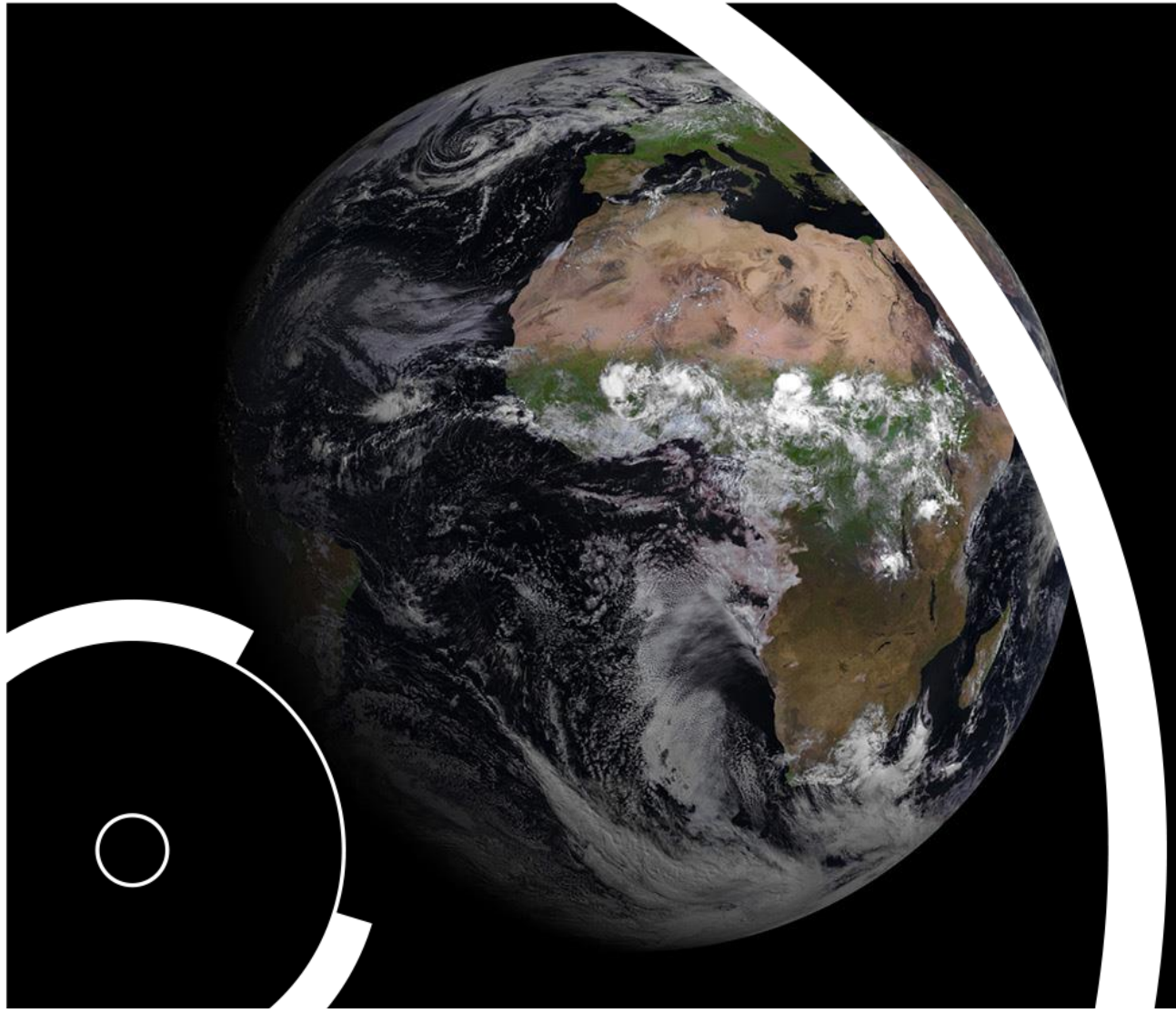
EUMETSAT



STATUS OF OPERATIONAL AND FUTURE ATMOSPHERIC WIND PRODUCTS AT EUMETSAT.

Régis Borde, Kevin Barbieux, Manuel Carranza , Thomas Flament, Olivier Hautecoeur, Youva Aoun and Sauli Joro

