Committee on Earth Observation Satellites

CGMS

WGClimate-24 & GHG-TT-6

Report of the Space Agency at DLR

WGClimate
The Joint CEOS-CGMS Working Group on

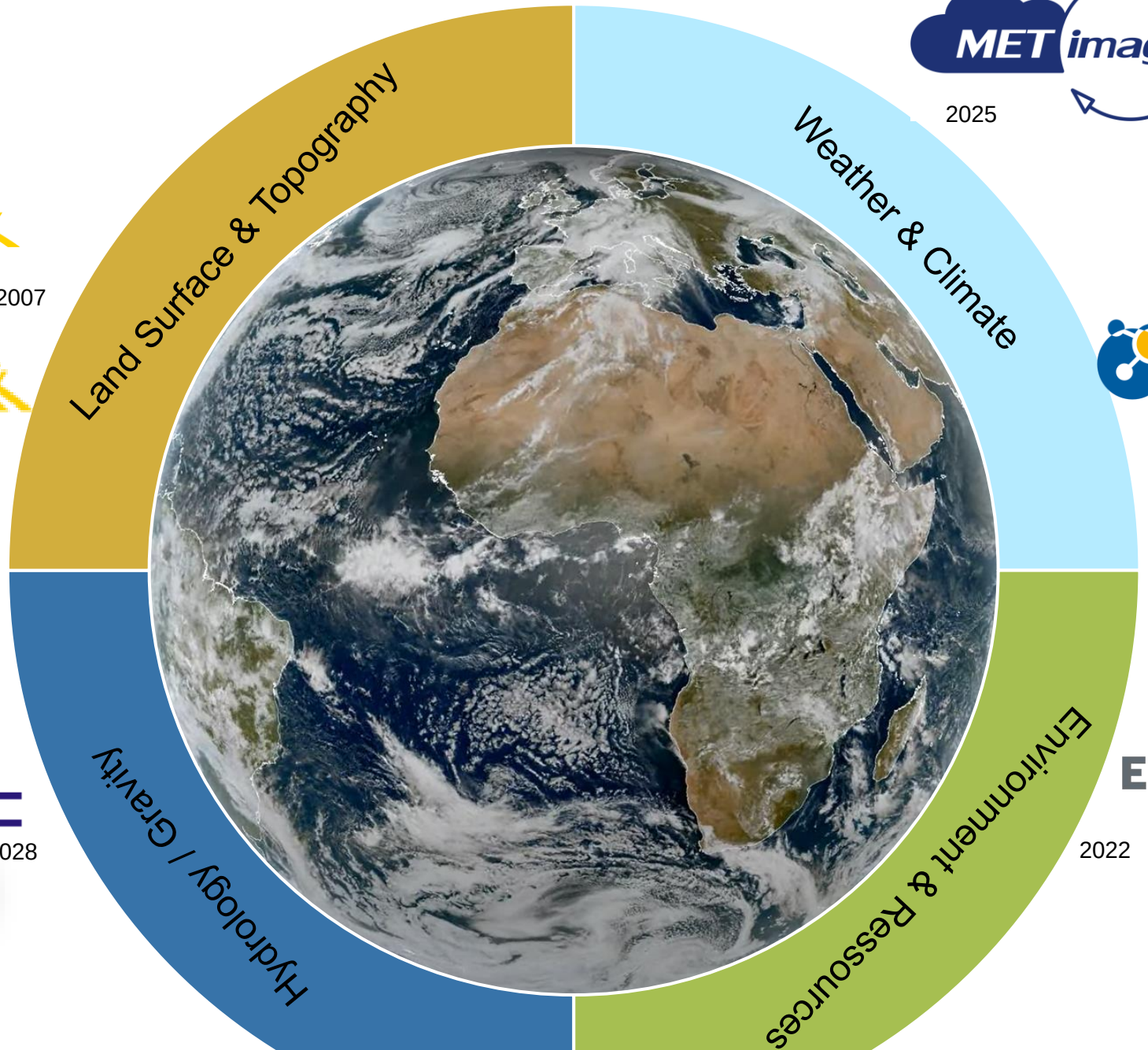
WGClimate-24 & GHG-TT-6
9 - 12 February, 2026
ESA ECSAT, Harwell, UK

