EUMETSAT

Overview of the EUMETSAT operated missions and their applications

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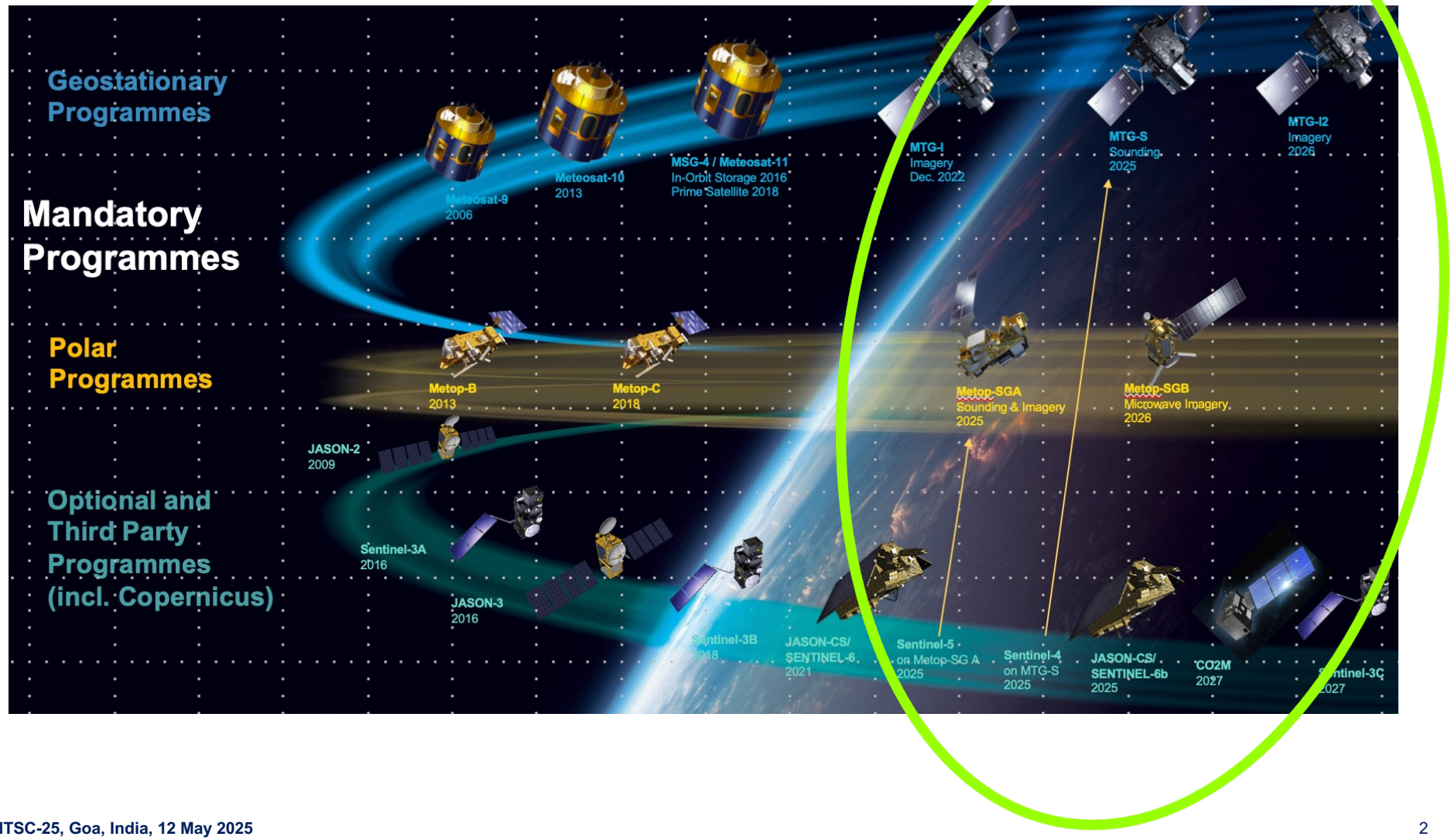
EUMETSAT