IWW16 8-12 May, Montréal, Canada

Agenda

Operation activities since IWW15

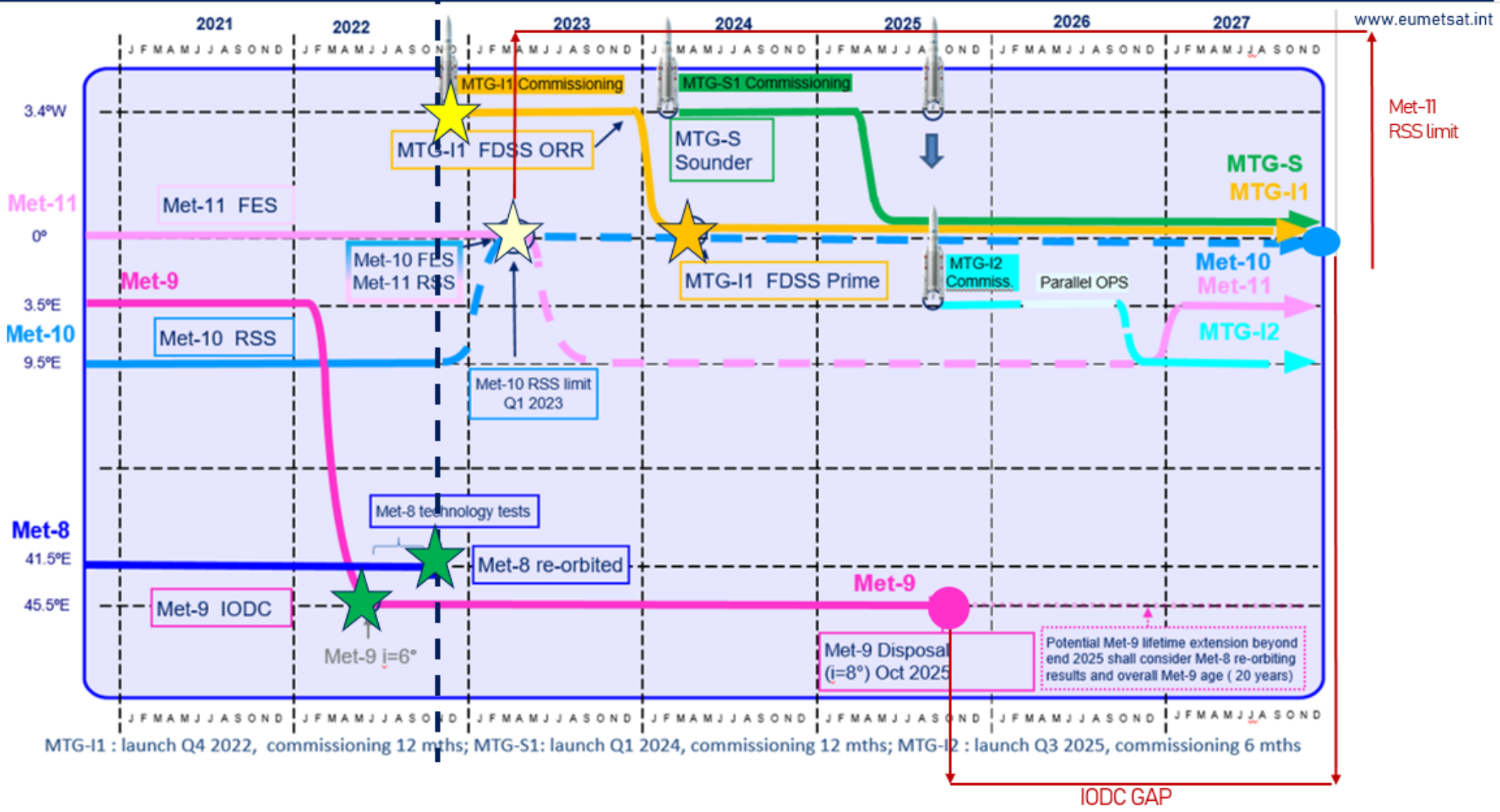
- MSG/SEVIRI
- EPS/AVHRR

New developments and future missions

- MTG/FCI
- S3/SLSTR
- EPS-SG/METImage
- EPS/3D IASI winds
- EPS-Aeolus

Operation MSG

Reference Operations Baseline [R1]



Summary of activities since IWW15

Operational activities since IWW15:

- ✓ Meteosat 9 prime over IODC and disposal of Meteosat 8 (2022)
- ✓ Swap Meteosat 10 becoming prime FES and Meteosat 11 doing RSS (Q1 2023)
- ✓ Use only Metop-B and Metop-C for dual operations (July 2021), Metop-A de-orbiting operations (From November 2021);

Future programs and new developments:

- ✓ MTG-FCI and EPS-SG METImage prototypes developed;
- ✓ S3/SLSTR AMV processor developed, implemented on WEkEO (2022);
- ✓ 3D IASI winds code developed, offline production (Q1 2023);
- ✓ Investigation of new tracking method based on feature tracking, and on improvement of the AMV quality (better HA using OCA, use of correlation surface). Ongoing activities.

Summary of upcoming activities

Operational activities:

- ✓ Commissioning MTG-FCI (2022-23)
- ✓ Implementation of S3/SLSTR AMV processor (To be discussed);
- ✓ Change EPS GS from AIX to Linux (On going up to 2024)
- ✓ 3D IASI winds code operational implementation foreseen on new EPS-GS (Q3 2024);

Future programs and new developments:

- ✓ Verification EPS-SG METImage code against reference code (PDAP activities, 2023-24);
- ✓ Preparation of 3D winds code V2 for MTG_IRS; Collaboration with P. Héas (INRIA, Rennes, France)

P. Héas, et al., 3D wind field profiles from hyperspectral sounders: revisiting optic-flow from a meteorological perspective, submitted to ArXiv, 2023. arXiv:2303.05154

- ✓ Investigation of new tracking method based on feature tracking, and on improvement of the AMV quality (better HA using OCA, use of correlation surface), comparisons AMV/Aeolus.