Albrecht von Bargen, DLR
Agenda Item 2.6

The German EO programme – serving our planet

- Better understanding
- Better information
- Better decision making

EO Missions



TERRA SAR X

2007

TANDEM

2010

GRACE-C

2028

GRACE-FO 2018

GRACE 2002

MET image

2025

DLR

MERLIN

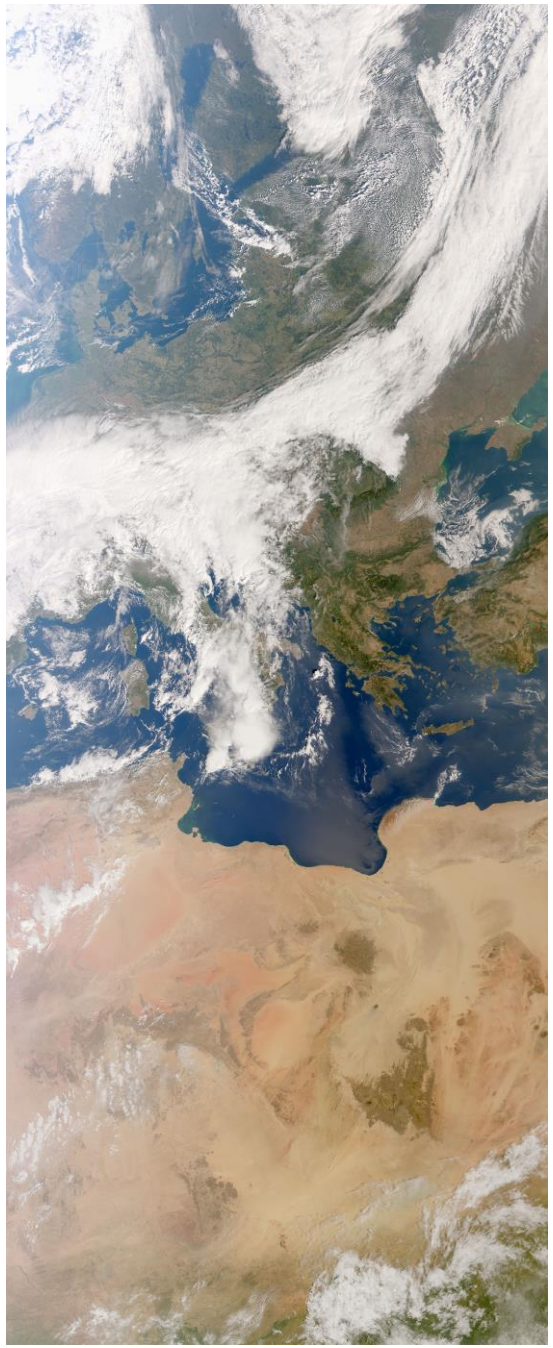
2029

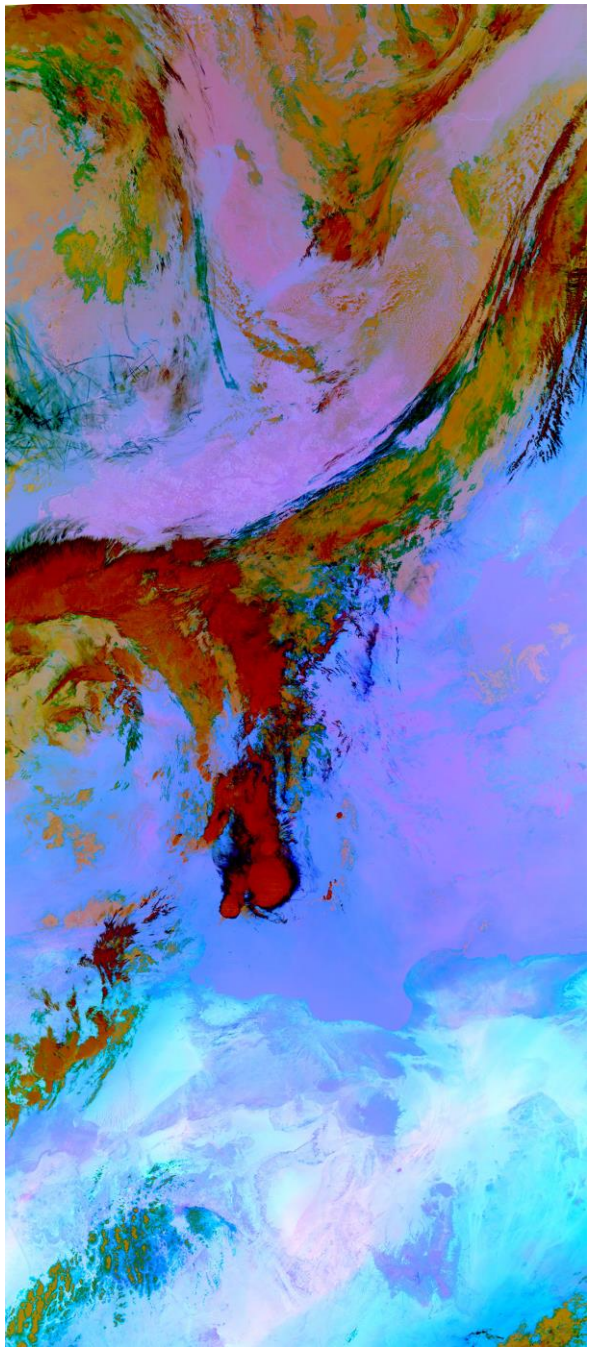
EnMAP

2022

METimage First Light

- METimage first light captured on 24 September
- Left: „true colour“ RGB image
- Right: Dust RGB from three thermal channels

