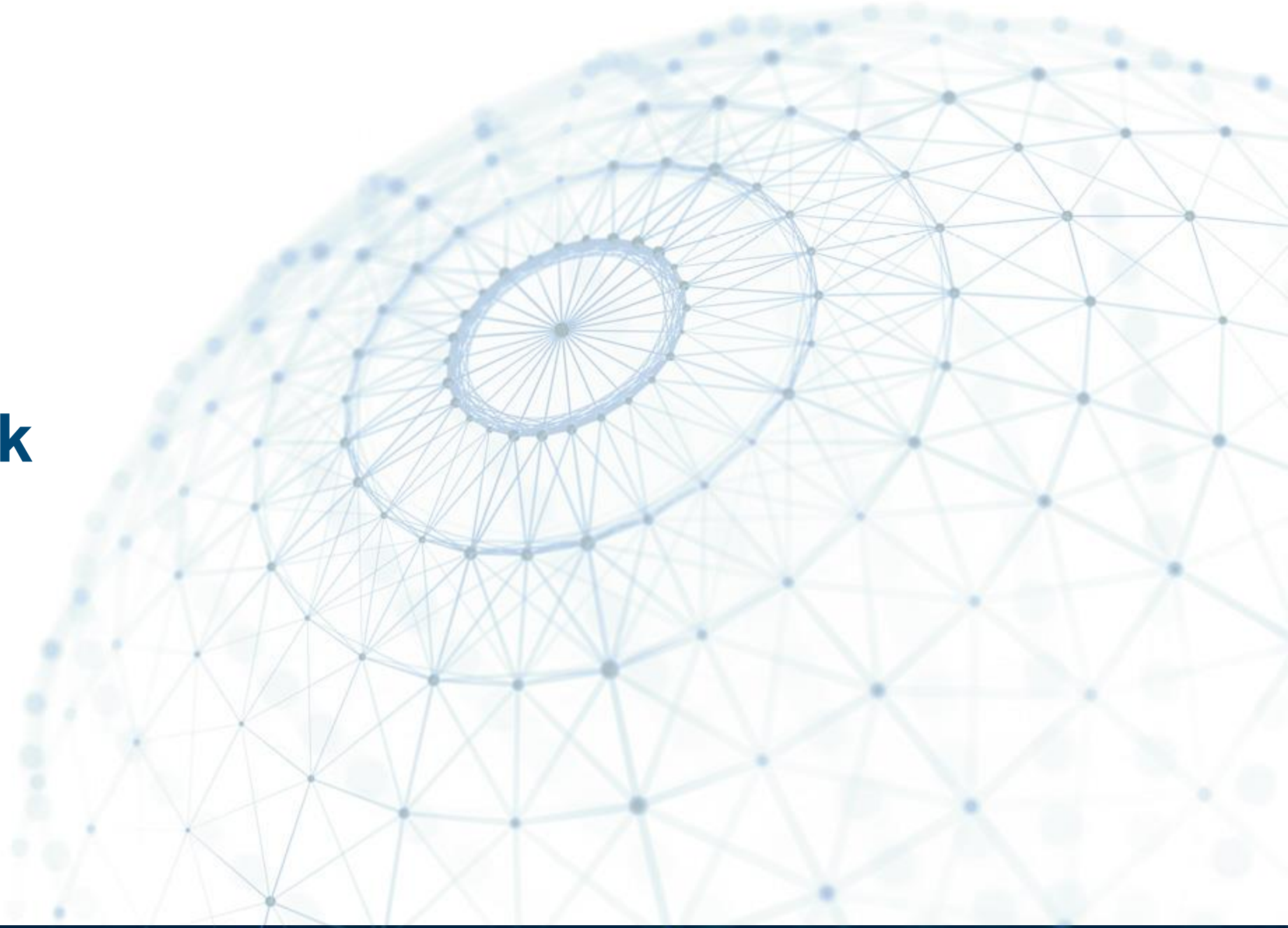
elisa.chardon-legrand@ecmwf.int

This work was made possible through access to early AMSR3 data provided by JAXA under the JAXA–EUMETSAT agreement.

Outline

1. Framework
2. Intercomparison of AMSR3 with AMSR2
3. Assimilation of AMSR3 instead of AMSR2 in IFS – Impact study
4. Conclusion and perspectives