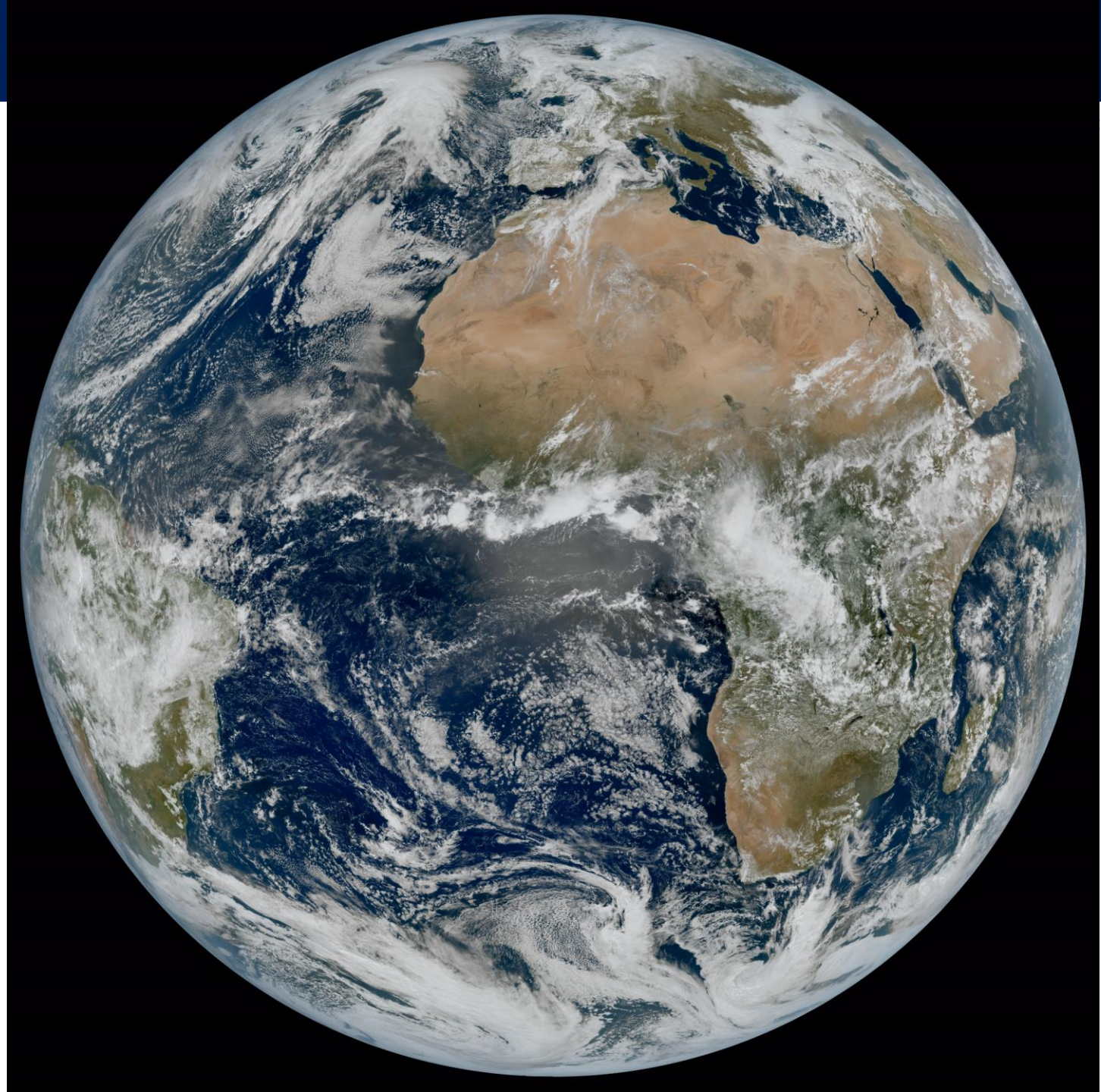
Operation MTG-FCI

MTG-I1.

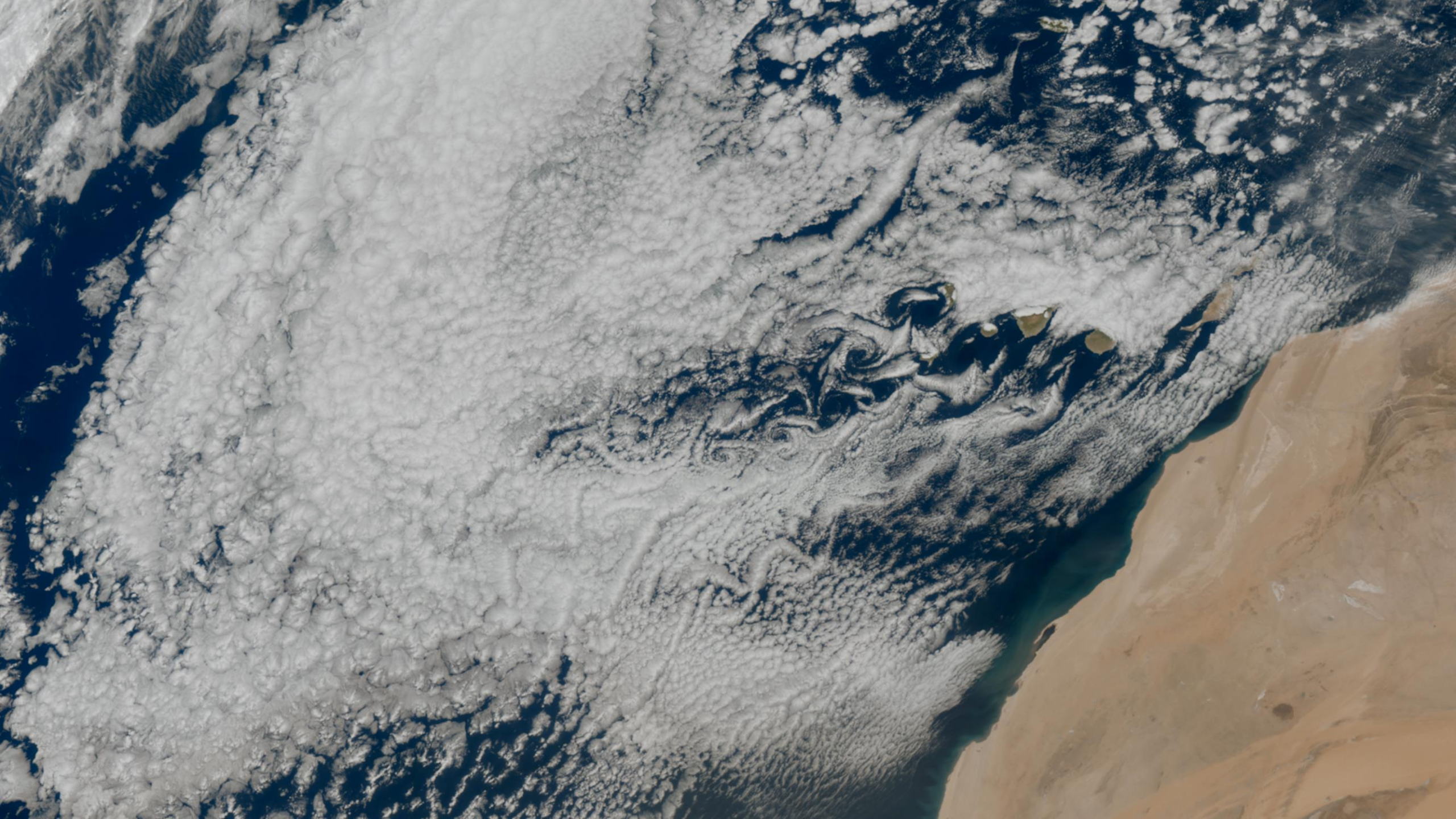
Launch 13th December 2022

First Image:

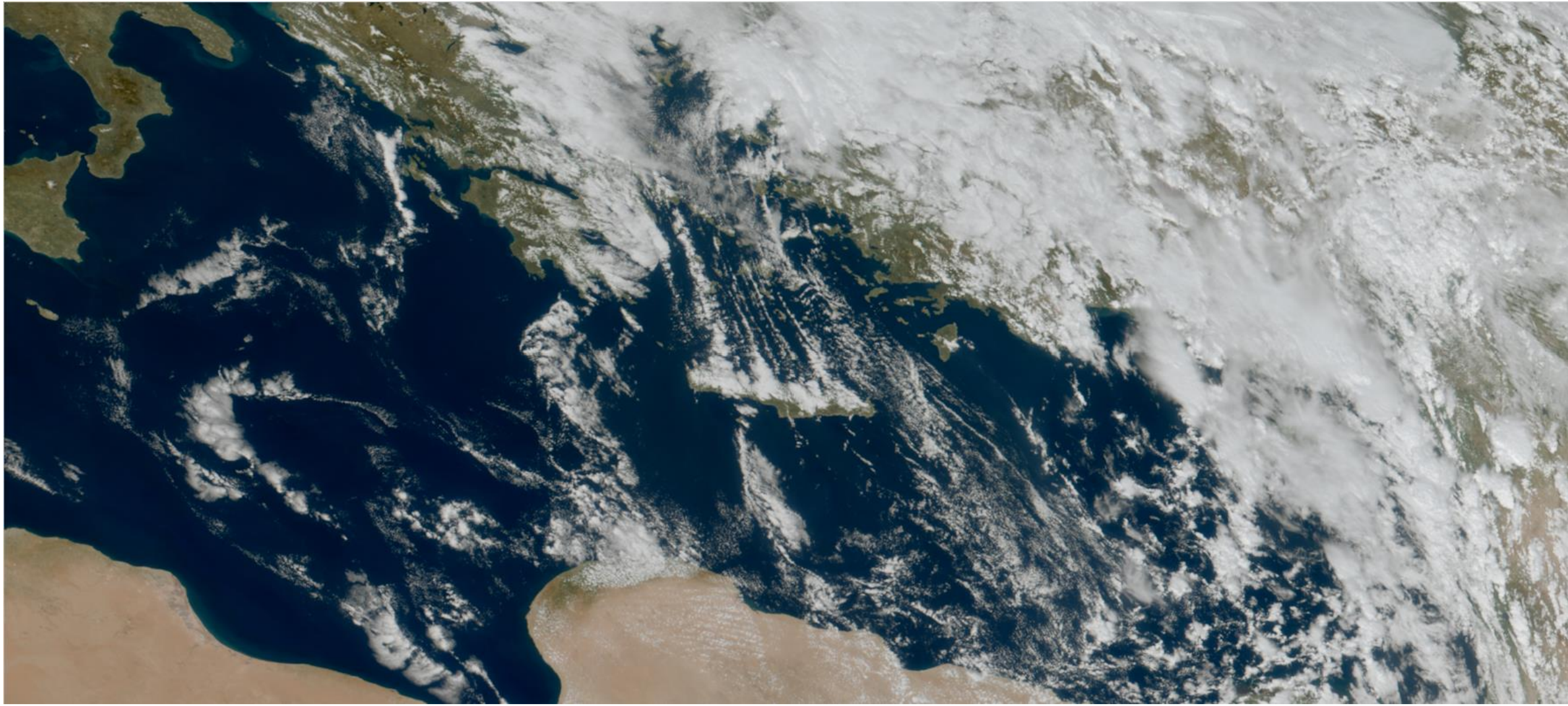
- ✓ This animation was made using one day's worth of data from MTG-I1, from 11:50 UTC 18 March to 11:50 UTC 19 March 2023. Images of the full Earth disc are produced by MTG-I1 every 10 minutes.;



FCI over Europe and RGB Products



Can you spot the differences?



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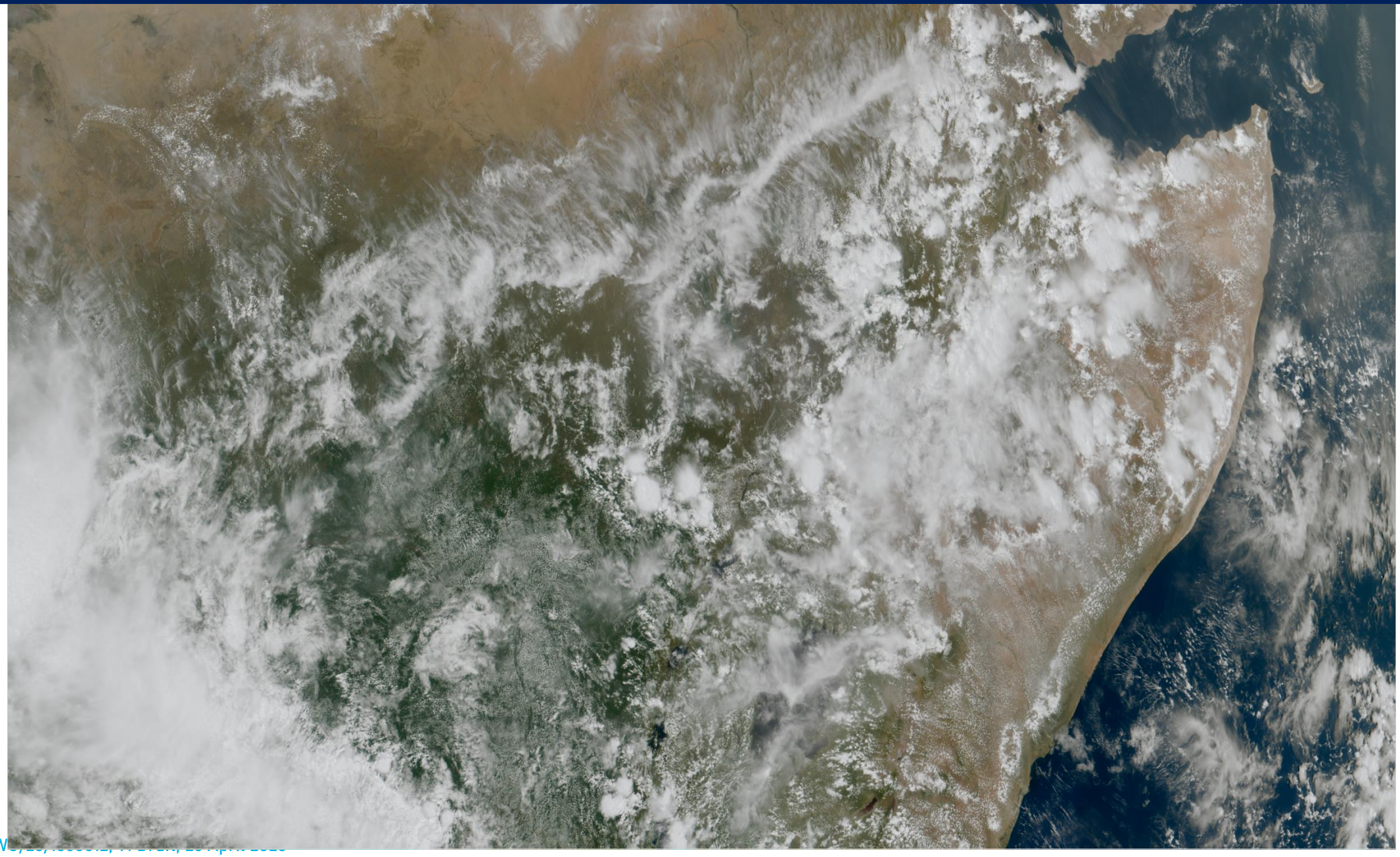