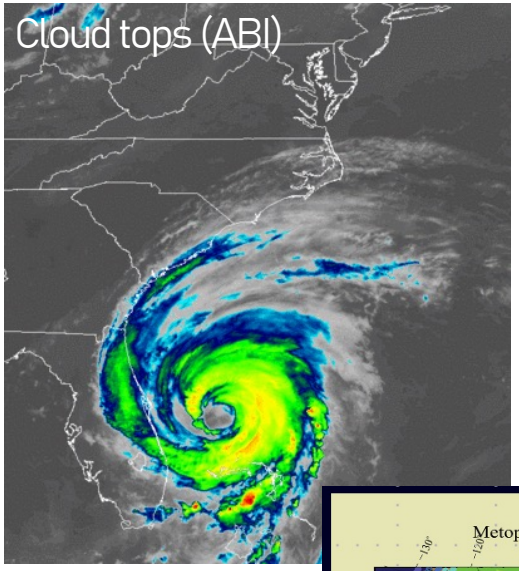
ITSC-25, 12 May 2025

EUMETSAT missions – current and future

www.eumetsat.int

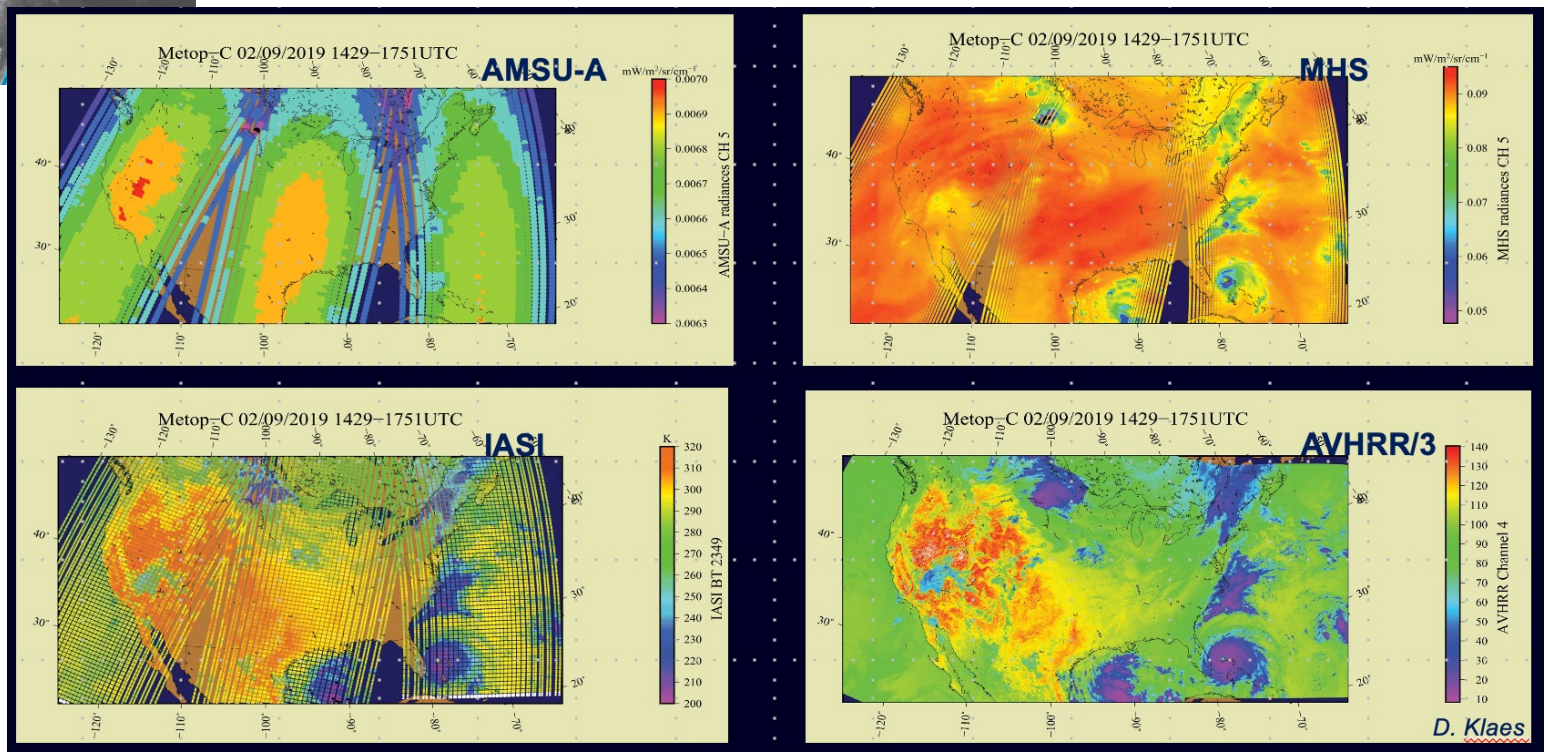


EUMETSAT's primary role remains support to NWP



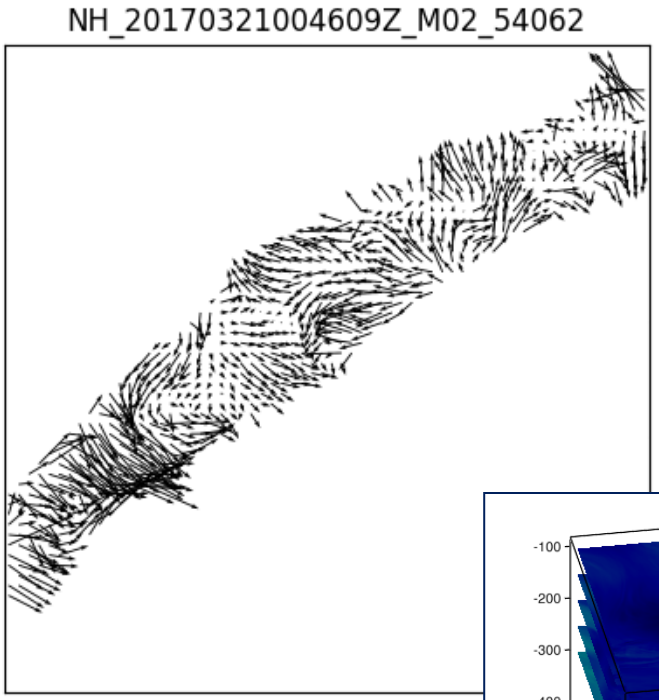
Hurricane Dorian
(September 2019)