1. Framework



1. Framework

AMSR3 - Calibration 0.1/00B

27 November 2025

AMSR3 - Calibration 0.2/00C

5 March 2026

AMSR3 - Final calibration 1.0/01A

4 June 2026

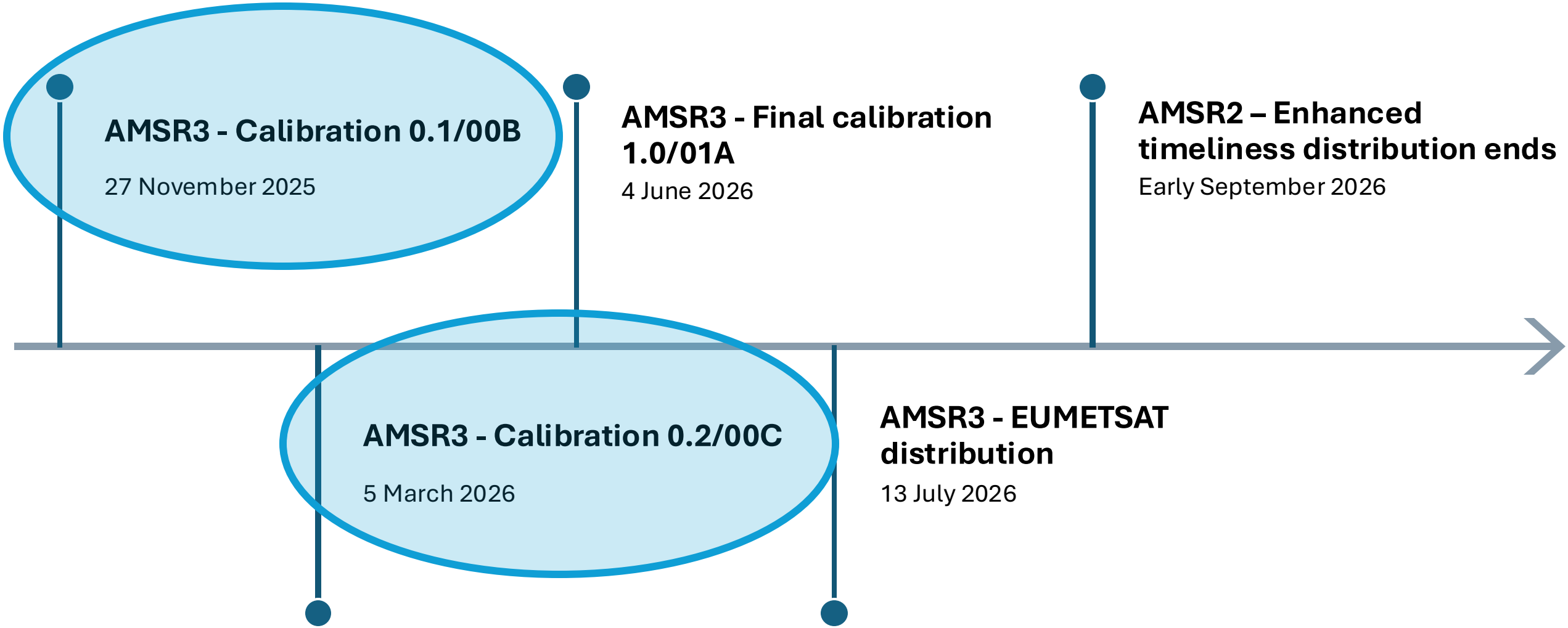
AMSR3 - EUMETSAT distribution

13 July 2026

AMSR2 – Enhanced timeliness distribution ends

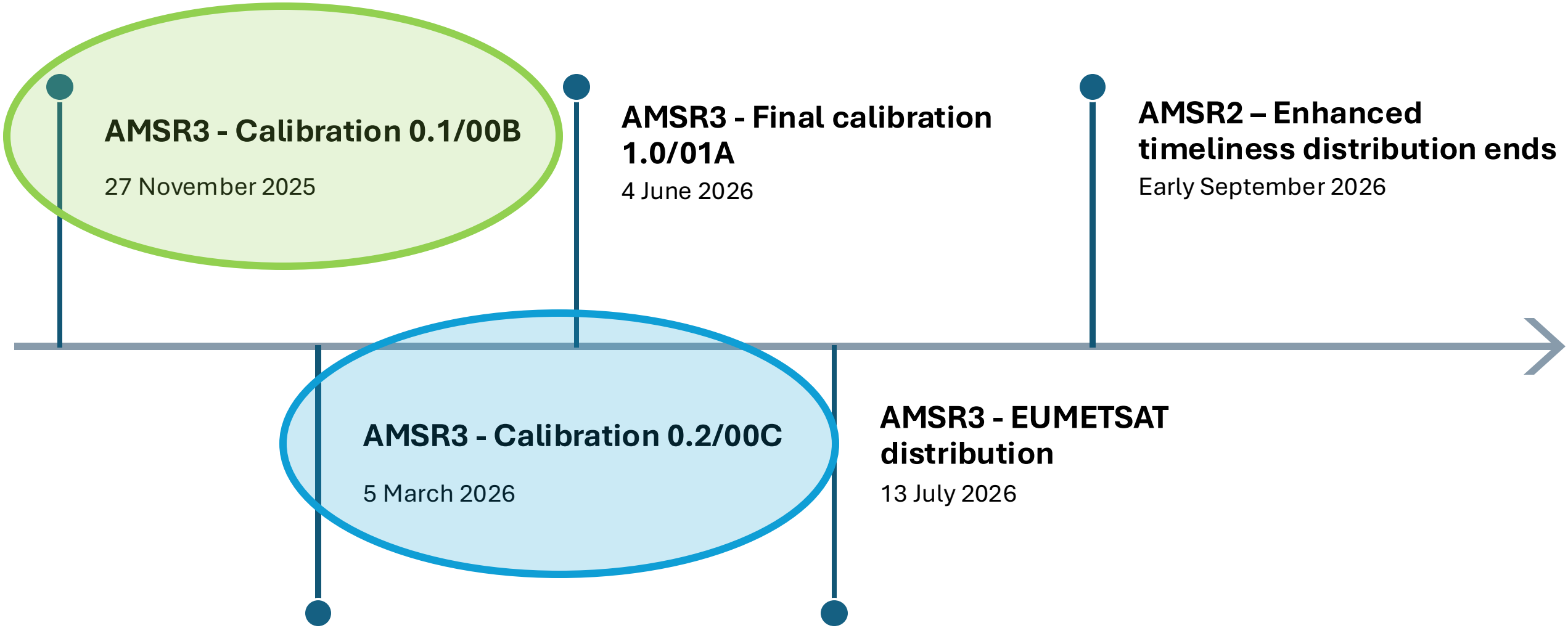
Early September 2026

1. Framework



*Focus of the studies performed

1. Framework

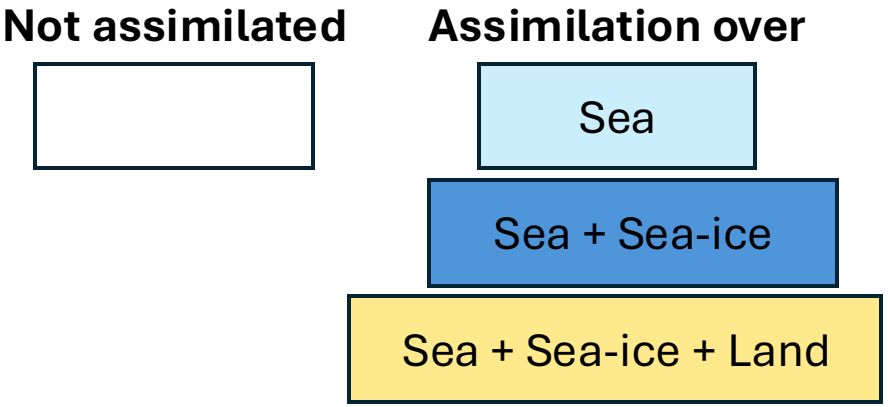


*Focus of the studies performed

*Result will be shown only for the calibration 0.1/00B

1. Framework

- **AMSR3 calibration :** 0.1/00B
- **Model :** IFS – 27km horizontal resolution
- **Cycle :** 50r1
- **All-sky assimilation of AMSR2/AMSR3**



AMSR3		AMSR2	
6.925v	6.925h	6.925v	6.925h
7.3v	7.3h	7.3v	7.3h
10.25v	10.25h		
10.65v	10.65h	10.65v	10.65h
18.7v	18.7h	18.7v	18.7h
23.8v	23.8h	23.8v	23.8h
36.42v	36.42h	36.5v	36.5h
89.0v (A)	89.0h (A)	89.0v (A)	89.0h (A)
89.0v (B)	89.0h (B)	89.0v (B)	89.0h (B)
165.5v			
183.31v ±7			
183.31v± 3			