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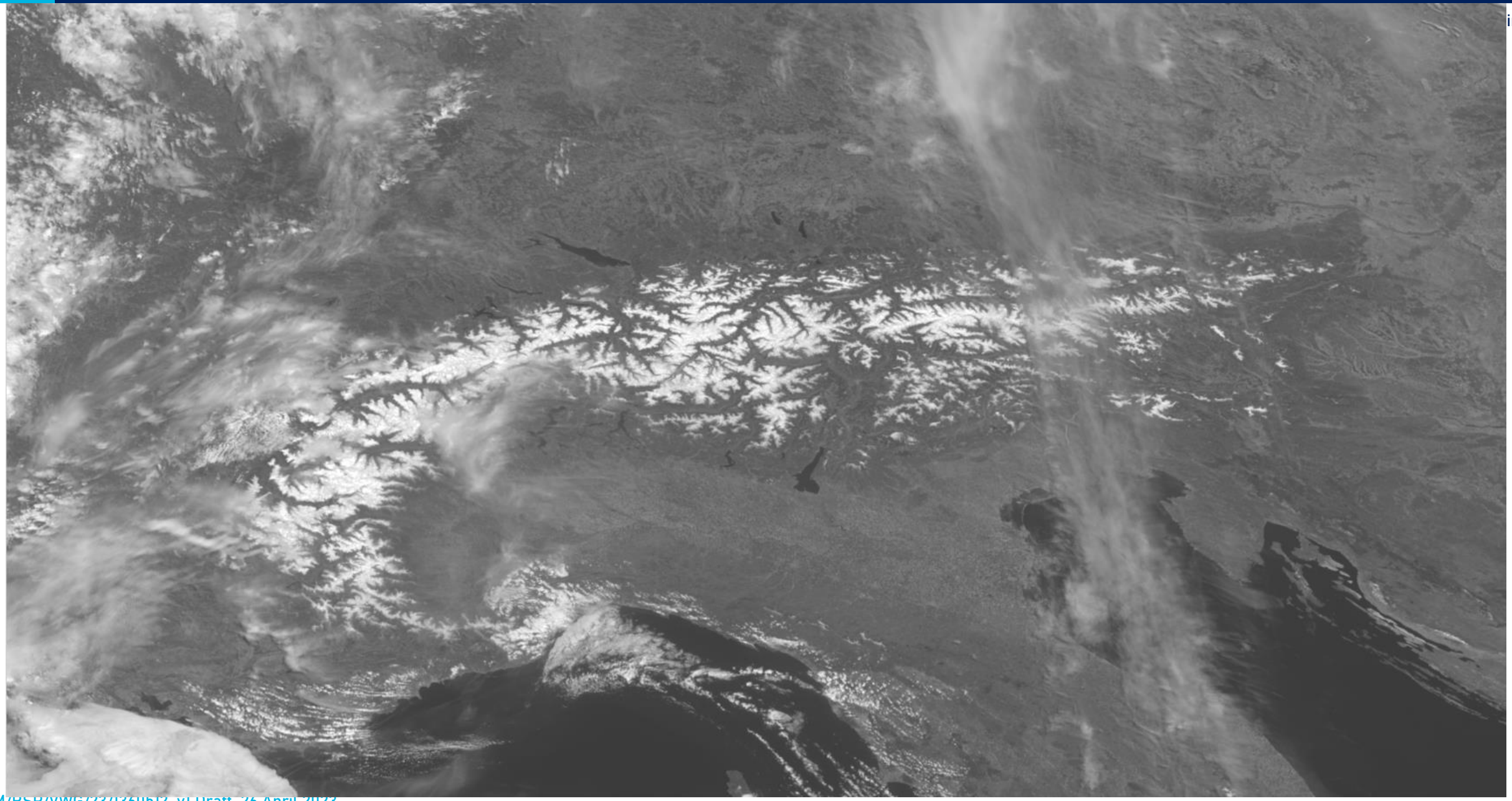