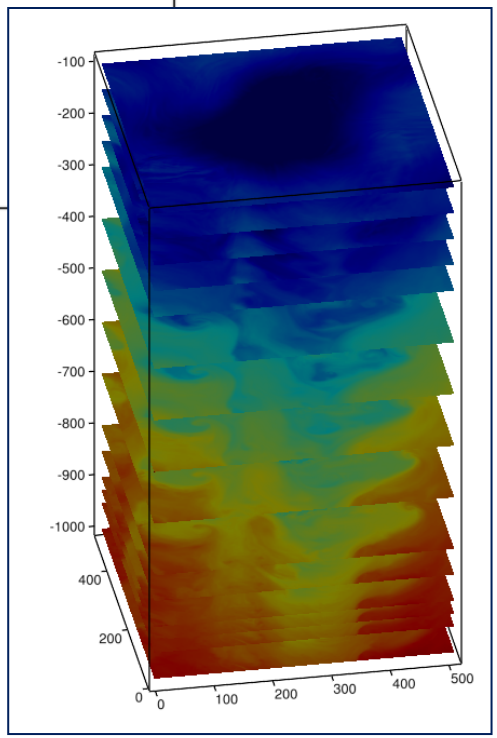
Metop-C: 2 September 2019



3D Winds from IASI

- Based on the operational IASI Level 2 products: All-sky water vapour, ozone and temperature profiles
- Dual satellite operations; 29 products per day and per area (NH and SH)
- High-latitude regions (polewards of 45°)
- Troposphere and low stratosphere; 19 layers (from 10 to 1000 hPa)
- 3D wind swath: ~1200km
- Spatial binning strategy implemented to reduce number of profiles, reduce the variance and limit problem of spatial correlation (Super-pixels ~100x100km2)
- Specific BUFR template designed



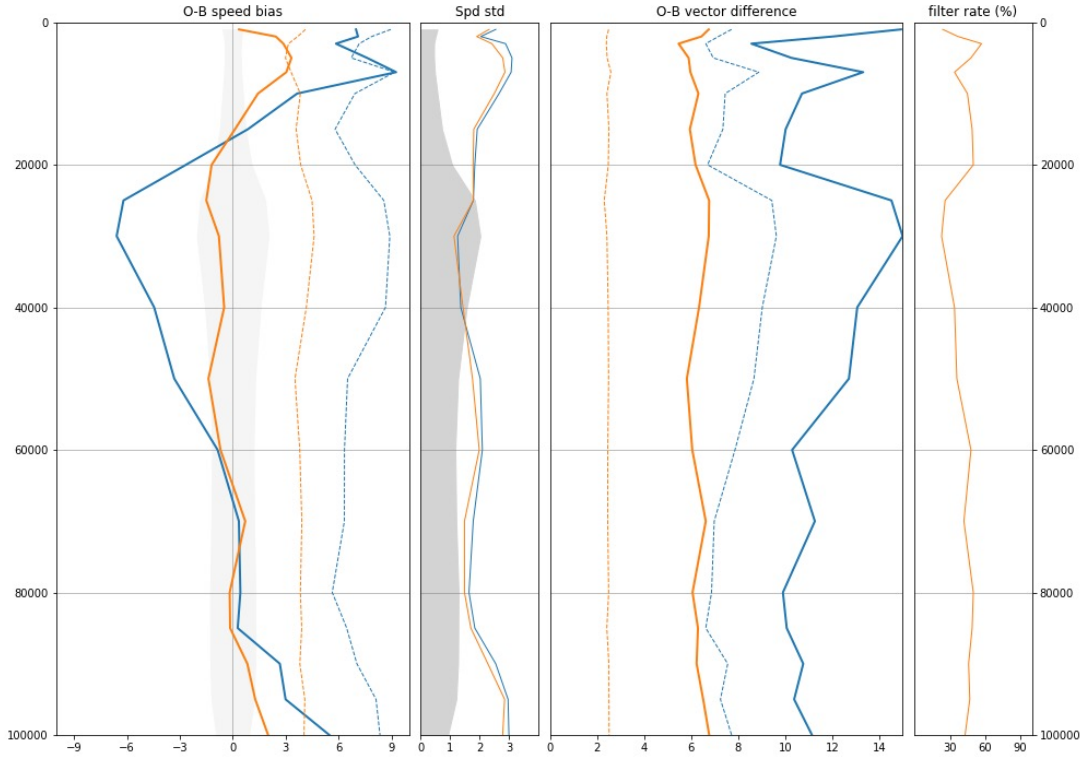


Joint inversion of all vertical levels

IASI 3D Wind Product (v1) - Potential for NWP application

- **O-B speed biases (solid line) and RMS (dashed line) profiles of IASI 3D winds against ECMWF forecast:**
  - **All the wind vectors (T, W, O_3)**
  - **Filtered on the vector difference against forecast wind (vd < 10 m/s)**
  - **Shaded zone shows the ECMWF variability inside the binning area**

- **After cut-off at 10 m/s for O-B:**
  - **Bias is close to zero and RMS < 4 m/s**
  - **Speed STD within the box comparable to ECMWF model field variability**
  - **40% of the wind vectors left**
  - **Statistics consistent on the vertical ranges, however a bit larger at low (P>850 hPa) and very high levels (P<150 hPa).**



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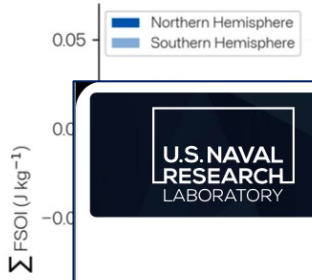
Impact on Forecast - FSOI