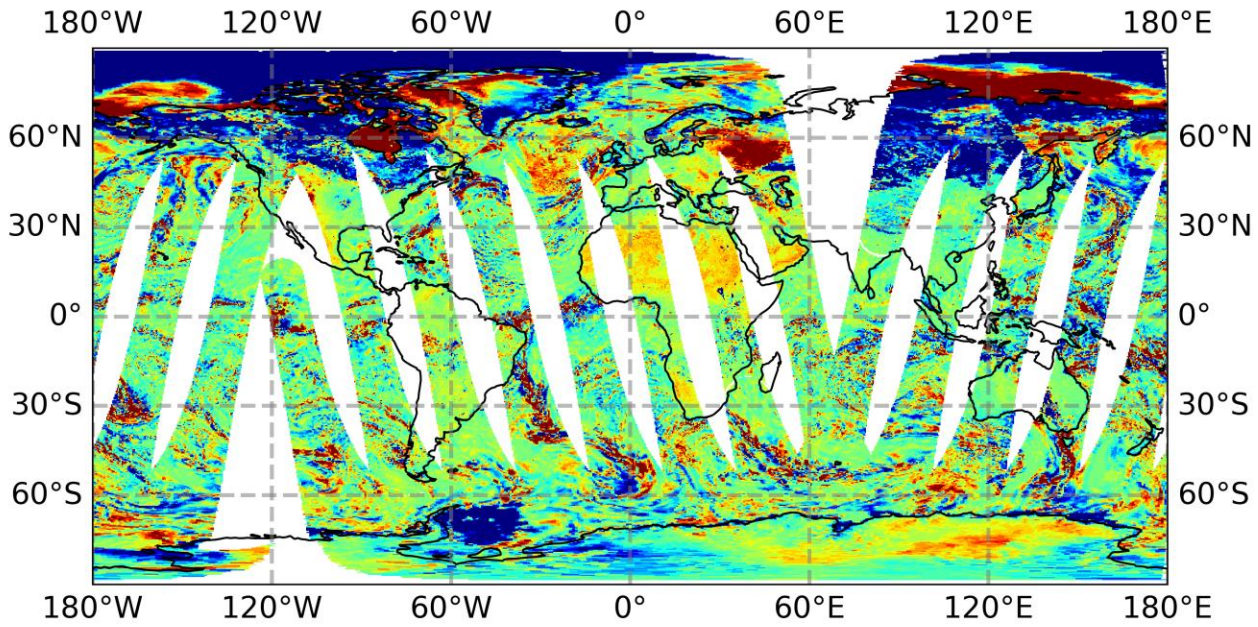
2. Intercomparison of AMSR3 with AMSR2

2. Comparison of AMSR3 with AMSR2

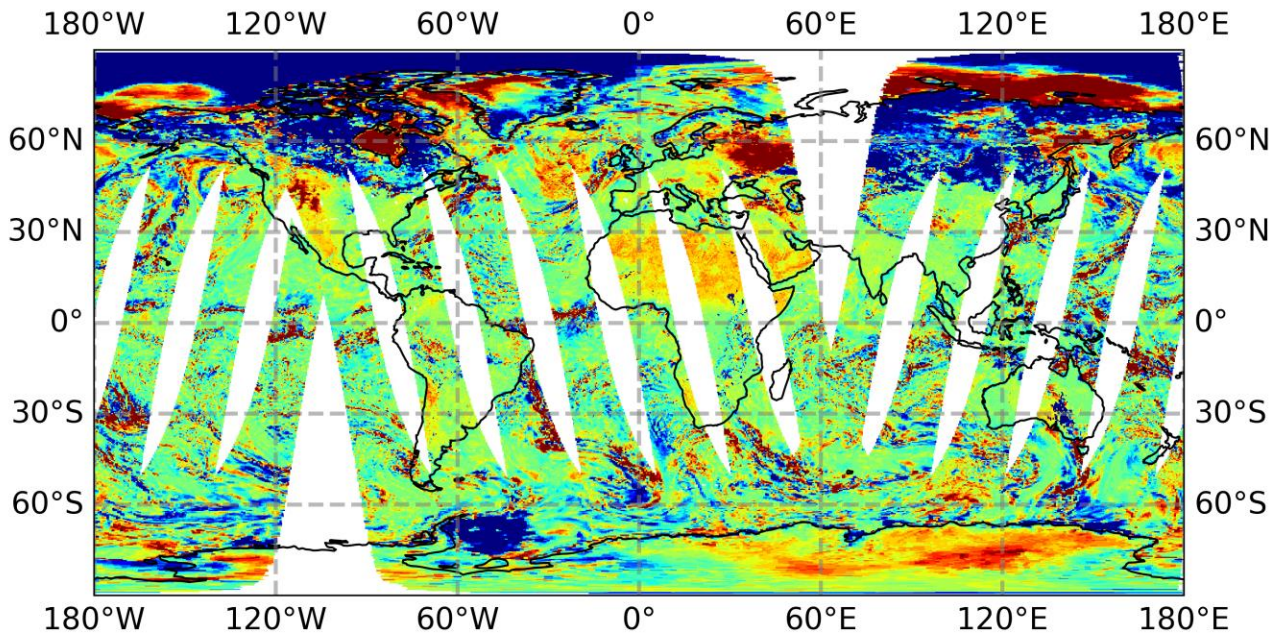
Background departures for the 36.42v GHz, 1 March 2026 - 12:00 UTC

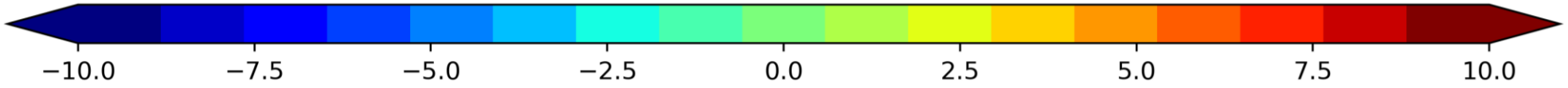
(After bias correction)