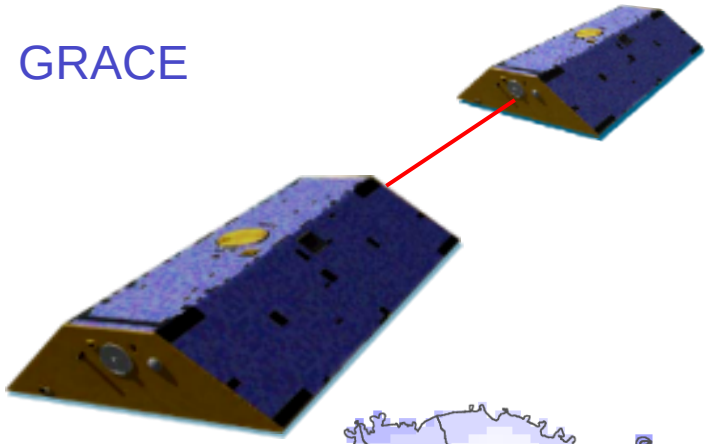


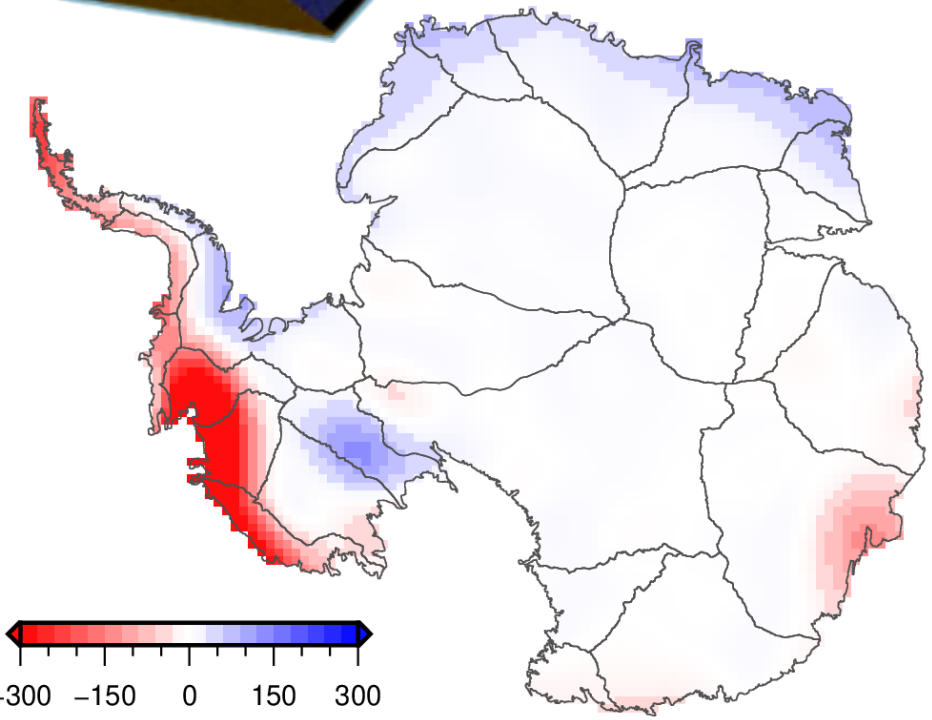


Credit: EUMETSAT

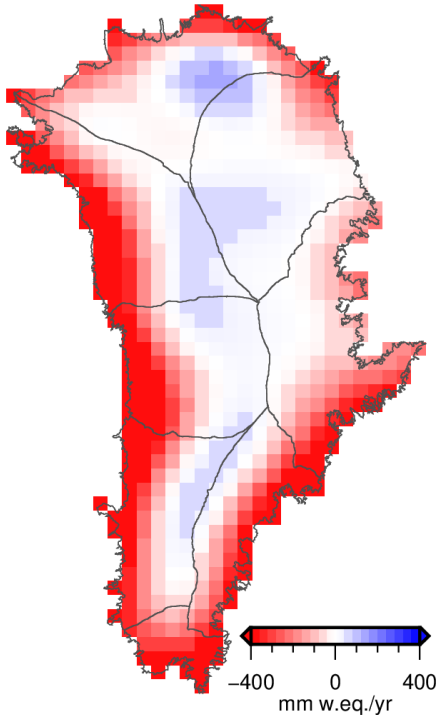
Ice sheet melting – Greenland and Antarctica

GRACE

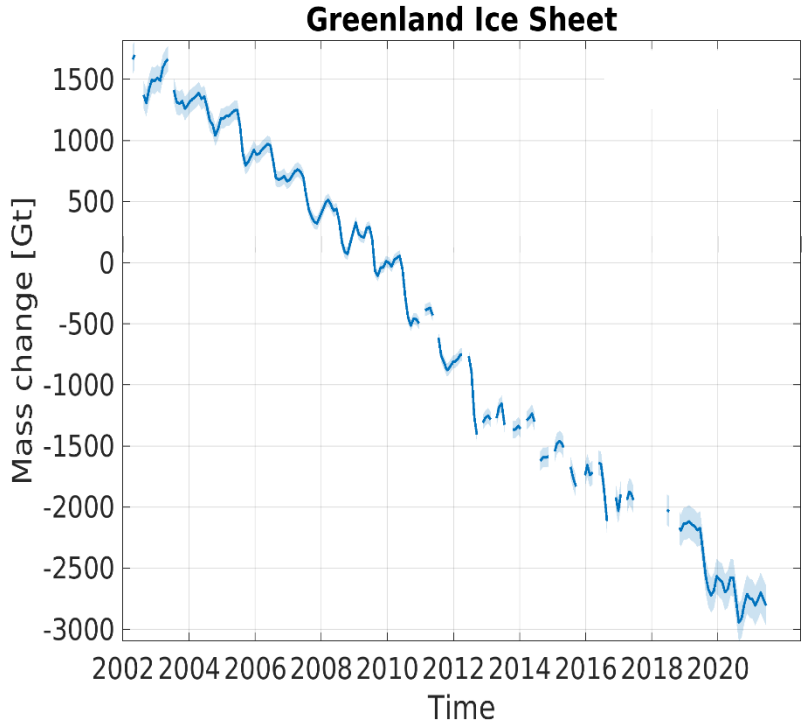


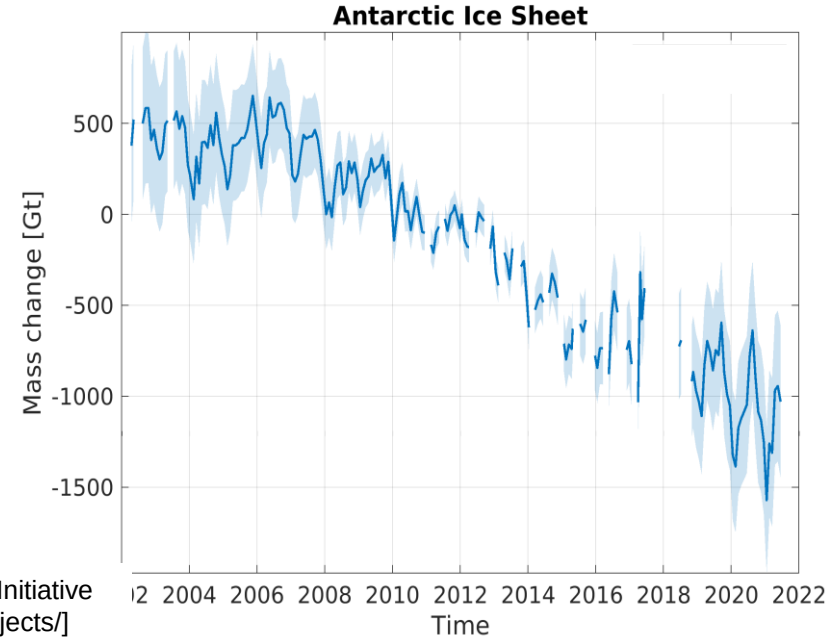


millimeter water equivalent per year



millimeter water equivalent per year





TECHNISCHE UNIVERSITÄT DRESDEN

Results generated in the framework of ESA' Climate Change Initiative
[https://data1.geo.tu-dresden.de, https://climate.esa.int/en/projects/]

EnMAP – 3 years Routine Operations

Transition from a pioneering science mission to a mature operational platform

- Excellent data quality demonstrated by science applications

→ Operational services in development

International collaboration supported by EnMAP

→ Pathfinder for Copernicus CHIME Mission
→ Coordinated acquisitions with ASI PRISMA Mission
→ Acquisition for USGS campaigns
→ Landsat Next Science Product developed on EnMAP