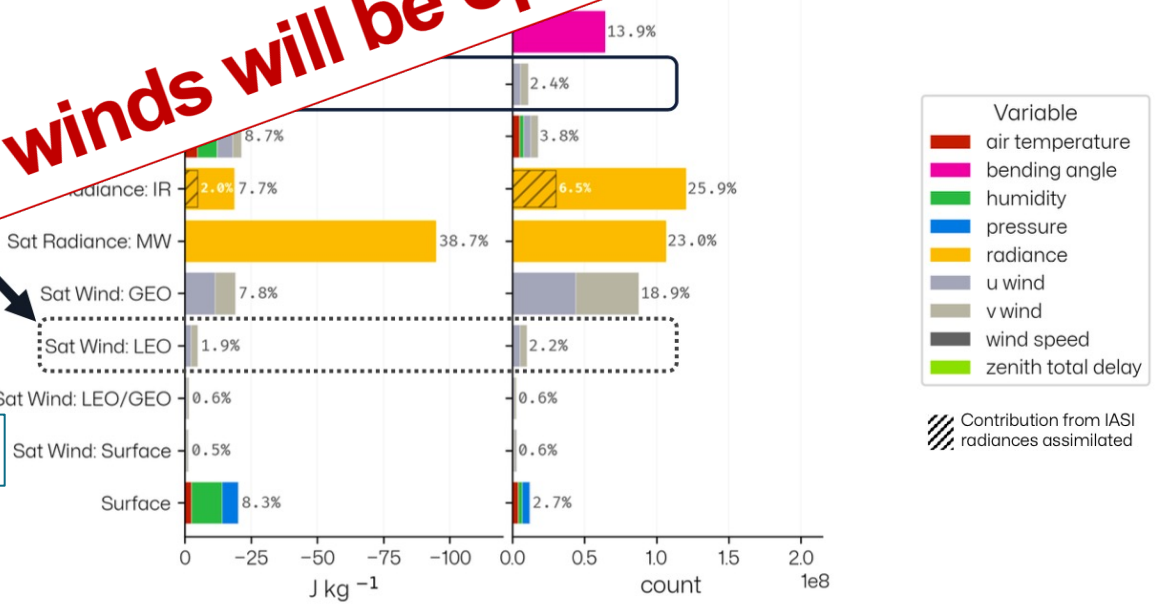
FSOI shows IASI winds are beneficial to the forecast most model cycles

Impact on 24-hr forecast



U.S. NAVAL RESEARCH LABORATORY

Impact on



CrIS 3D winds to be demonstrational at EUM in Q4'25

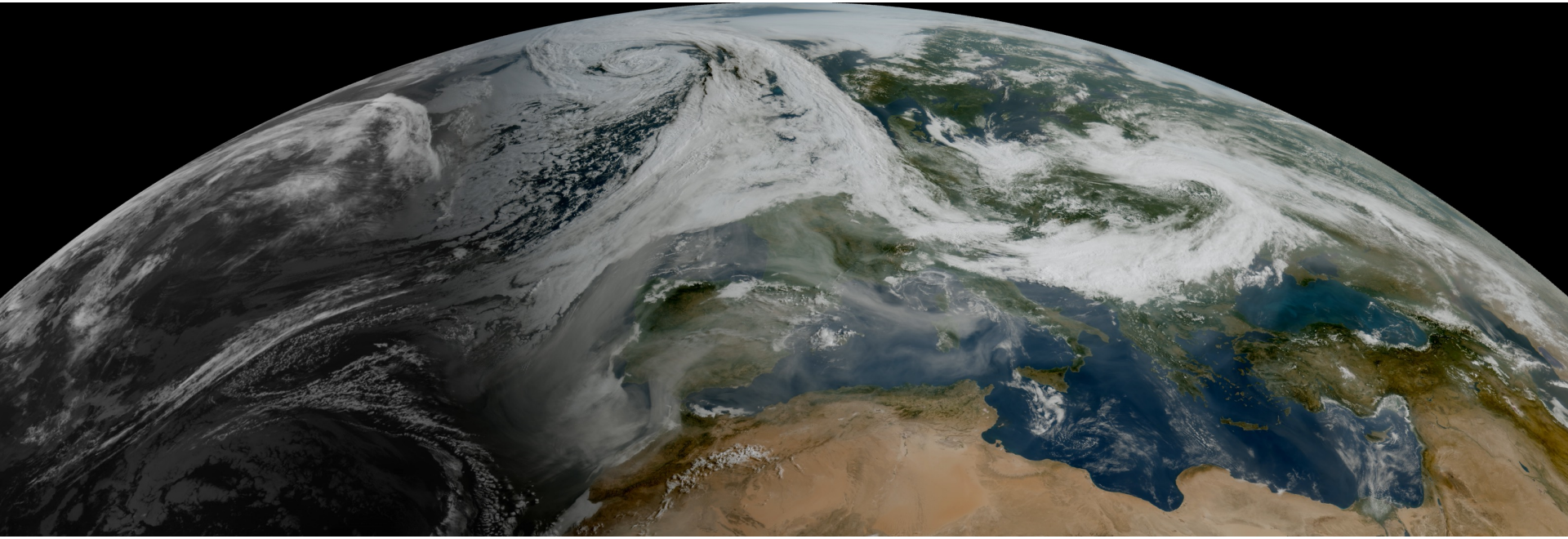
MTG/IRS 3D winds will be operational in 2026

Courtesy: Blaylock, et al., AMS 2024

Shown is the total FSOI in the April experiment.
February was similar.