AMSR3



AMSR2





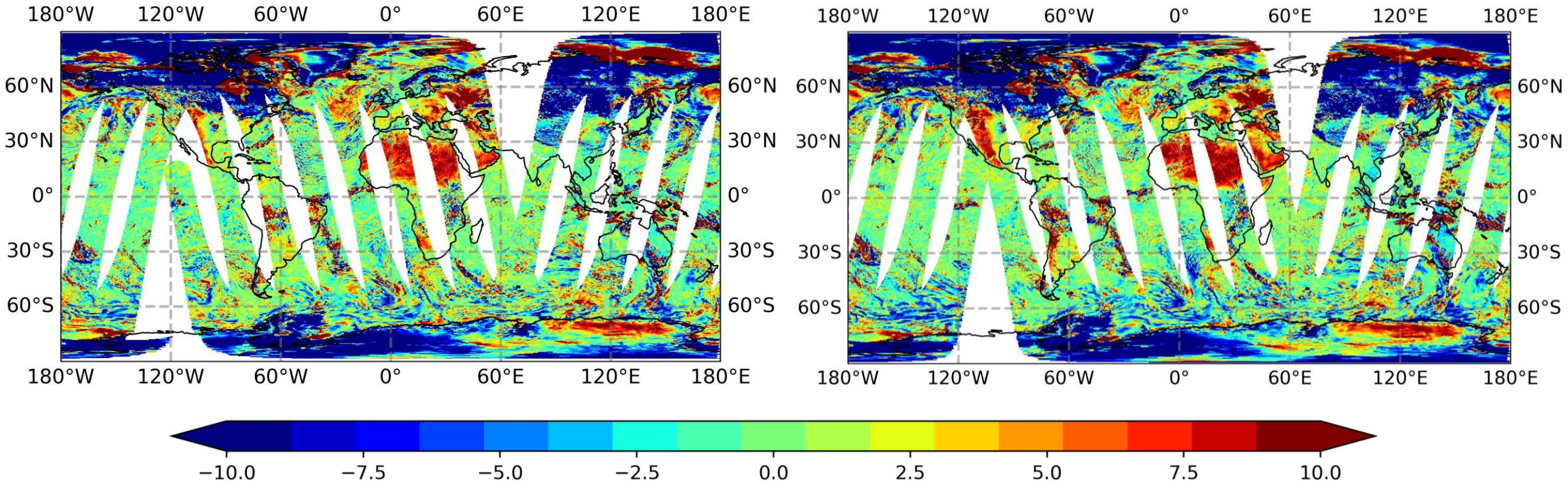
Background departures [K]

2. Comparison of AMSR3 with AMSR2

Background departures for the 89v GHz, 1 March 2026 - 12:00 UTC

(After bias correction)

AMSR3 **AMSR2**

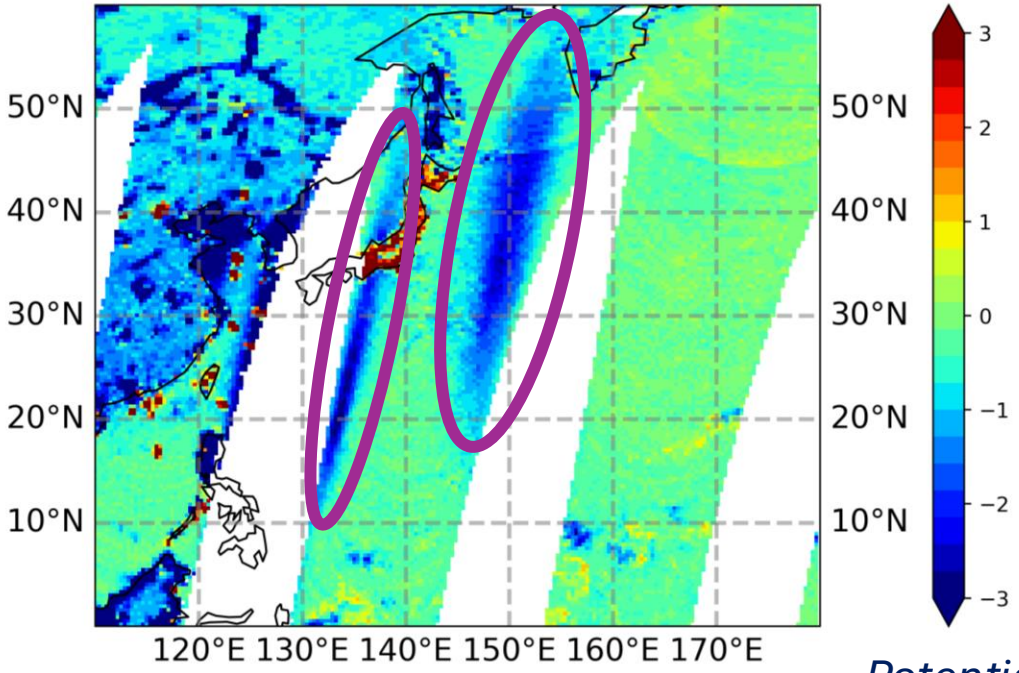


2. RFI signals with AMSR3 over sea

Difference of background departures between 6.925v – 7.3v GHz : $(O\text{-}B)_{6.925v}$ - $(O\text{-}B)_{7.3v}$