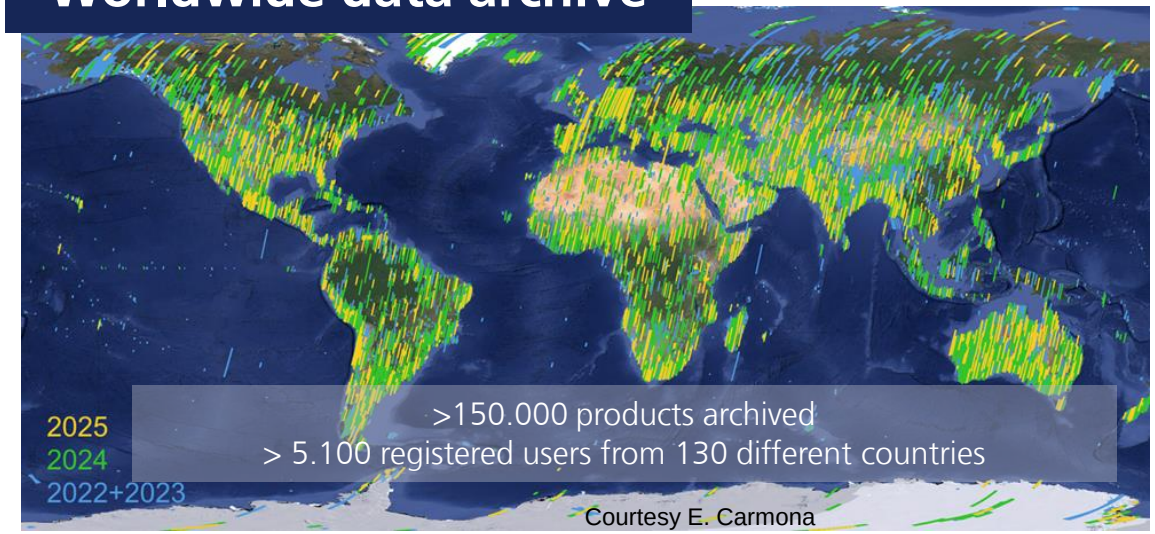
Collaboration with IMEO

UN environment programme | International Methane Emissions Observatory

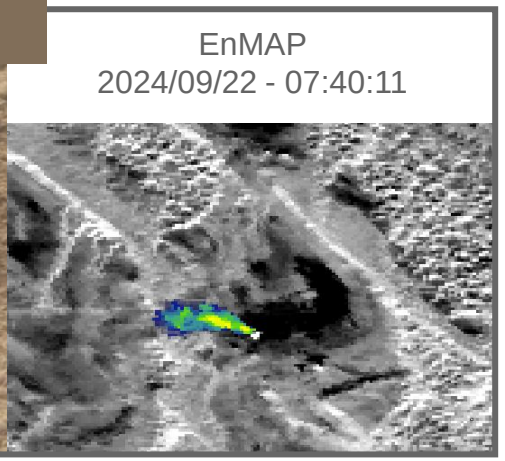
- 2023: scientific demonstration of EnMAP's excellence capability
- 2024-now: systematic provision of selected scenes
- **Today's milestone**: Interface for automatically L1B access

→ Seamless processing chain for IMEO methane maps

Worldwide data archive

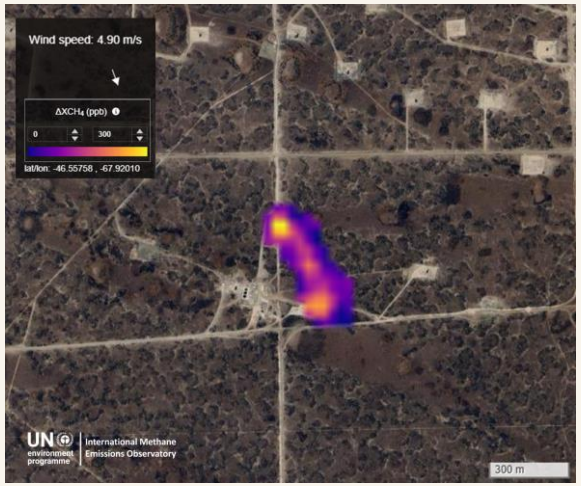


Supporting IMEO



CH4 Emission Mitigation with EnMAP

- **Mitigation case example:**
  - On April 4, 2025, **EnMAP detected a plume in Santa Cruz, Argentina**.
  - MARS notified it, and after an inspection, operators identified the issue and managed to mitigate it in a few days.
  - Preventive measures were taken to avoid similar problems in the future. The facility has not shown any more leaks to date.
  - More information is available in the IMEO 2025 Annual Report.



Methane plume detected by EnMAP in Argentina on April 4, 2025

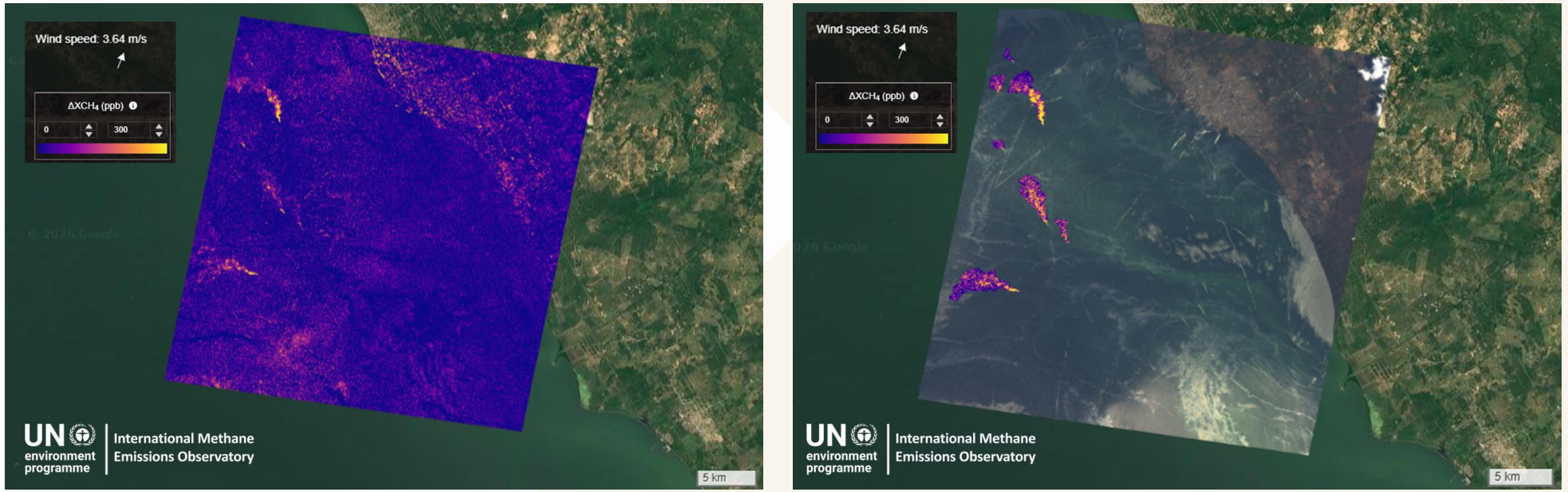
- EnMAP has provided data on the **status of emissions in more than 10 mitigation cases** of MARS

- EnMAP is especially **important for complicated cases** (e.g., heterogeneous, vegetated areas with dark surfaces) given its performance and higher sensitivity to methane.

