



EarthCARE 2026 Science and Validation workshop

8–12 June 2026 | Rhodes House | Oxford, UK

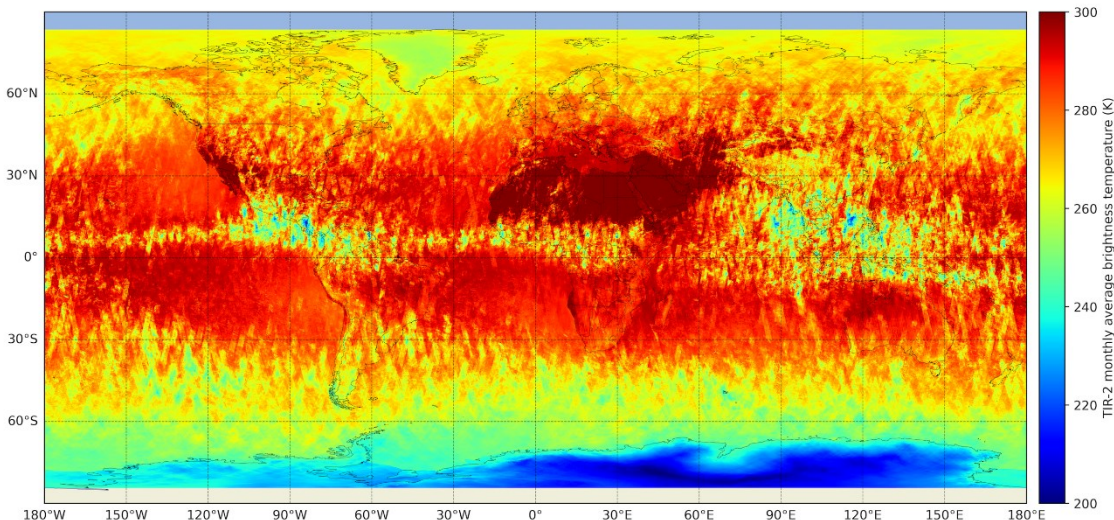
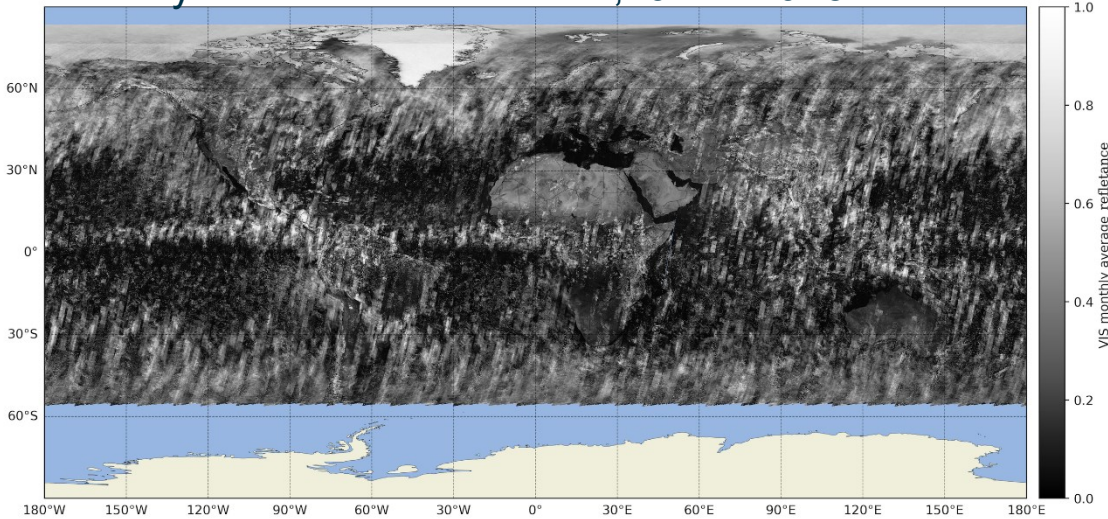
Status of EarthCARE MSI Level-1 performance and detection of aerosol and cloud properties after **two** years of observations

Anja Hünerbein, Sebastian Bley, Nicole Docter, Nils Madenach, Rene Preusker
& the whole MSI-IWG-DISC team

EarthCARE MSI L1 performance



Monthly mean VIS reflectance, June 2025



Monthly mean TIR-2 brightness temperature, June 2025

MSI's earth-view measurements are **stable**!