3 March 2026 - 12:00 UTC

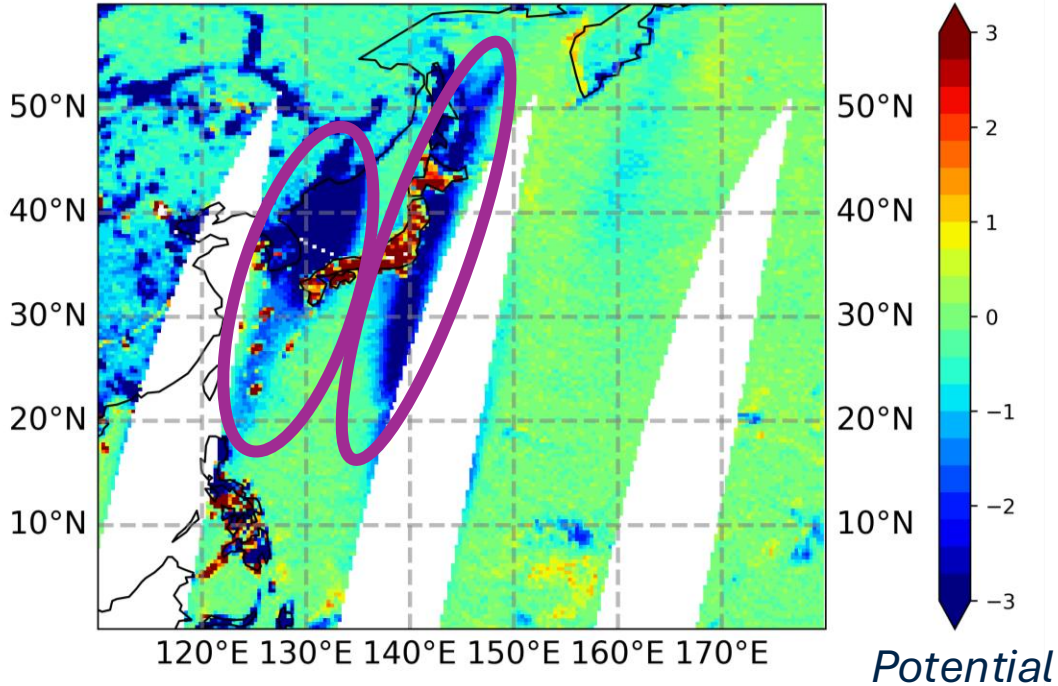
AMSR3



Potential 6.925v RFI

Potential 7.3v RFI

AMSR2



Potential 6.925v RFI

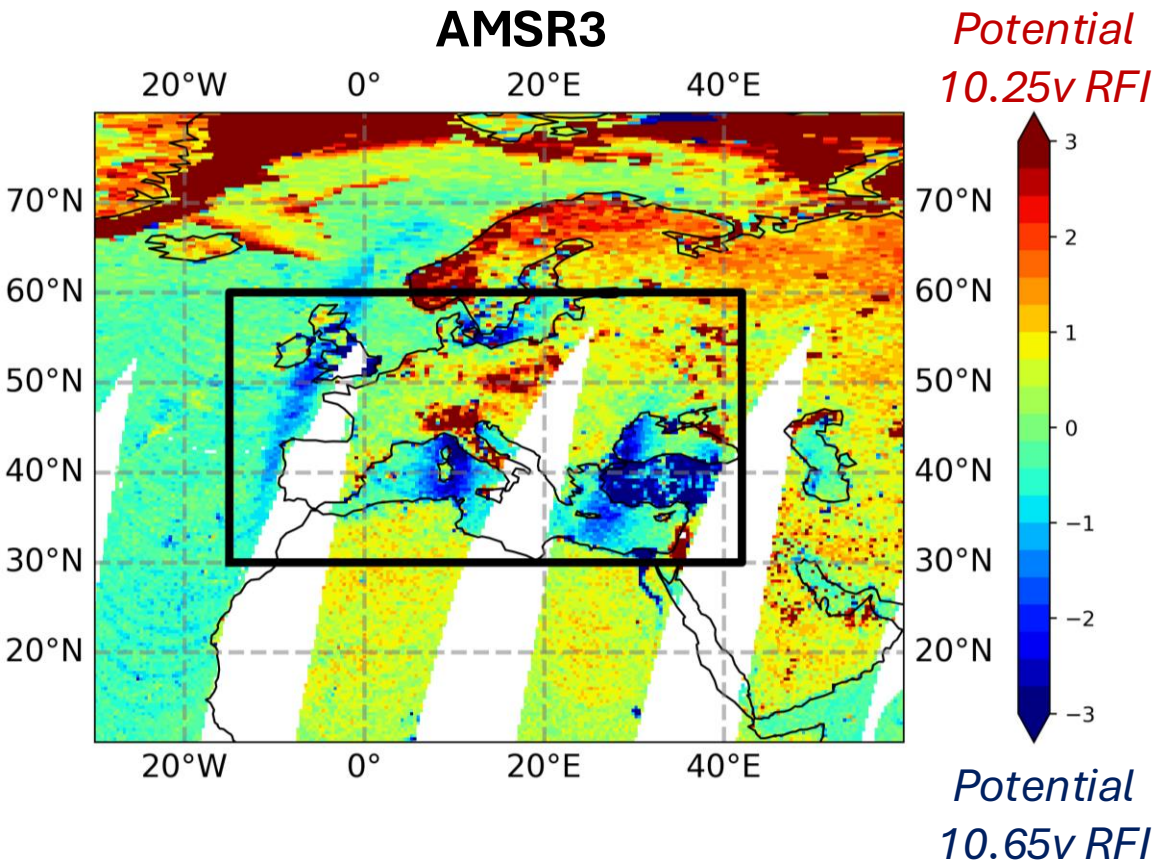
Potential 7.3v RFI

The location and intensity of the RFI signals differ because the orbits of AMSR3 and AMSR2 are not identical.

2. RFI signals with AMSR3 over sea

Difference of background departures between 10.25v – 10.65v GHz : $(O\text{-}B)_{10.25v}$ - $(O\text{-}B)_{10.65v}$