- With its **lower detection limit**, it is key to **verifying that emissions have ceased and confirming feedback from operators**.

Emission detection offshore

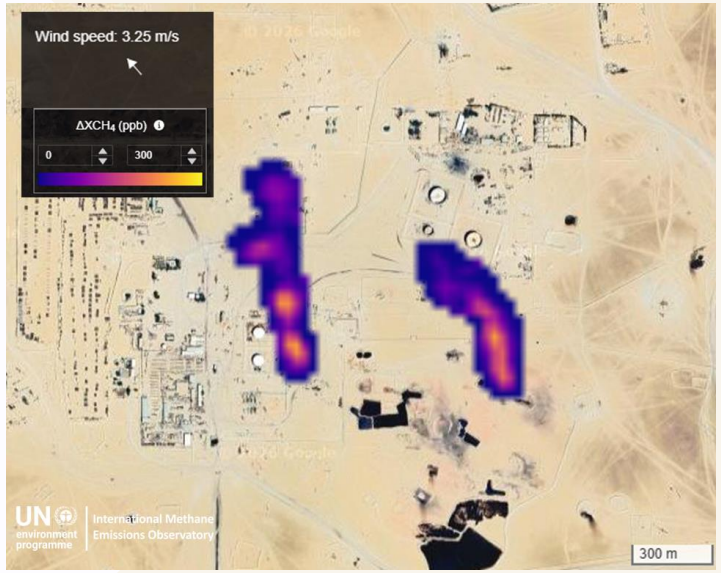
- With EnMAP's pointing capability, it is possible to acquire images in glint mode or close to glint mode



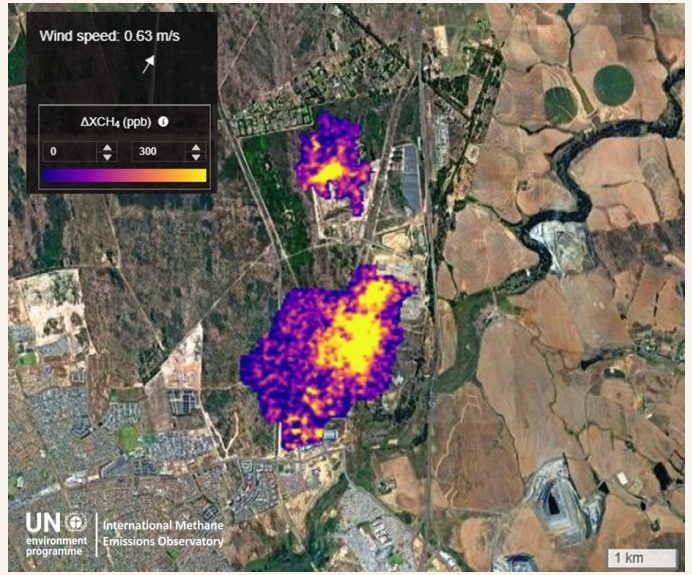
Left: methane retrieval from an image acquired by EnMAP over Lake Maracaibo, Venezuela. Right: detected plumes masked with the EnMAP RGB background. Additional information in IMEO's Eye on Methane data platform.

Examples of other nice plumes detected with EnMAP

Plumes detected with EnMAP in a coal mine area over Poland. Additional information in IMEO's Eye on Methane data platform.



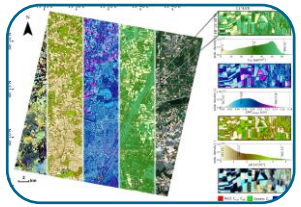
Plumes detected with EnMAP in an O&G field in Libya. Additional information in IMEO's Eye on Methane data platform.

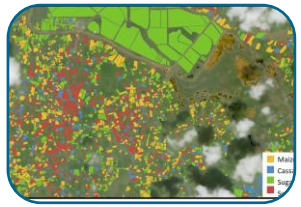


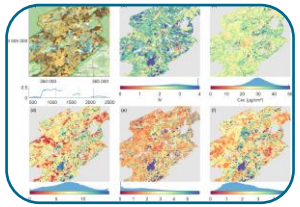
Plumes detected with EnMAP over a landfill area in South Africa. Additional information in IMEO's Eye on Methane data platform.

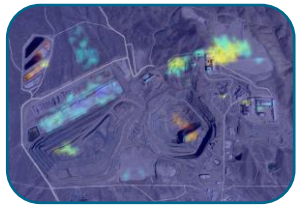
EnMAP Community: Expanding into New Frontiers

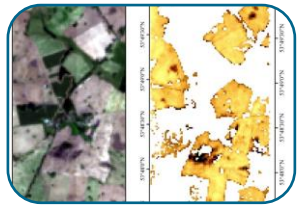
From applied scientific research ....

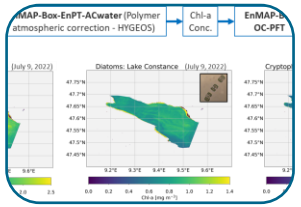

Agricultural practice and crop forecasts


Crop type classification

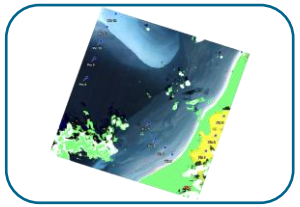

Forest monitoring

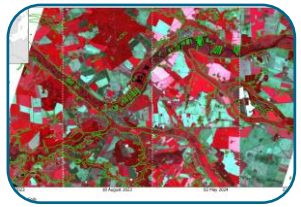

Raw material detection

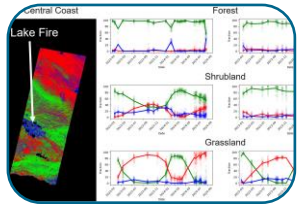

Soil quality - soil degradation, numerical estimation of soil organic carbon (SOC)