8

but Earth system observations are of increasing importance

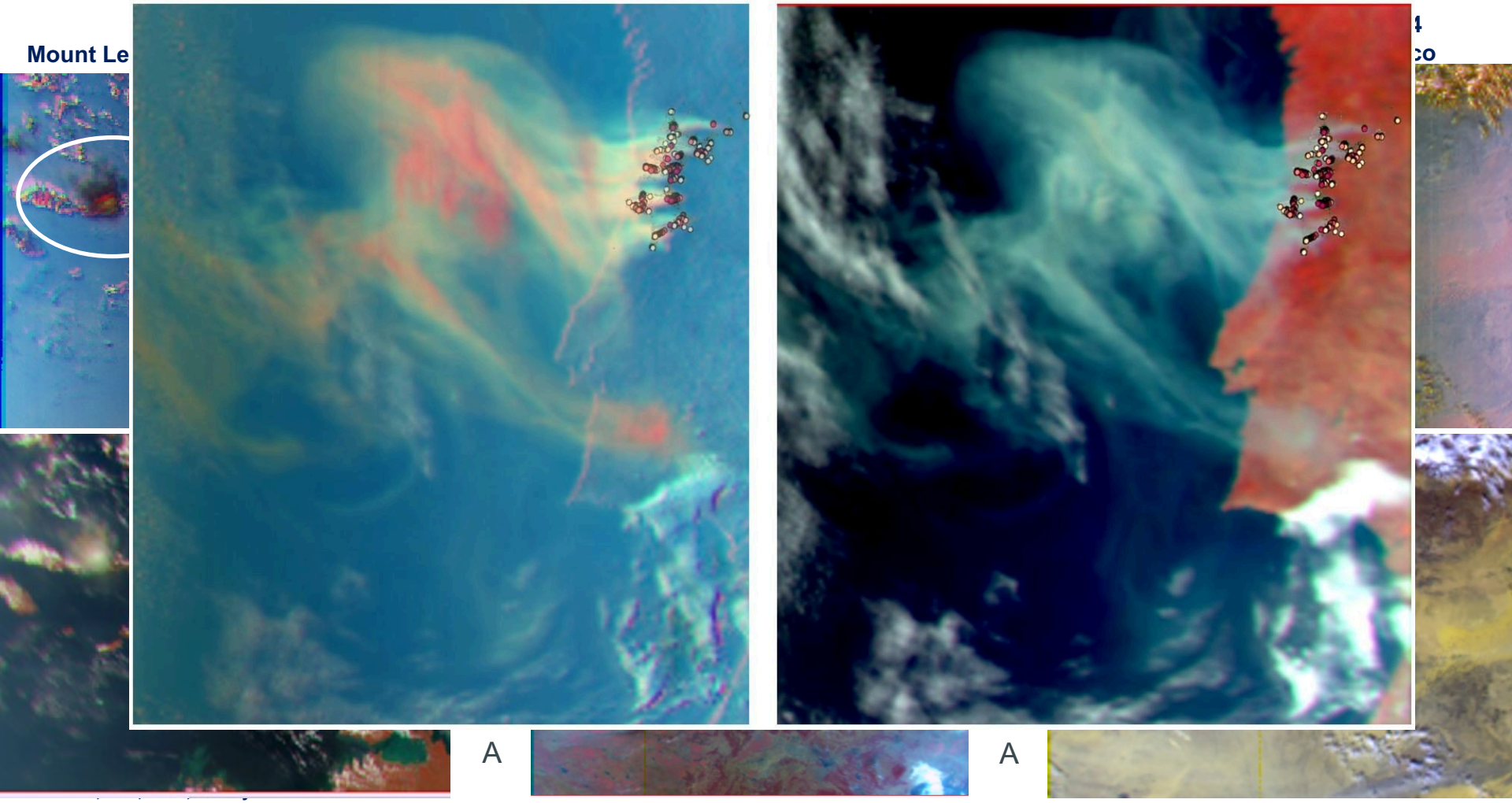


24 hours of MTG/FCI: Canadian wildfires reaching the Iberian peninsula (June 2023), 10 min steps