- Significant improvements were made to pixel geolocation and inter-band co-registration,
- Comparisons FCI revealed systematic radiance offsets in MSI data. An additional *ad hoc* vicarious calibration was applied, successfully reducing **relative** biases to below 1%.
- Across-track reflectance variations were traced to issues in measured solar irradiance data from onboard diffusers.
- Replacing measured solar irradiance with theoretical values improved the radiometric consistency and stability of the MSI Level-1 products.

→ ongoing activities for vicarious calibrations

EGUSPHERE-2026-2652 | Research article

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[EarthCARE MSI Level-1 Data: First In-Orbit Calibration and Validation](#)

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EarthCARE MSI L1 performance



- EarthCARE MSI Level 1 baseline BA, deployed and published since 27 May and fully reprocessed
- EarthCARE MSI Level 1 baseline BD, published since 23 April 2026 with new gain update

Baseline	Start Date (Frame)	Stop Date	Most important Updates
BD	23 Apr 2026 (10804C)		MSI SWIR1 maintenance gain update; CCDB v16
BC	18 Nov 2025 (08374A)	23 Apr 2026 (10804B)	-
BA	16 Jul 2024 (00756C)	18 Nov 2025 (08375H)	MSI VNS maintenance gain update and usage of theoretical TSIS-2 based solar (spectral) irradiances; CCDB v15
AF	28 Jan 2025 (03807C)	27 May 2025 (05651B)	Coregistration and diffuser BSDF update; CCDB v14
AF	27 Jan 2025 (03790C)	28 Jan 2025 (03807B)	Only coregistration update; CCDB v13
AE	13 Jan 2025 (03569B)	27 Jan 2025 (03790B)	CCDB v13

**baseline; fully
reprocessed MSI L1
data set**

MSI level 2 products M-CM, M-COP and M-AOT



MSI L2 products since July 2024 until now

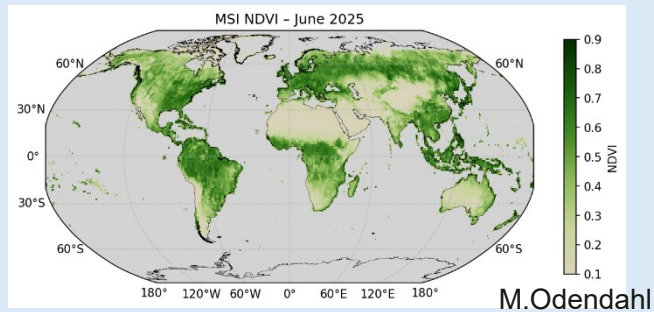
M-CM

the cloud mask product

cloud_mask
cloud_type
cloud_phase
surface_classification

quality status

NDVI



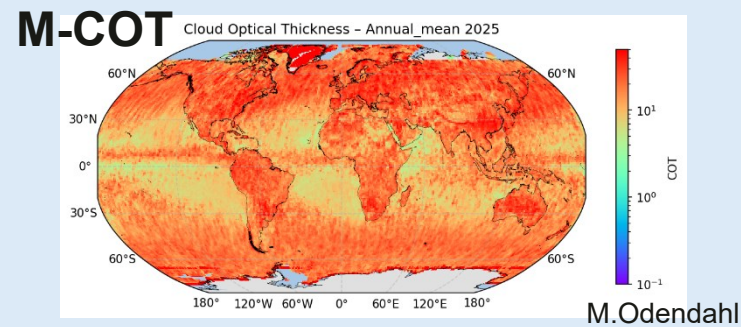
Hünerbein, A. et al., 2023
<https://doi.org/10.5194/amt-16-2821-2023>