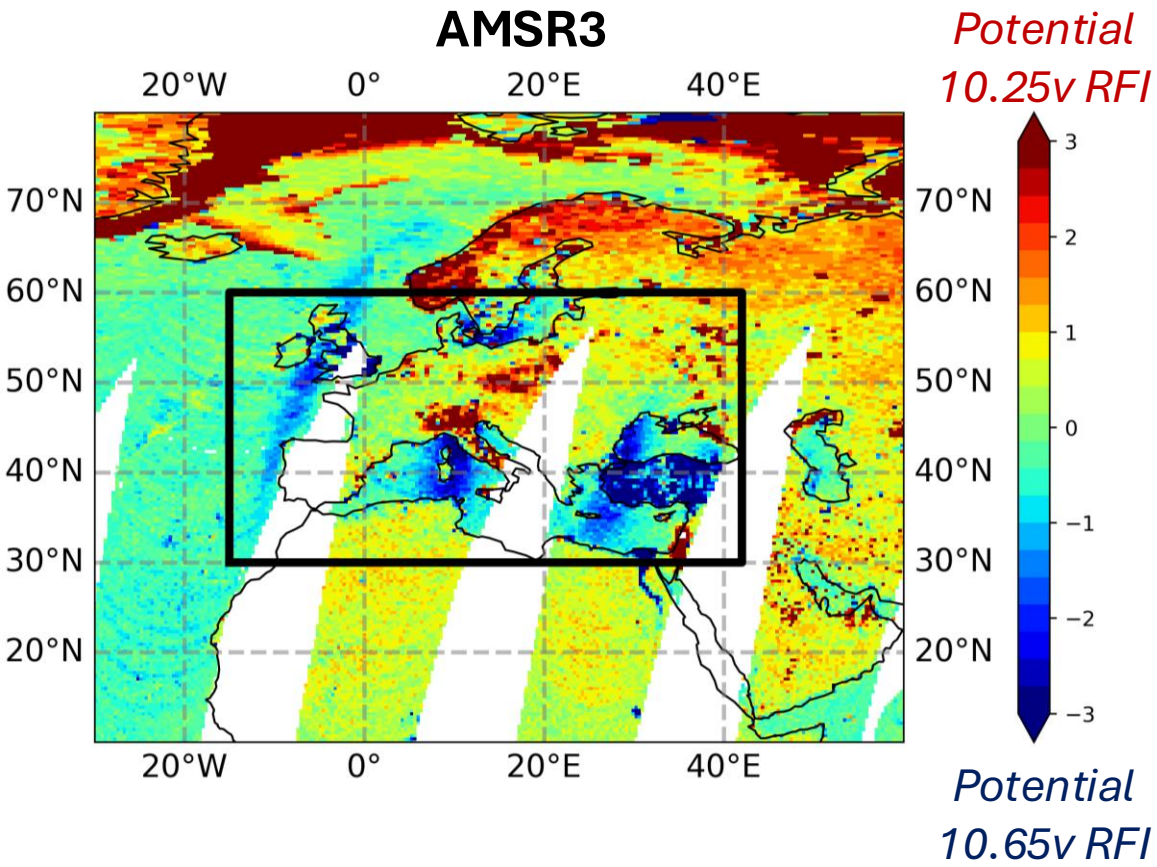
8 January 2026 - 00:00 UTC



Region where RFI glint angle detection from geostationary satellites is applied for the 10.65 GHz channel.

2. RFI signals with AMSR3 over sea

Difference of background departures between 10.25v – 10.65v GHz : $(O\text{-}B)_{10.25v}$ - $(O\text{-}B)_{10.65v}$
8 January 2026 - 00:00 UTC



Region where RFI glint angle detection from geostationary satellites is applied for the 10.65 GHz channel.

Thanks to the 10.25GHz, we were able to detect an extension of the signal.

3. Assimilation of AMSR3 instead of AMSR2 in IFS – Impact study

3. Impact study – description of the experiments

- Period of study : 3 January 2026 – 3 March 2026 (2 months)
- Model : IFS
- Cycle : 50r1
- All-sky assimilation of AMSR2 or AMSR3.
- AMSR2 or AMSR3 is used to constrain sea-surface temperature and sea-ice concentration in the coupled assimilation system.

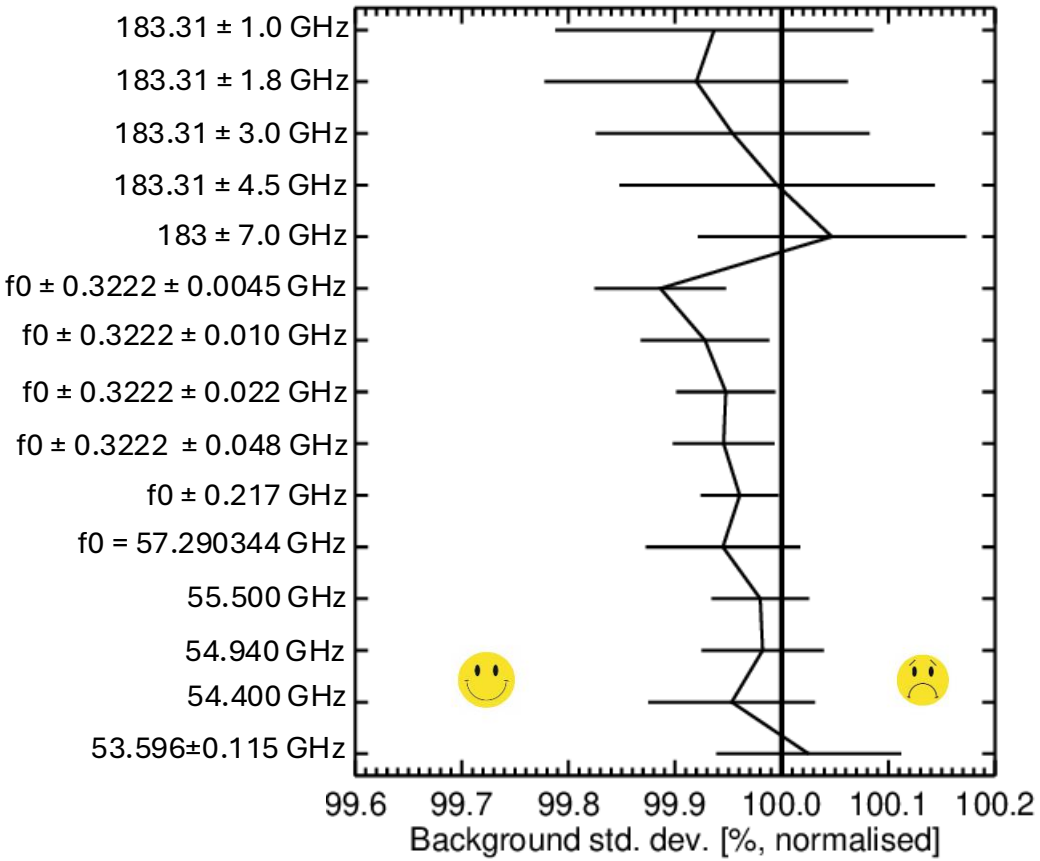
- List of the experiments :
  - **EXP_{AMSR2} : Assimilation of AMSR2**
  - **EXP_{AMSR3} : Assimilation of AMSR3 (AMSR2 channels only)**

The results are preliminary and may change following with a longer evaluation period and/or the updated calibration.