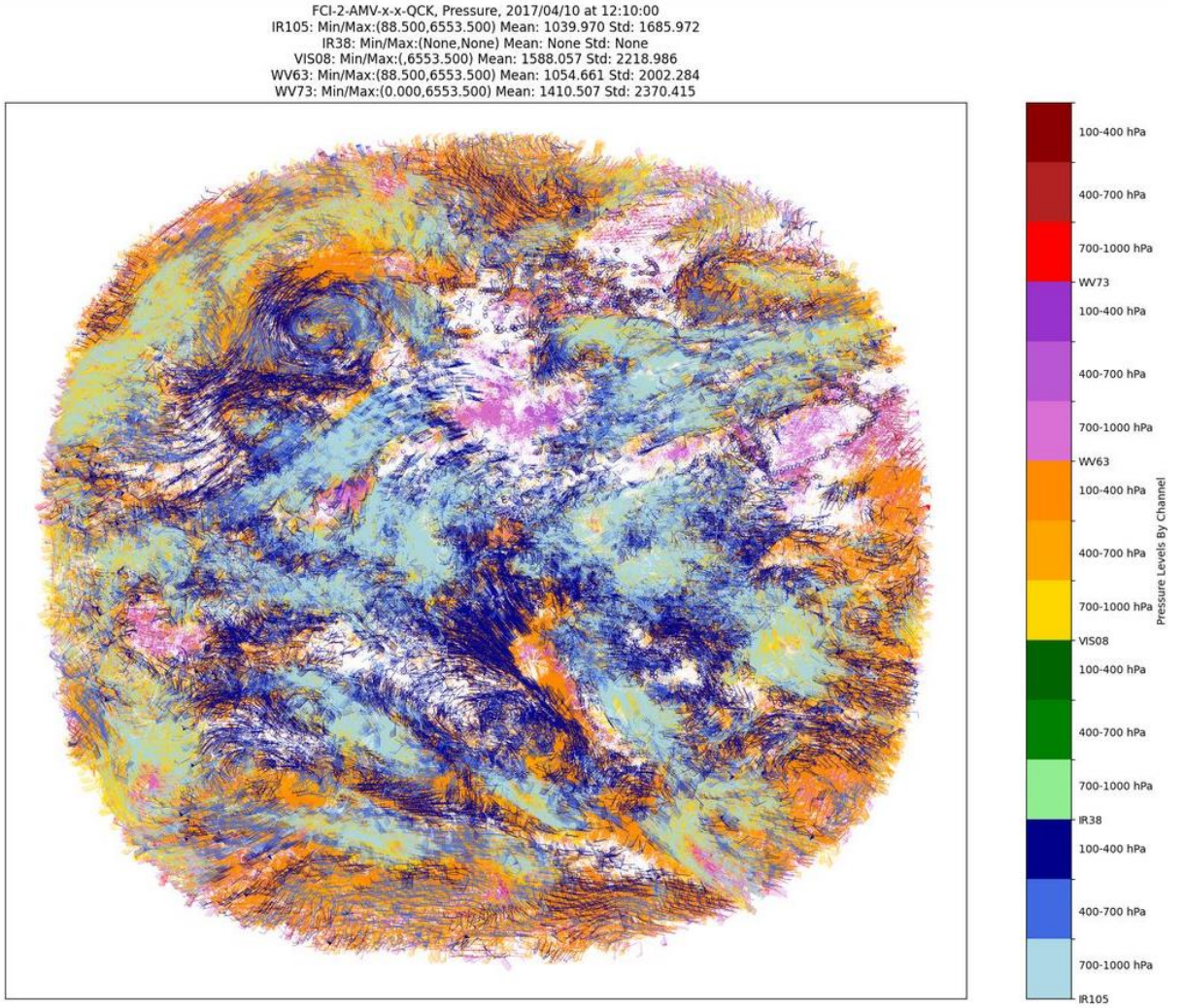
MTG-FCI AMV - Status

Difference MTG / MSG products.

- ✓ Use 3 images instead of 4 → half hourly product
- ✓ 5 channels: Vis0.8, IR3.8, WV6.3, WV 7.3 and IR10.5
- ✓ HA based on CTTH product
- ✓ Same BUFR sequence as MSG

L2PF activities:

- ✓ Factory Acceptance Review Q1 2022 successful
- ✓ AMV integration in L2PF at EUMETSAT demonstrated Q4 2022
- ✓ Two outstanding main issues:
  - Completion of low-level height assignment correction – demonstrated at factory Q1 2023, to be integrated at EUM Q2 2023
  - Use of target optimisation in target selection – demonstrated at factory Q2 2023, to be integrated at EUM Q3 2023
- ✓ Start of commissioning of AMV product foreseen Q3 2023
- ✓ Start of regular operational dissemination of AMV products – foreseen for sometime in 2024 (currently scheduled Q1 2024)



Courtesy G. Dew, GTD and TSN, image extracted from L2PF system test.

Sentinel-3 AMV - Status

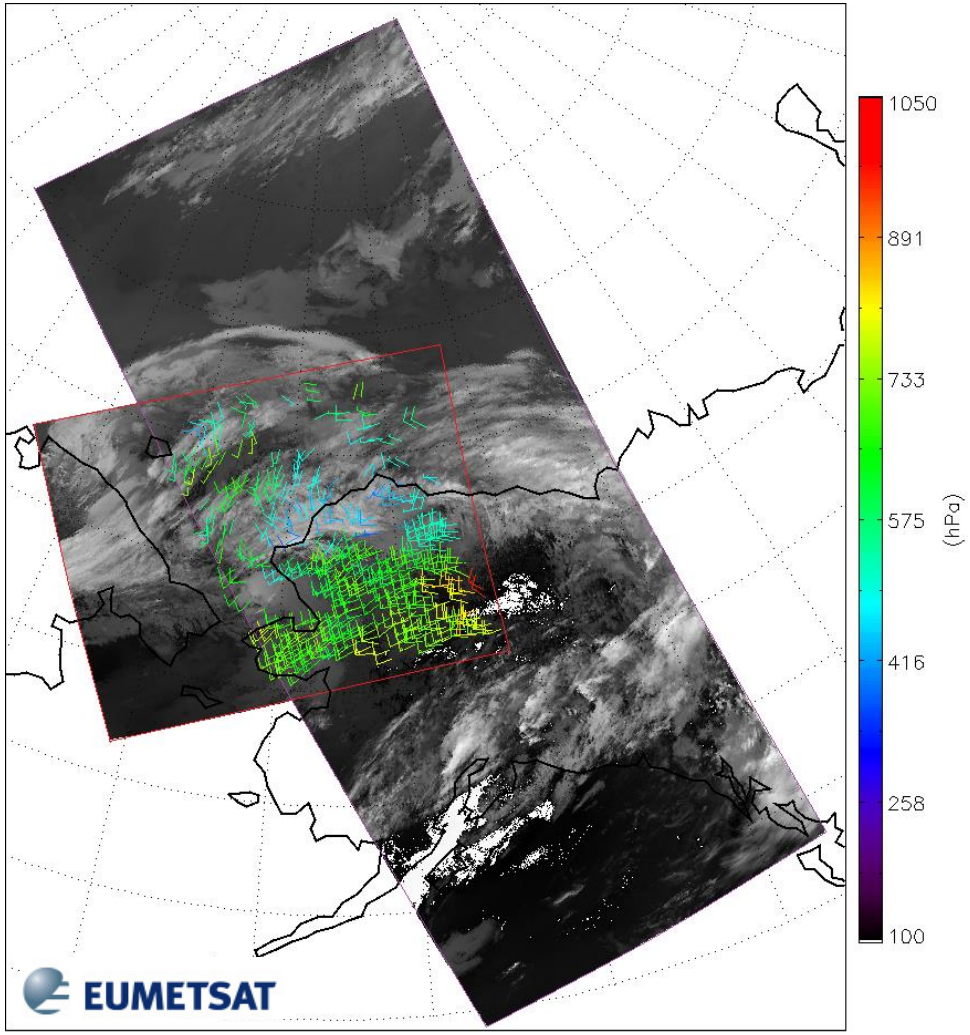
➢ Processor is finished and documentation is up-to-date (ATBD and Validation report).