M-COP

the cloud optical and physical
properties product

cloud_optical_thickness
cloud_effective_radius
cloud_top_temperature/pressure
/height
cloud_water_path

quality status and error



Hünerbein, A. et al., 2024
<https://doi.org/10.5194/amt-17-261-2024>

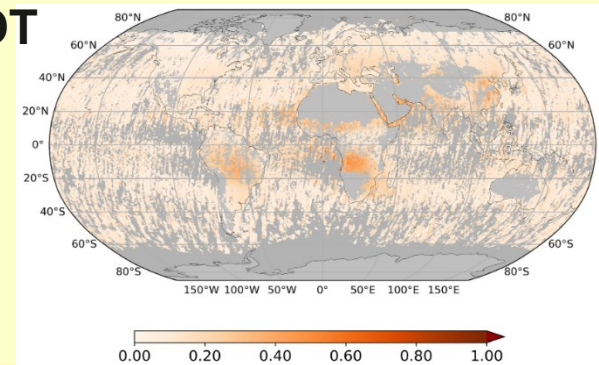
M-AOT

the aerosol optical and physical
properties product

aerosol_optical_thickness_670nm
aerosol_optical_thickness_865nm
angstrom_parameter_670nm_865nm

quality status and error

M-AOT



Docter, N. et al., 2023
<https://doi.org/10.5194/amt-17-2507-2024>

MSI L2 baseline BC -> BD



- EarthCARE MSI Level 2 baseline BA, deployed and published since 27 May and fully reprocessed
- EarthCARE MSI Level 2 baseline BC, published since 18 November 2025

Baseline M-CLD	Baseline M-AOT	Start Date (Frame)	Stop Date	Most important Updates M- CLD	Most important Updates M- AOT
BD (v11.60)		9 June 2026		New LUT for M-Ctype, improved M-CM night retrieval and added SWIR1 test to detect cloud over snow	
BC (v11.40)	BC (v11.40)	18 Nov 2025 (08374A)		Surface parameters have been improved	Optimization of the cloud edge setting
BA (v11.30)	BA (v11.30)	08 Jun 2025 (06307C)	18 Nov 2025 (08376B)	Fully reprocessed data set will be available for this baseline	

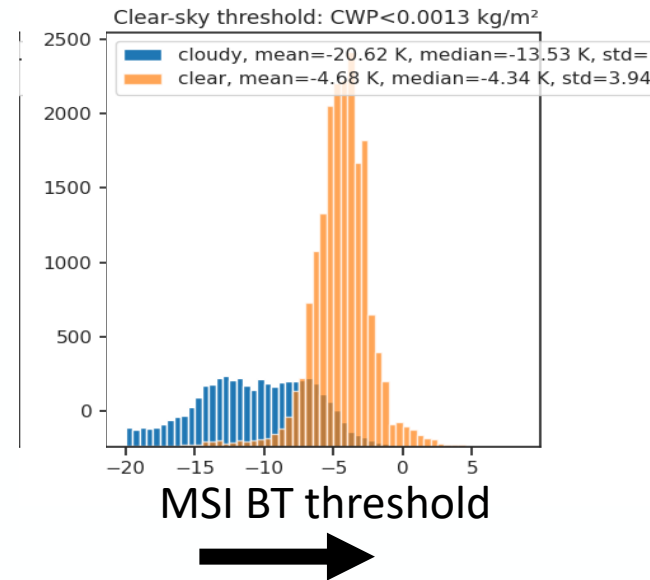
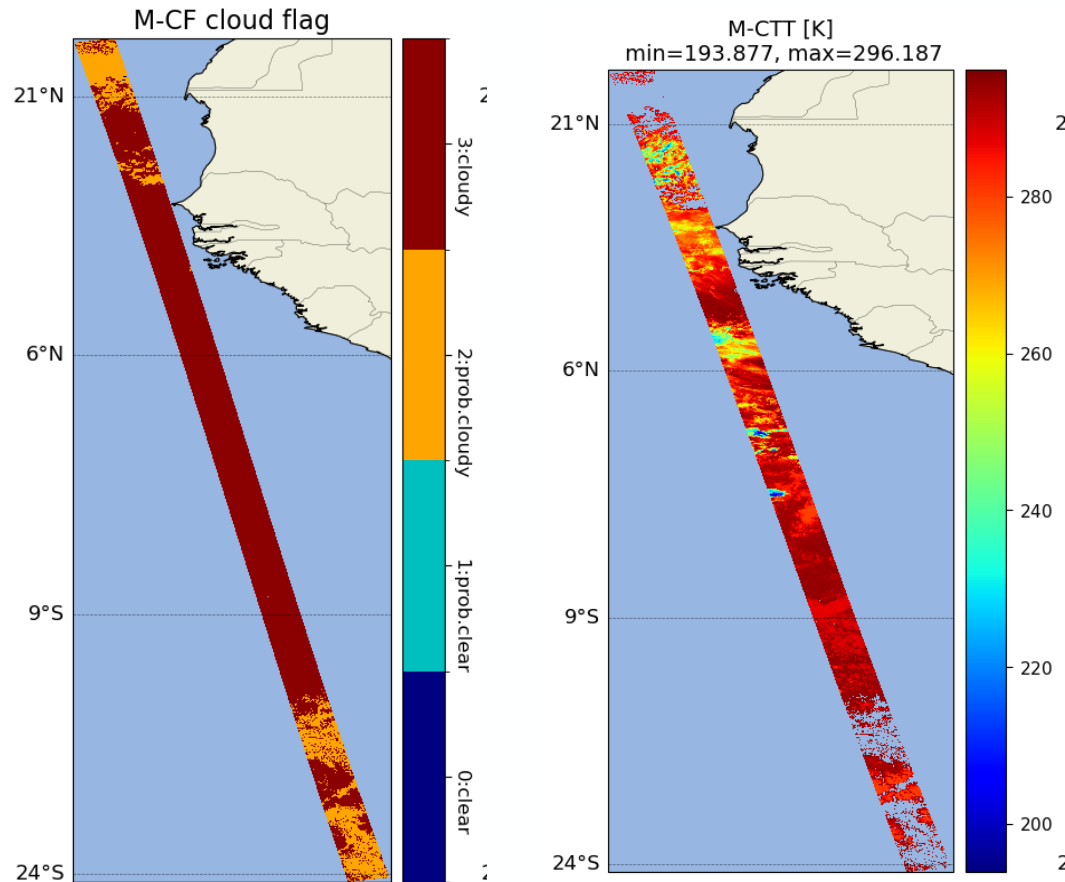
**Update BD
tomorrow**