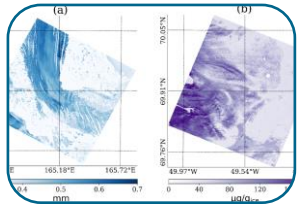
Water quality


Algae classification

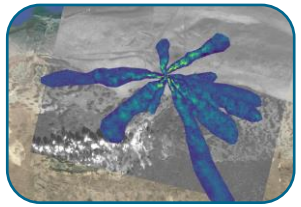

Rewetting of peatlands

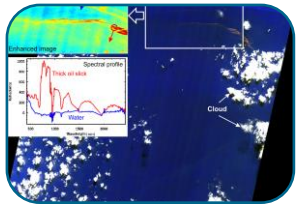


Fire ecosystems: Fire risk assessment, fire consequences, regeneration processes

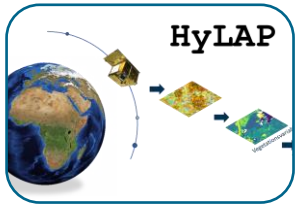

Snow and ice characterization, glacier monitoring


Methane plumes


Methane leakage: detection and quantification


Oil spills


Detection of illegal waste dumps



Agricultural nformation products as a service

Mangroves monitoring (blue carbon market)

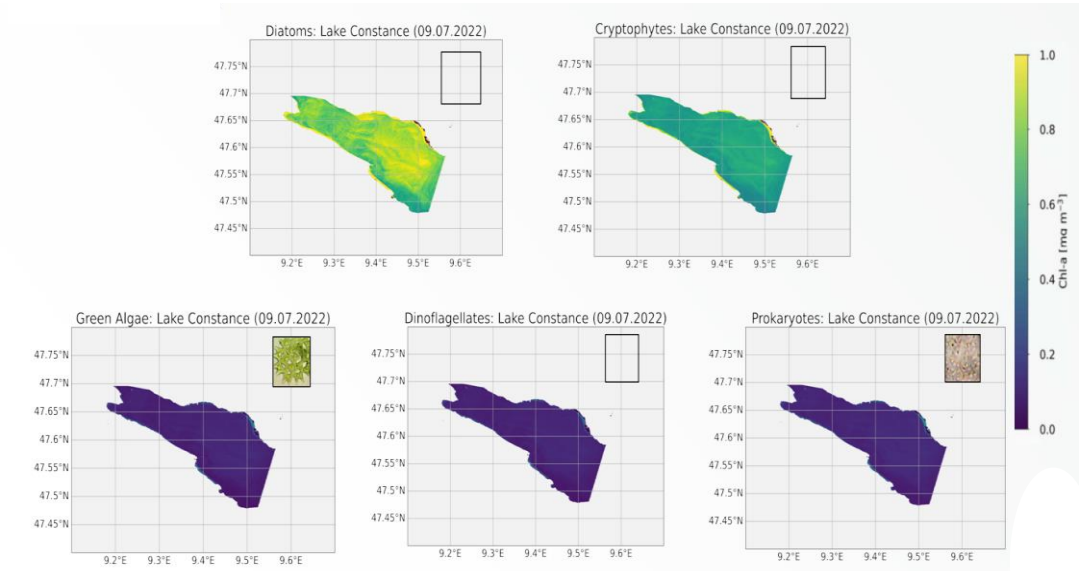

Seagrass monitoring

... to applications as commercial services

Courtesy images: GFZ, LMU, AWI, Universität Bremen, Universität Heidelberg, Brockmann Consult, Universität Greifswald, HU Berlin, OHB, EOMAP

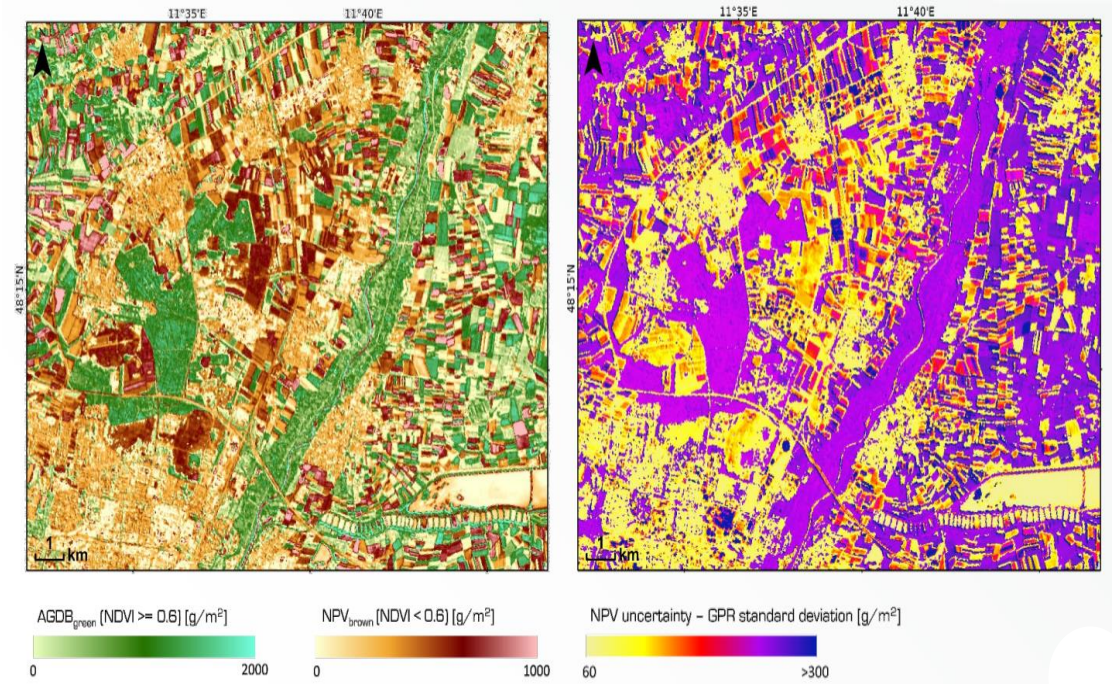
Hyperspectral applications – case examples from EnMAP