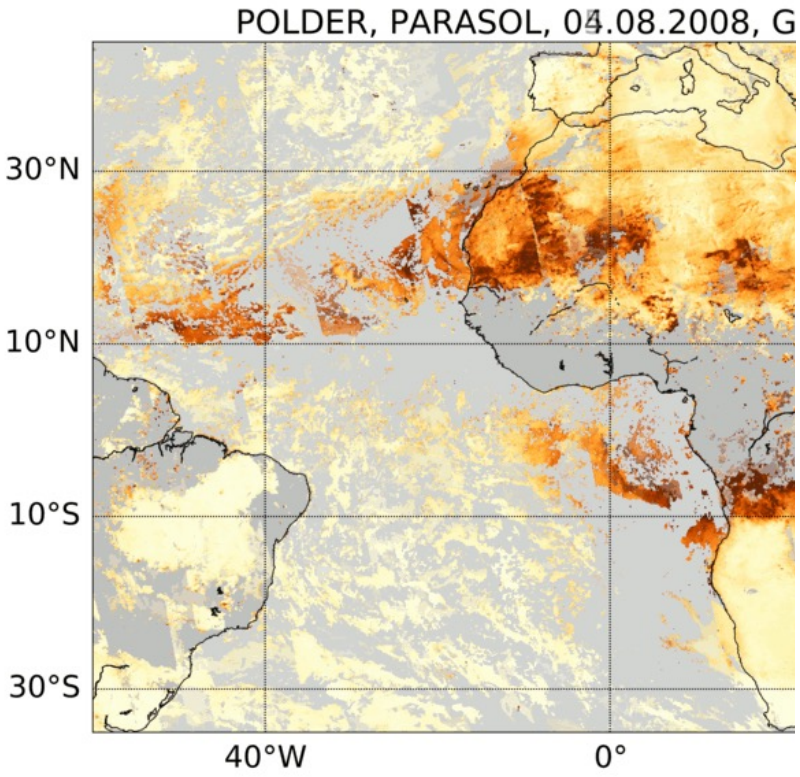
EPS-SG/3MI preparations: *Combining spectral, directional and polarisation*

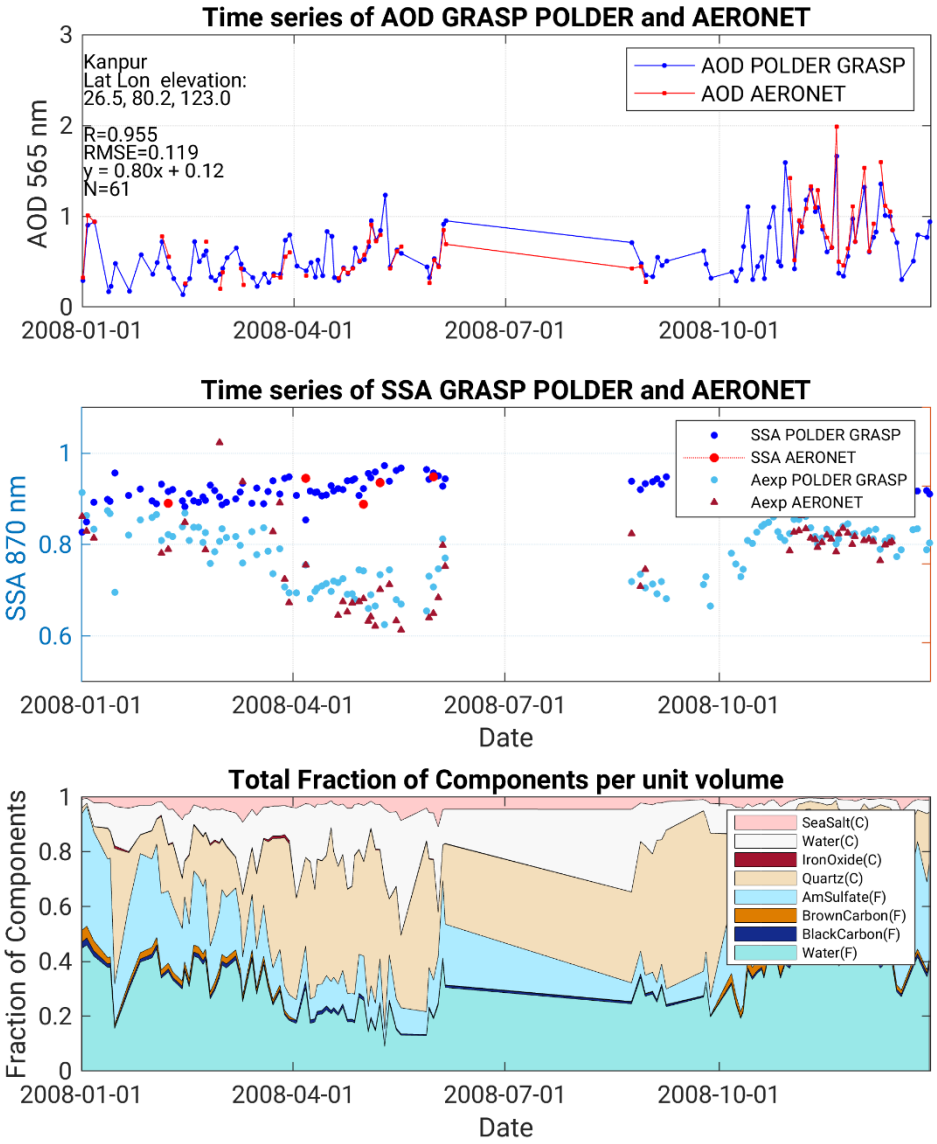
All aerosol types can be captured (from HARP on NASA/PACE)

- high ability to observe fine particles (asset of polarimetry)
- but also desert dust, volcanic ash, pollution… combined with spectral and directional