**baseline; fully
reprocessed MSI
L2 data set**

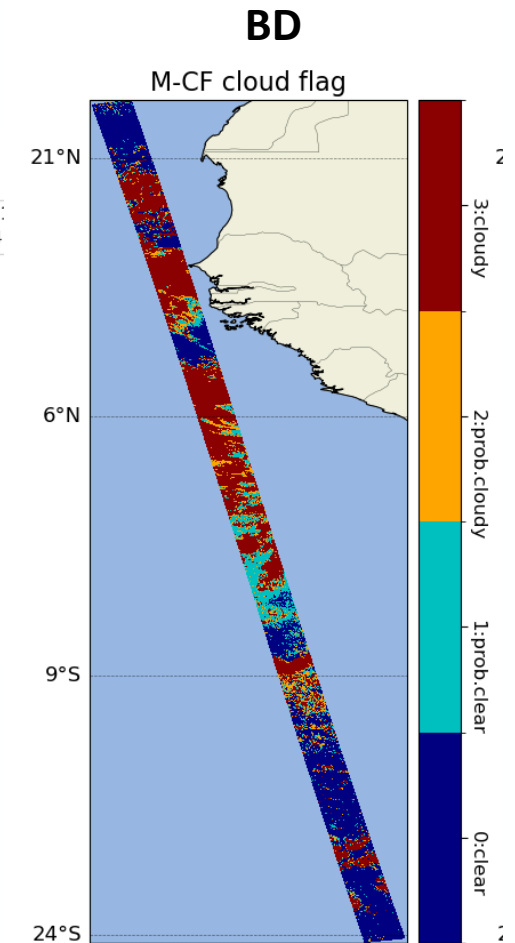
Progress towards baseline BD

M-CM thresholds started adjusted with real MSI data and compare with ACM-CAP CWP products updated **BD for the night frames**