Barbieux, K., O. Hautecoeur, M. De Bartolomei, M. Carranza, and R. Borde, 2021, *The Sentinel-3 SLSTR Atmospheric Motion Vectors Product at EUMETSAT*, Remote Sens. 2021, 13, 1702. https://doi.org/10.3390/rs13091702

➢ Processor Implemented on WEkEO and demonstration dataset made available.

- ✓ Feedback received from ECMW and DWD;
- ✓ The feedback shows very strong similarities between the SLSTR AMV products and the AVHRR AMV products;
- ✓ The impact study from ECMWF suggests a mostly neutral impact of SLSTR AMVs when including AVHRR AMVs;
- ✓ Operational implementation foreseen to populate the high latitudes with wind measurement during the **transition phase between EPS and EPS-SG**, during which dual-Metop **AVHRR winds will not be available**

AMV extracted from SLSTR images taken over Northern Alaska on 14/08/2019 at 08:00:43 UTC (S3B - red contour) and from 06:56:15 to 07:05:15 UTC (S3A - purple contour). K. Barbieux and R. Borde (EUM)



EPS-SG METImage AMV – Status

- Same framework as Sentinel 3 / SLSTR AMVs.

Prototype code is developed. It includes AMV extraction from 5 channels: Vis0.8, IR3.7, WV6.73, WV 7.3 and IR10.7

- Dataset V2 distributed in December 2021:
  - ✓ Feedback on dataset V1 received from CIMSS (D. Santek);
  - ✓ Comparison with MODIS winds shows good agreement;
- Future Work:
  - ✓ Verification against reference code (PDAP activities, 2023-24);
  - ✓ Scientific validation of the products;
  - ✓ Investigate dual AVHRR-METImage AMV product.

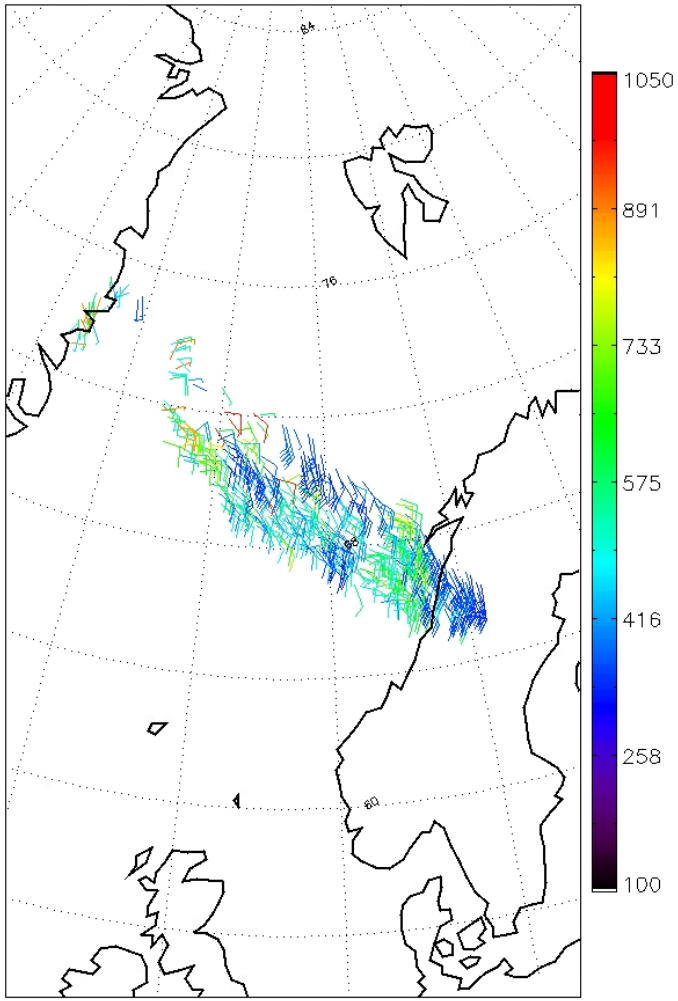
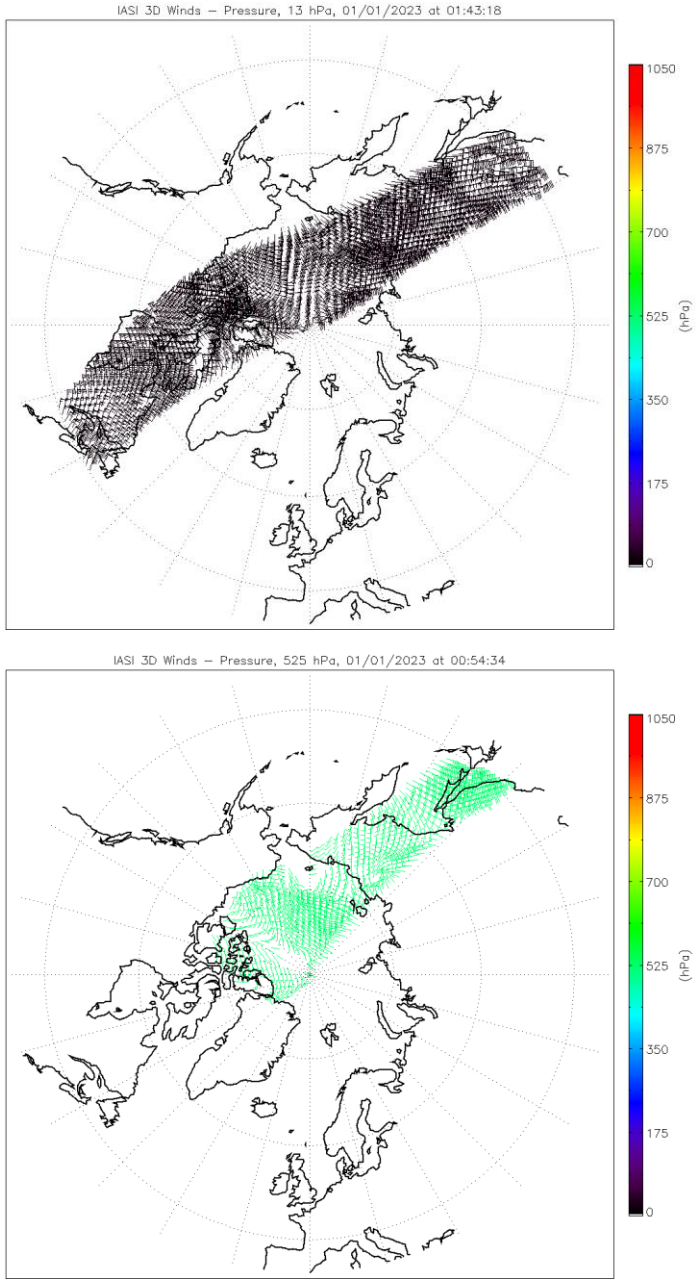