Ongoing processing of the glo



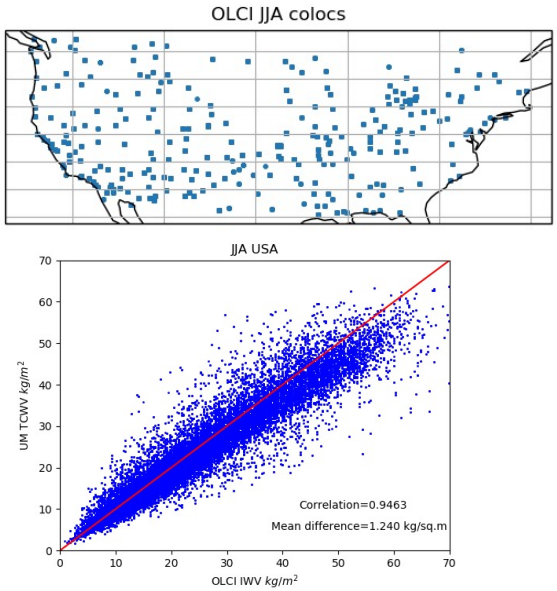


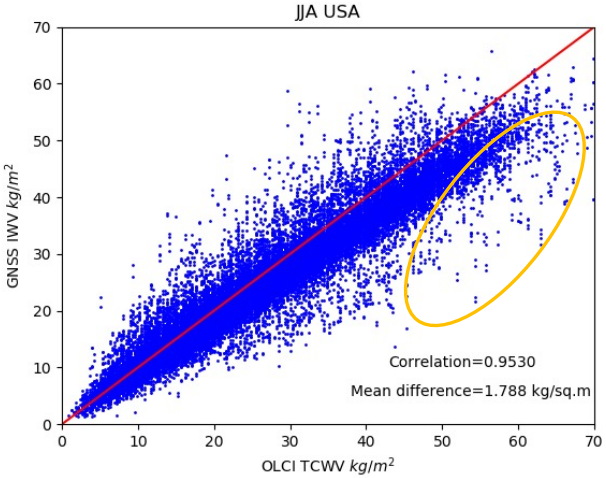
Studies highlight: COWa – water vapour from S3/OLCI

- COWa: development of TCWV retrievals using Sentinel-3/OLCI NIR channels
- For future evolution of the EPS-SG METimage product
- Used in NWP assimilation at the MetOffice since Spring 2021 – improvements in the tropics hydro/dynamical cycle

Met Office

Triple colocations stats USA





OLCI TCWV values show a moist bias for high total column amounts

https://www.eumetsat.int/COWa

Programme proposal: EPS-Sterna

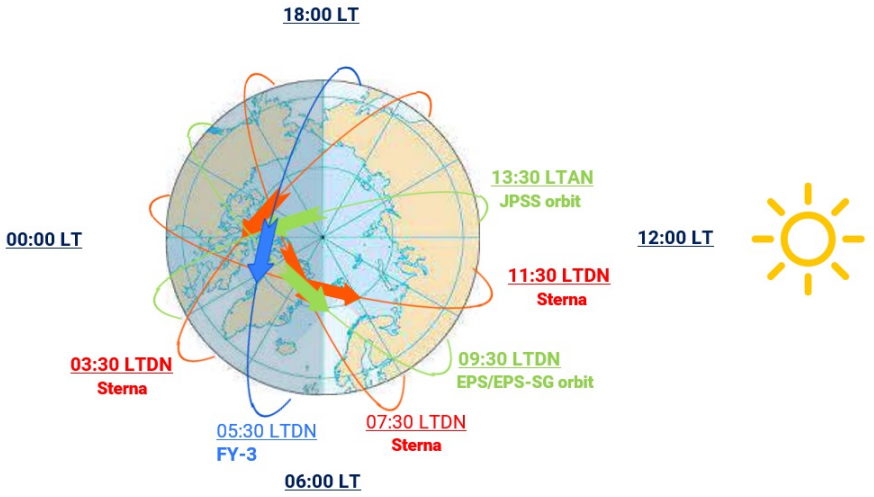
- EUMETSAT Polar System Sterna will constitute EUMETSAT contribution to the realisation of the WIGOS Vision 2040
- EPS-Sterna, “identical” to ESA’s AWS to launch shortly, will complement the observations from the EUMETSAT Polar System (EPS-SG)/Microwave Sounder (MWS) mission, from the NOAA JPSS and QuickSounder programmes as well as from the CMA FY satellites.

- EPS-Sterna passive microwave instruments will enable the retrieval of atmospheric temperature, humidity profiles and cloud information with frequent revisit time.
- It will be a global mission expected to improve significantly the accuracy of both global and regional NWP models.
- It will contribute to Nowcasting applications at high latitudes through an increase in the frequency of microwave observations.
- It will contribute to climate monitoring by adding to the existing record data with increased spatiotemporal sampling.

Programme proposal: EPS-Sterna (ii)

Constellation architecture:

- 3 Sun Synchronous orbits at 595 km altitude Inclination: 97°-98°; LTDN 03:30, 07:30, 11:30 – complementary to EPS-SG and JPSS orbits
- Repeat cycle per individual satellite: 9 days
- Number of satellites of initial full constellation: 6
- 2 Satellites per each orbital plane phased at 180°
- A total of 20 satellites will be needed to cover the 13 years mission lifetime – two of them are considered spares