Frame A 09432 BC



MSI BT threshold



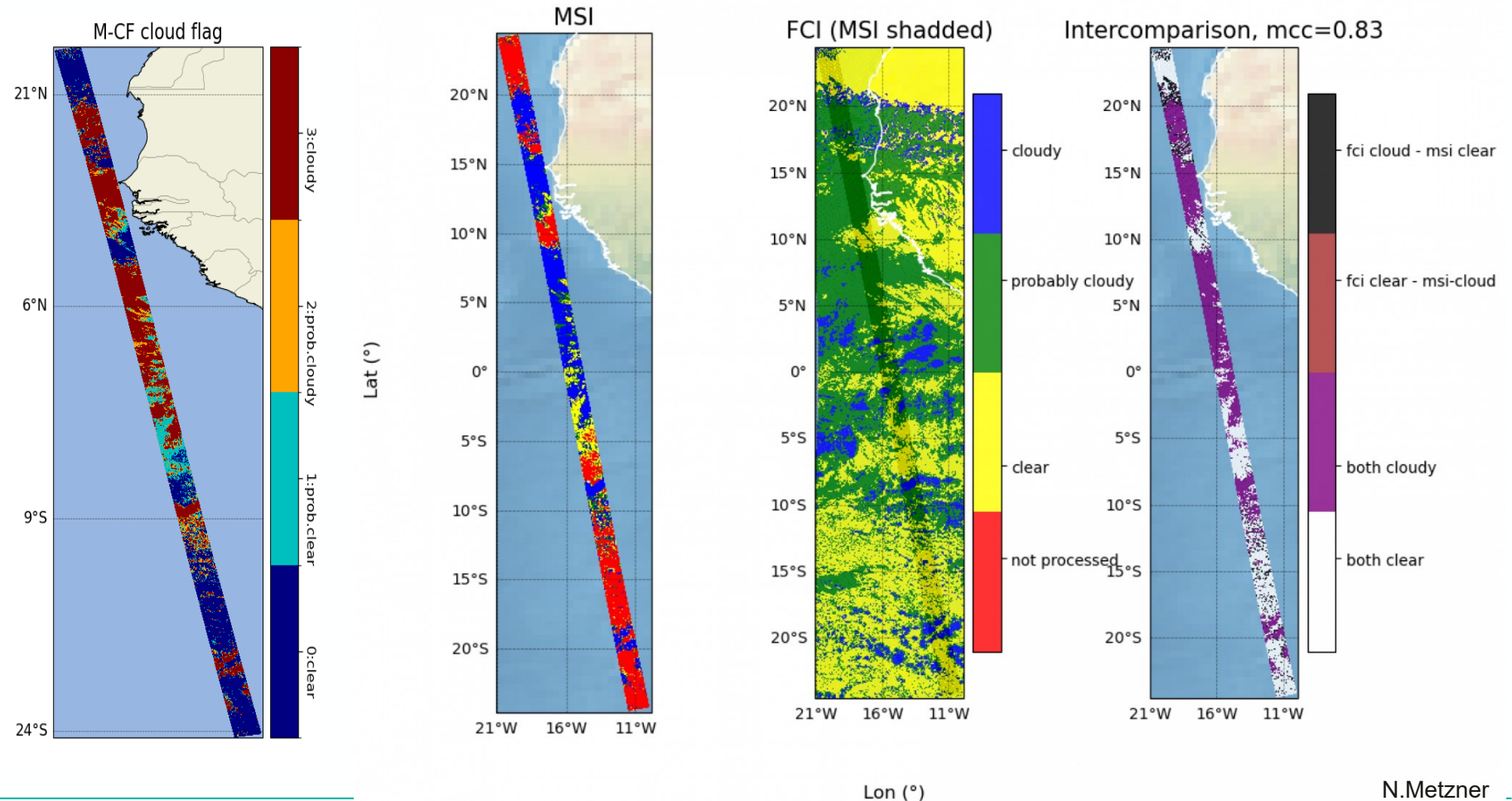
N.Metzner

Progress towards baseline BD

- M-CM thresholds started to adjust with real MSI data and compare with ACM-CAP CWP products
- updated **BD for the night frames**

Cloud mask 09432A (2026-01-25)