3. Impact on the background

Relative differences of std(O-B) for ATMS

EXP_{AMSR3} - EXP_{AMSR2}



AMSR3 - on

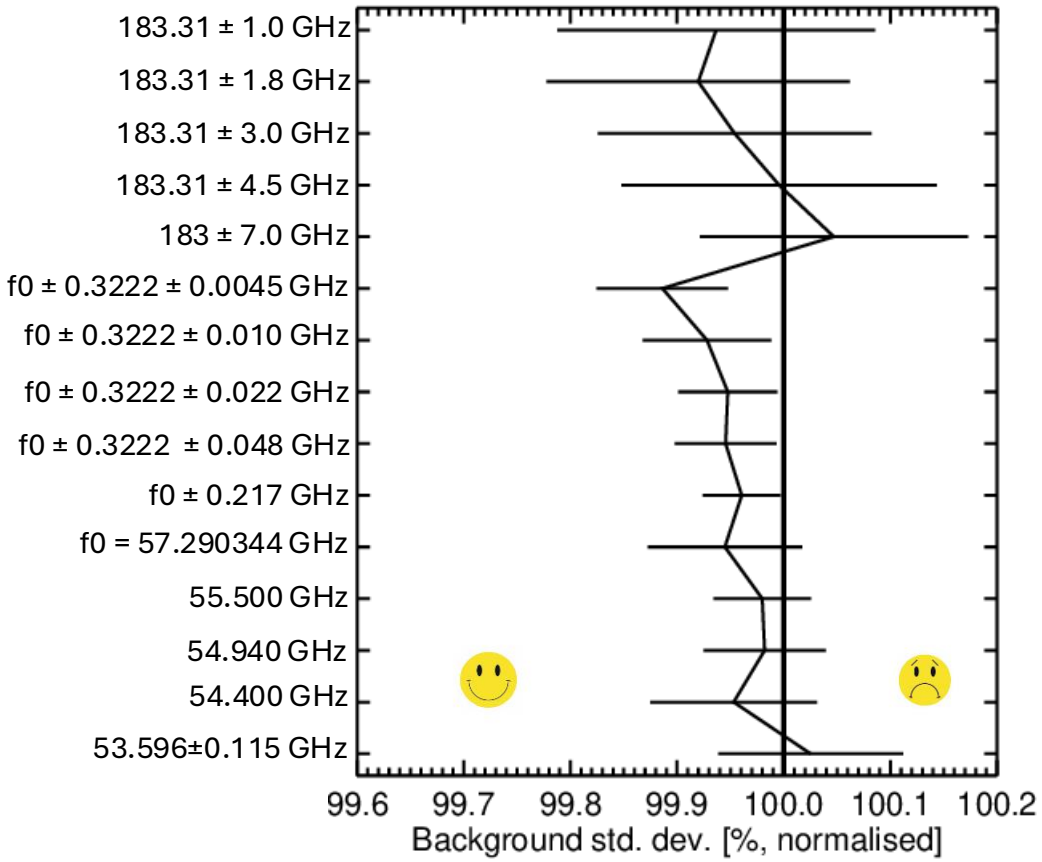
100% =

AMSR2 - on

3. Impact on the background

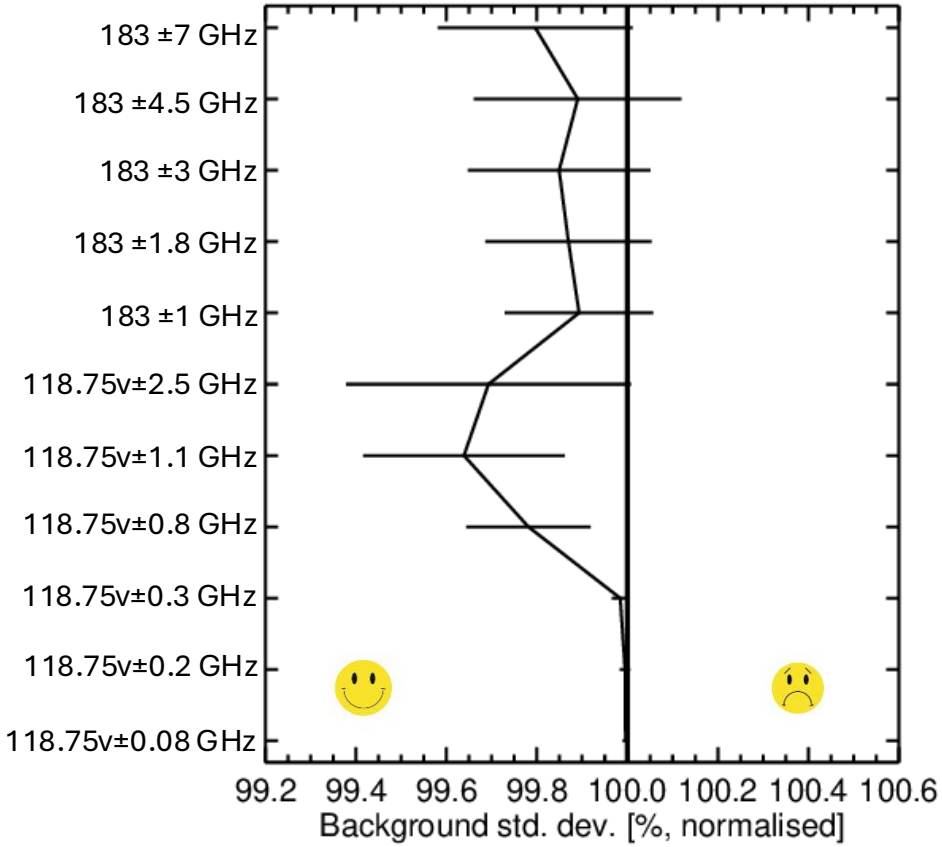
Relative differences of std(O-B) for ATMS