Monitoring the Phytoplankton Functional Types in Lake Constance



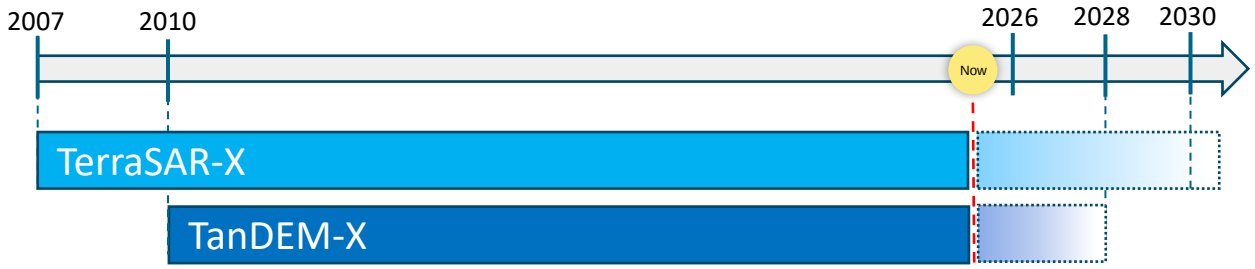
EnMAP data ©DLR [09.07.2022] Courtesy Marianna Soppa (AWI)

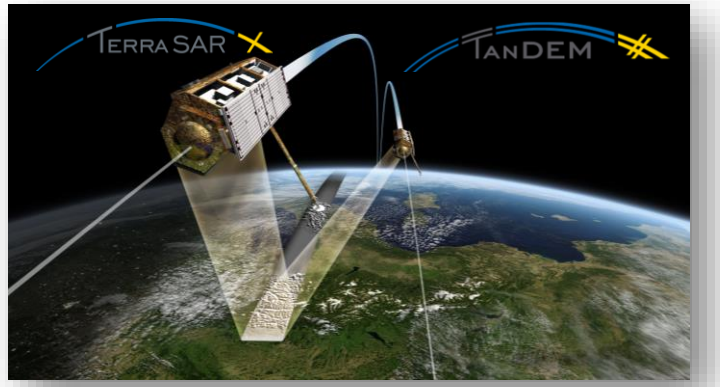
Quantitative Maps of non-photosynthetic vegetation NPV

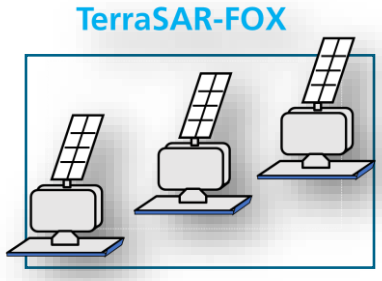


EnMAP data ©DLR [2022] Courtesy Tobias Frank (LMU Munich)

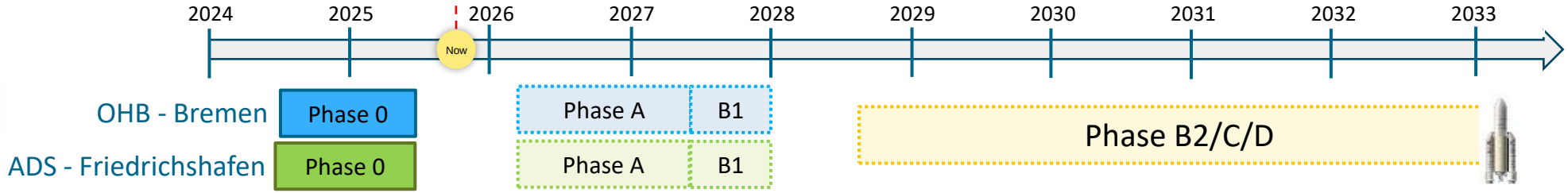
German X-Band and TerraSAR Follow-On X-Band Mission







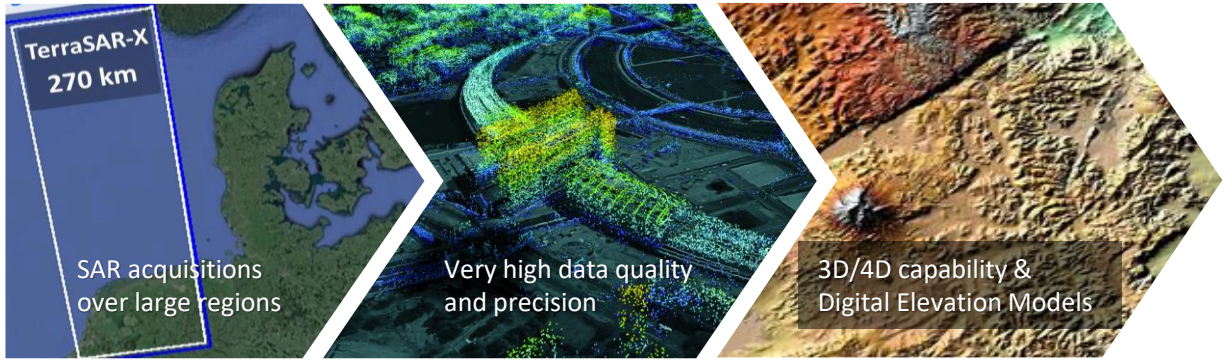
Phase 0 successfully completed in July 2025