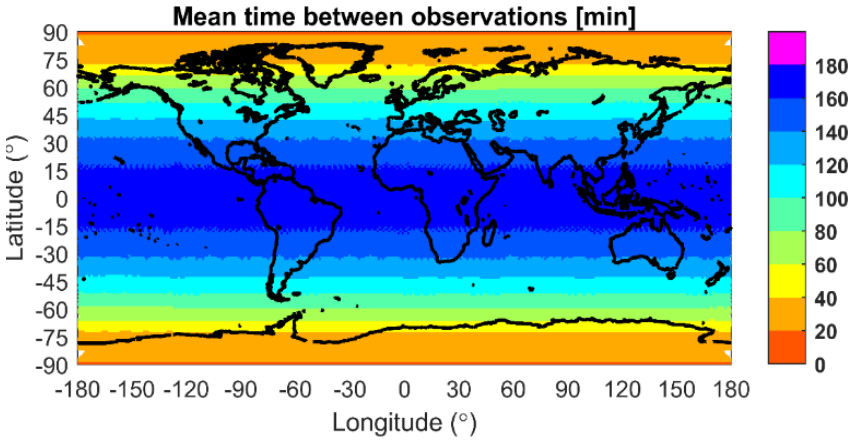


Constellation performance (time to achieve 90% coverage):

- **EPS-Sterna only:** 3.1 - 4.7 hours
- **EPS-Sterna + EPS-SG +JPSS:** 2.4 - 3.8 hours

Mean time between observations (with 6 satellites): 20 min-3 hours

NB two different satellite solar panel configurations will be used across the three different orbital planes.



Copernicus Imaging Microwave Radiometer - CIMR

Large Deployable Reflector Subsystem

8.6 m

8.5 m

Platform:
GNSS, Star trackers, Momentum control, etc.

6.4 m

Solar Panel:
2.6 kW EOL

PRIMARY OBJECTIVES (ESA)

- To provide high-spatial resolution microwave imaging radiometry
  erived products
  and sub-daily
  gions and

  Concentration,
  olar regions
  ature;
  nd AMSR like
  ty in Polar

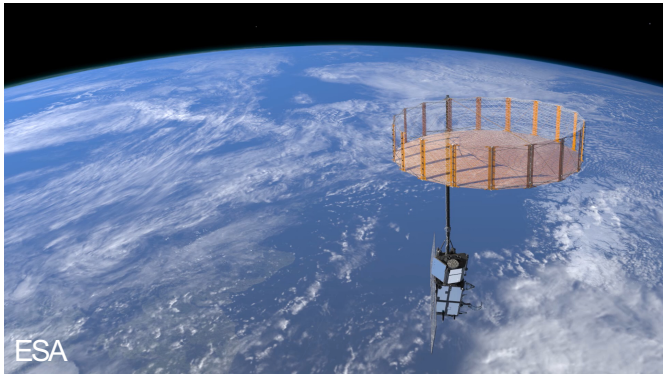
CTIVES (EUM)

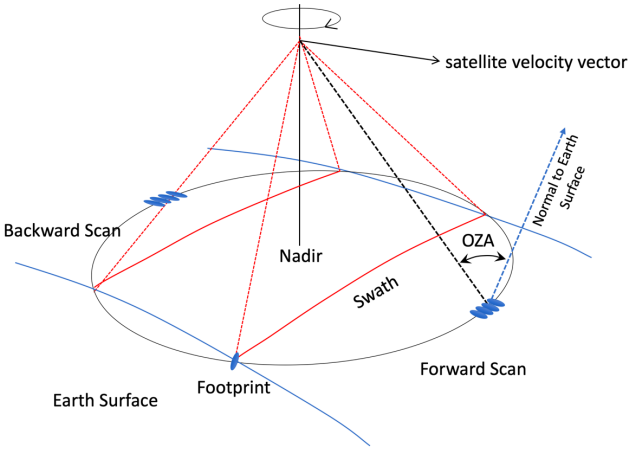
tmospheric

ns related to snow cover and on land (soil moisture, surface temperature, etc.).

Copernicus Imaging Microwave Radiometer - CIMR

Frequency band	L	C	X	K	Ka
Relevant ECVs	Salinity	Sea surface winds & temp.		Water vapour, cloud & rain	
Allocated band [GHz]	1.4 – 1.427	6.425–7.250	10.6-10.7	18.6-18.8	36-37
Centre frequency [GHz]	1.4135	6.925	10.65	18.7	36.5
Footprint size [km]	**<60**	**≤15**	**≤15**	**≤5.5**	**<5 (goal=4)**
L1b Radiometric resolution [K] NEΔT	≤0.3	≤0.2	≤0.3	≤0.4 (goal: ≤0.3)	≤0.7
Polarisation	Full Stokes				
Swath width	>1900 km				
Observation Zenith Angle [deg.]	52.0 ±1.0	55.0 ±2.0			





CIMR-A: Q4/2029
CIMR-B: ~2035
CIMR-C (TBC): ~2042

Next challenges for future EUMETSAT mission

- Foresight “exercise” to frame the next generation LEO and GEO missions has begun with key experts form around the globe
- Areas under discussion target the continuation of measurables and the key environmental applications/service areas (to be addressed in the user consultation process in phase 0-A) → *we are clearly moving towards seamless Earth System observations*
- A series of foresight workshops are planned at the EUMETSAT User Conference next September in Lyon, and in Darmstadt in October 2025.
- Current planning agreed with Member States:
  - Meteosat 4th Generation (M4G) definition phase will start in ~2028
  - EPS Third Generation (EPS TG) definition phase will start in ~2032

More to come from EUMETSAT in ITSC-26 and ITSC-27
→ ITSC recommendations will be considered

Thank you!