EXP_{AMSR3} - EXP_{AMSR2}



Relative differences of std(O-B) for MWHS-2

EXP_{AMSR3} - EXP_{AMSR2}



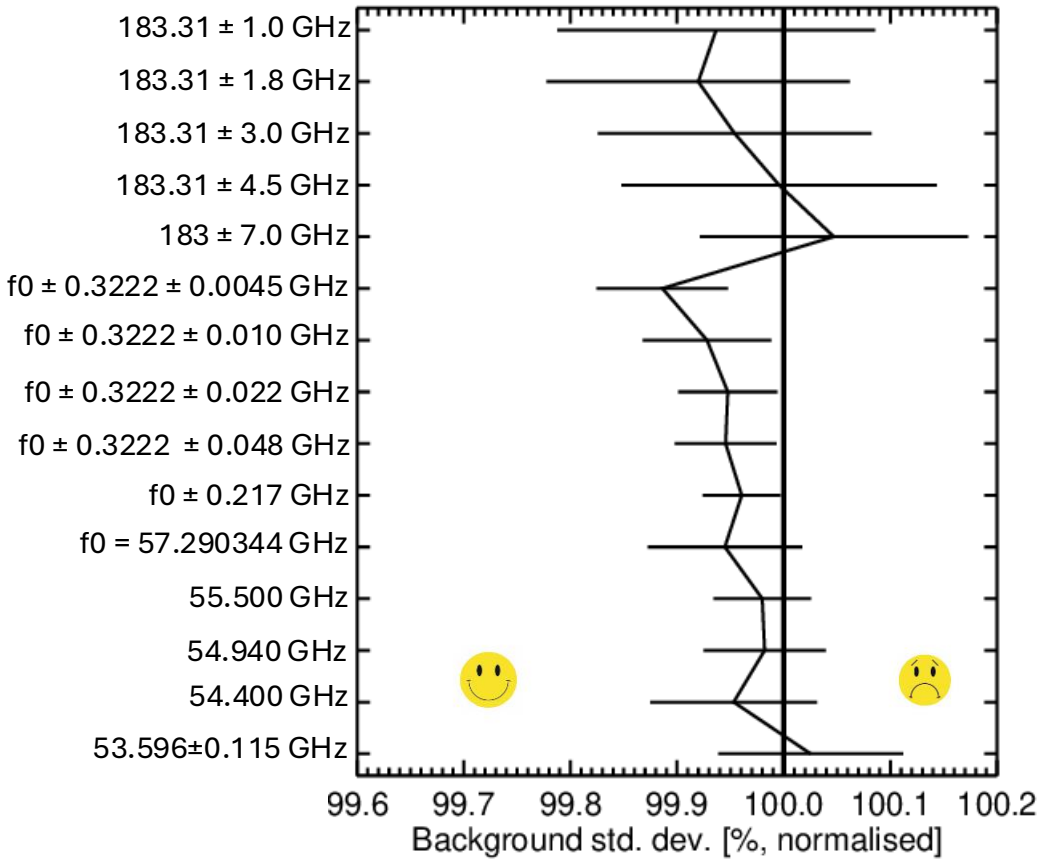
100% = *AMSR3 - on*

AMSR2 - on

3. Impact on the background

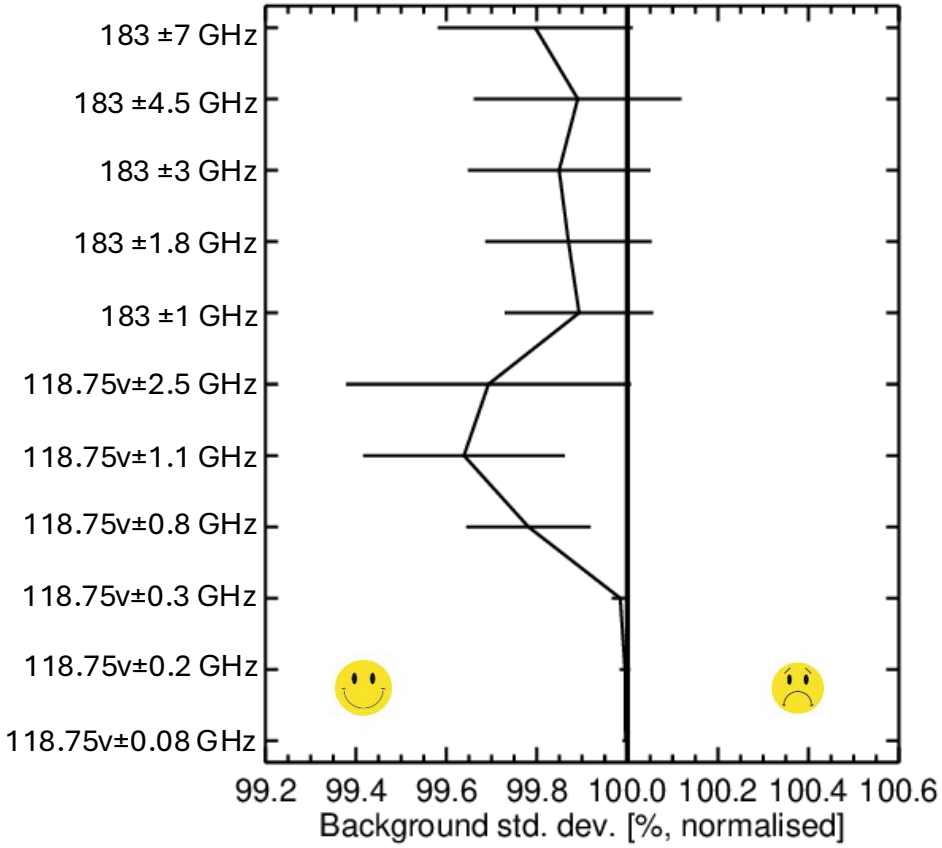
Relative differences of std(O-B) for ATMS

EXP_{AMSR3} - EXP_{AMSR2}



Relative differences of std(O-B) for MWHS-2

EXP_{AMSR3} - EXP_{AMSR2}



100% = *AMSR3 - on* / *AMSR2 - on*

- Mostly neutral.
- Slight improvements relative to MWHS-2.

4. Conclusion and perspectives

4. Conclusions and perspectives

- **AMSR3 Compared to AMSR2 based on the 0.1/00B calibration:**
  - Overall, AMSR3 shows comparable data quality to AMSR2.
  - RFI patterns are broadly consistent with AMSR2, although their intensity and location differ slightly.

- **When the same channels are assimilated, AMSR3 replicates the impact of AMSR2.**

  → We can replace AMSR2 with AMSR3 in operational assimilation.

- **The 10.25 GHz channel appears promising for RFI detection.**

These results are preliminary and may change following the updated calibration.

4. Conclusions and perspectives

- **AMSR3 Compared to AMSR2 based on the 0.1/00B calibration:**
  - Overall, AMSR3 shows comparable data quality to AMSR2.
  - RFI patterns are broadly consistent with AMSR2, although their intensity and location differ slightly.

- **When the same channels are assimilated, AMSR3 replicates the impact of AMSR2.**

  → We can replace AMSR2 with AMSR3 in operational assimilation.

- **The 10.25 GHz channel appears promising for RFI detection.**

These results are preliminary and may change following the updated calibration.

Work in progress and perspectives (using 1.0/01A AMSR3 data)

- ❑ Continue impact and data quality assessments *(166v GHz, 183.31±3 GHz, 183.31±7 GHz channels included)*
- ❑ Refine AMSR3 observation error models.
- ❑ Optimize the assimilation of the 166v GHz, 183.31±3 GHz, 183.31±7 GHz channels.
- ❑ Implementation and evaluate an RFI glint detection method for the 10.65 GHz based on the difference $(O\text{-}B)_{10.25}$ - $(O\text{-}B)_{10.65}$.

Elisa Chardon--Legrand

Scientist (EUMETSAT Fellowsip), ECMWF

elisa.chardon-legrand@ecmwf.int

www.ecmwf.int