➤ compared with FCI
show good
agreement

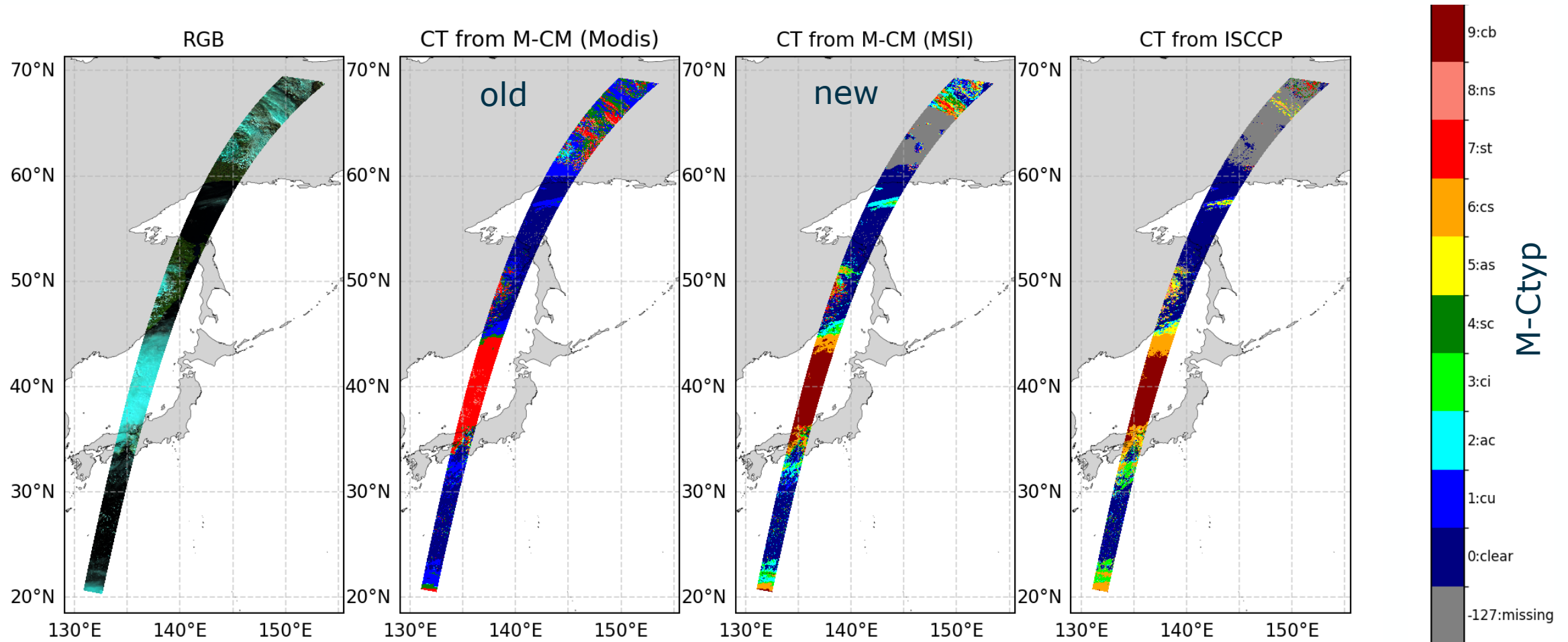


N.Metzner

Progress towards baseline BD



- M-CM thresholds started adjusted with real MSI data
- M-Ctyp the LUT are updated **BD** (based on BA) and compare with ACM-CAP (see more P014)



Thanks for your attention!

Presentation:

- “Linking Vertical Cloud Structure to MSI Reflectances”, Gregor Walter, **T315, Wednesday, 12:18**

Poster:

P004	Validation of MSI reflectance and brightness temperature (MSI_RGR) with satellite intercomparisons and ground-based measurements	Masataka Muto
P011	Futher attempts and method developments of EarthCARE MSI Cloud flag validation using whole-sky camera images	Minrui Wang
P014	An updated MSI cloud type (M-Ctype) product based on reprocessed EarthCARE observations	Annika Burzik
P046	Synergistic Observations of Tropical Cyclones from EarthCARE, Meteosat Third Generation, and Himawari across the Atlantic and Pacific Ocean	Sebastian Bley
P076	Towards Radiative Closure Using Ground-Based Observations from ACTRIS and measurements from EarthCARE's MSI and BBR	Nils Madenach