Figure: AMVs derived from simulated METImage band 37 (10.69 µm) images, West of Norway. Altitudes in hPa.

IASI 3D winds – Status

- **Operational implementation is ongoing:**
  - ✓ Processor is finished; Off line production started in Q1 2022 (4 months available);
  - ✓ The target for operational implementation on EPS GS is 2023;

  See Manuel Carranza's presentation in Session 5
- **Future work:**
  - ✓ Scientific validation, Q2-Q4 2023 (Radiosondes, AMVs, Aeolus, Aircraft)
  - ✓ Preparation for MTG-IRS and EPS-SG-IASI-NG.
- **Product description:**
  - ✓ Based on IASI Level 2 products: All-sky water vapour, ozone and temperature profiles;
  - ✓ Dual satellite operations (Metop-B and Metop-C); 29 products per day (NH and SH);
  - ✓ High-latitude regions (polewards of 45°);
  - ✓ Troposphere and low stratosphere; 25 layers (from 10 to 1000 hPa);
  - ✓ Specific BUFR template designed.



Top: Animation of all pressure levels for EUMESTAT IASI 3D winds over the North pole on 01/01/2023 at 01:43:18
Bottom: Animation of all EUMETSAT IASI 3D winds at 525 hPa over the North pole on 01/01/2023

EPS-Aeolus– Status

Status of DWL activities at EUMETSAT :

- ✓ The EPS-Aeolus preparatory programme has been approved by EUMETSAT council in December 2022. Approval of the full programme is expected for 2025;
- ✓ 2 satellites (lifetime 5.5 years nominal) → min. 10 years mission duration;
- ✓ Actual launch date of the first satellite foreseen in 2031
- ✓ Ramp-up of the EPS-Aeolus team finished end of March 2023;
- ✓ "Elements of Programme Proposal" were sent to Member States, before full programme proposal in 2024
- ✓ Further refinement of EURD;
- ✓ Scientific studies on going and/or in preparation

See Thomas Flament presentation in Session 5

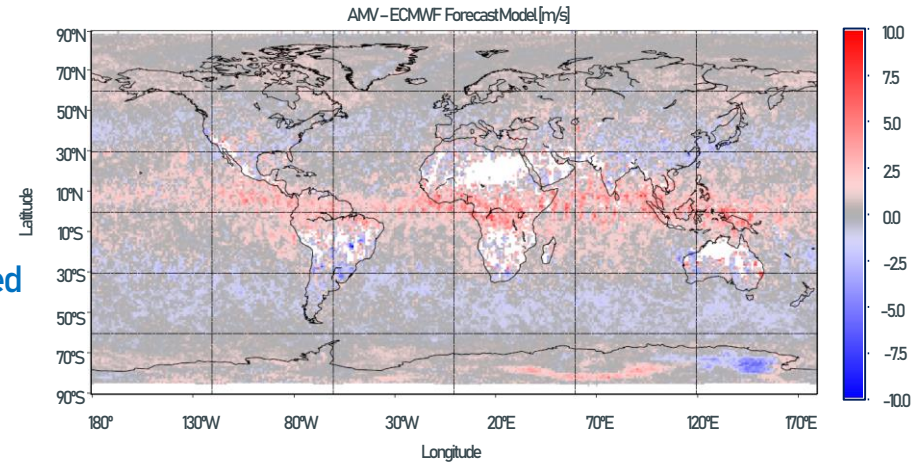
New developments

Investigation of AMV speed bias over Tropics:

- ✓ Long standing problem;
- ✓ Explanation found in relation to use of wind guess and robustness of correlation process in LEO context.

Barbieux, K., Borde, R. The reason behind the tropical and extratropical atmospheric motion vectors speed biases from EUMETSAT's low Earth orbit satellites. Soon to be published in *Remote Sensing Letters*.

See Kevin Barbieux's poster in Session 2



Biases of S3A SLSTR AMVs against the ECMWF forecast model for the period 22 April 2021 to 21 May 2021. Only AMVs faster than 2.5 m/s and whose QIs are greater than 60 are used. Cells in which fewer than 5 fitting AMVs were derived are left blank.

Investigation of new feature tracking method:

- ✓ No need to use wind guess even in LEO framework;
- ✓ Results very promising.

See Kevin Barbieux's presentation in Session 2

Investigation of the use of OCA product for HA:

See Alessio Bozzo's presentation in Session 2

See Francis Warrick's presentation in Session 3

AMV reprocessing activities

- Important part of AMV activities at EUMETSAT
  - ✓ Production of CDRs for MFG/MSG and AVHRR winds
  - ✓ Important for climatology studies and reanalysis

See Marie Doutriaux-Boucher's presentation in Session 6

Thank you!

Questions are welcome.