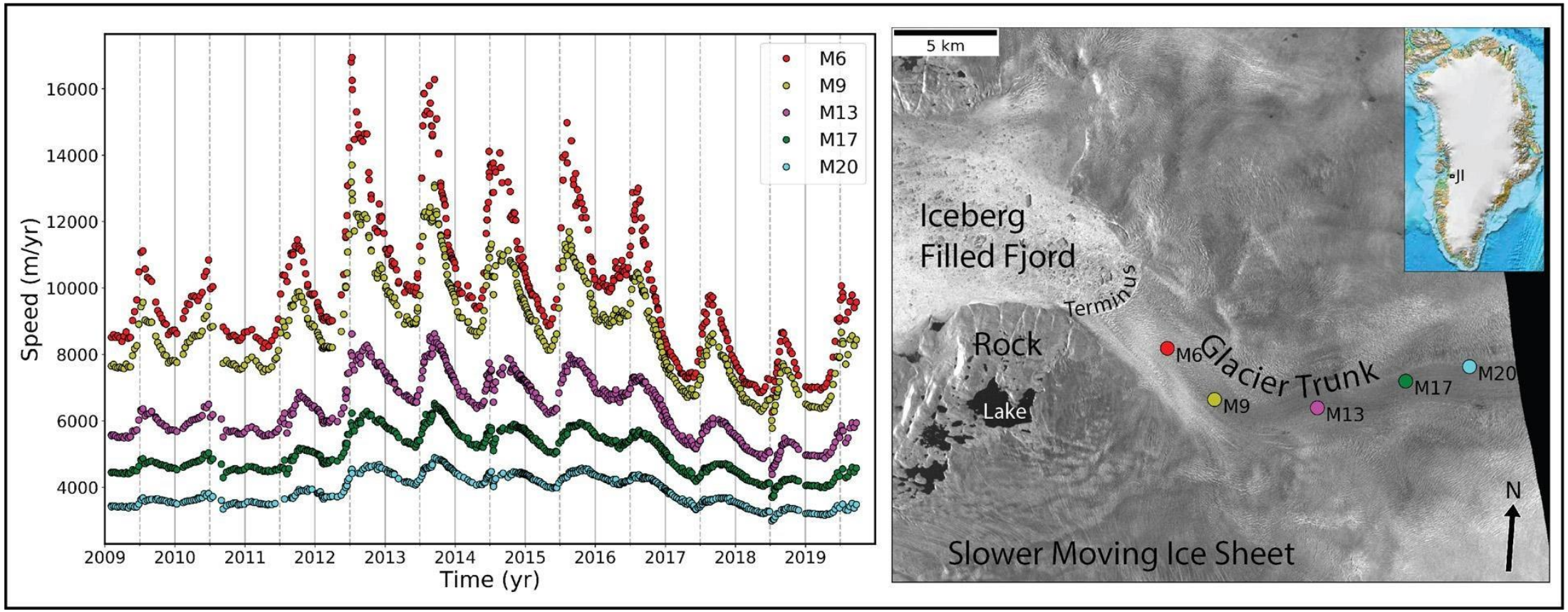


Main features of the TerraSAR-FOX mission:

- Multistatic mission → Enhanced SAR precision
- Formation of 3 small/medium size satellites
- Radar instrument → Pioneering SAR technology

TerraSAR-FOX special features

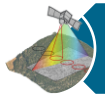




Credit: Ian Joughin / University of Washington Applied Physics Labaratory

Mission Preparation

Call for missions 09/2024 → Directed at scientific, commercial & governmental institutions → Small Sat Missions (SM) & Institutional Missions (IM) w/ different philosophies → 23 submissions 6 concepts selected for studies


IM1: VeggieH - Vegetational carbon cycle


IM2: HyperEarth - Hyperspectral constellation


SM1: SENSORIS - Short-term gravitational variables


SM2: ODEM - AtOx in Thermo-/Mesosphere


SM3: MUSE - Multispectral/TIR


SM4: Boltzmann - Multispectral/TIR

Q4/25
- Kick-Offs of Phase 0/ feasibility studies

Q3/26
- Results of Phase 0/ feasibility studies

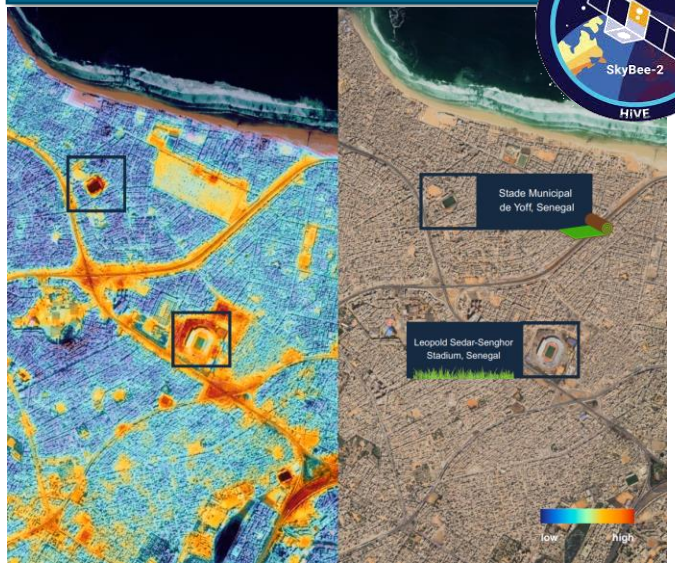
Q4/26
- Evaluation of results and recommendation for implementation

New Space „Made in Germany“

German New Space Start-ups supported by the German Space Agency through data purchase contracts and free data provision for science in Germany via the EO-Lab platform.

constellr

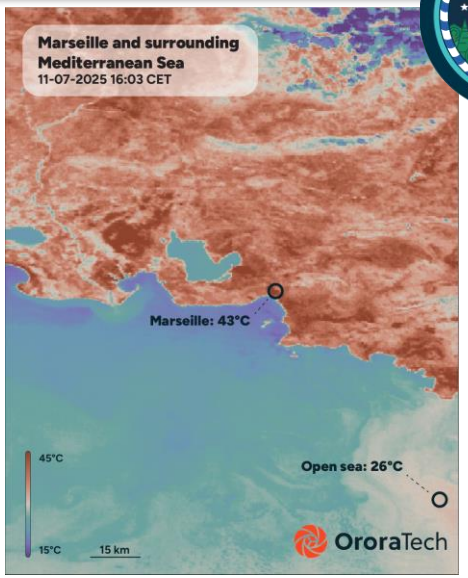
- High spatial resolution thermal data
- 2 satellites launched as of 2025
- Contract to freely provide monthly packages for scientific purposes



© constellr

ORORA TECHNOLOGIES

- High temporal resolution thermal data
- 11 satellites launched as of 2025
- Contract to freely provide individual scenes for scientific purposes

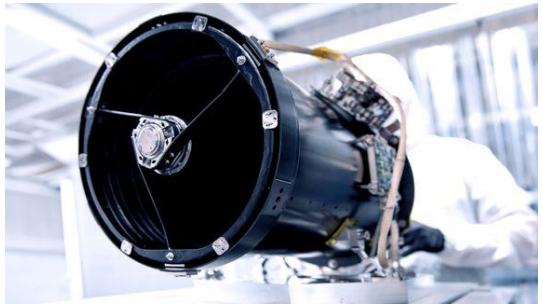


© OroraTech

marble imaging

Earth Observation reimagined

- Very high resolution visual, near and short-wave infrared data
- First launch in 2026
- Evaluation of demand and potentials in science for possible contract



© Marbe Imaging, Scanway Space

National Copernicus Implementation

National Network

- Thematic coordinators increasingly sustained
- New fields adressed (Transport, Urban, Energy)
- Dissemination of information via national earth observation website
- Regular National Copernicus Forum (every 1.5 years) with contiuous growth

Application development

- Regular calls for pilot and flagship projects
- 34 pilot projects, 6 flagship projects

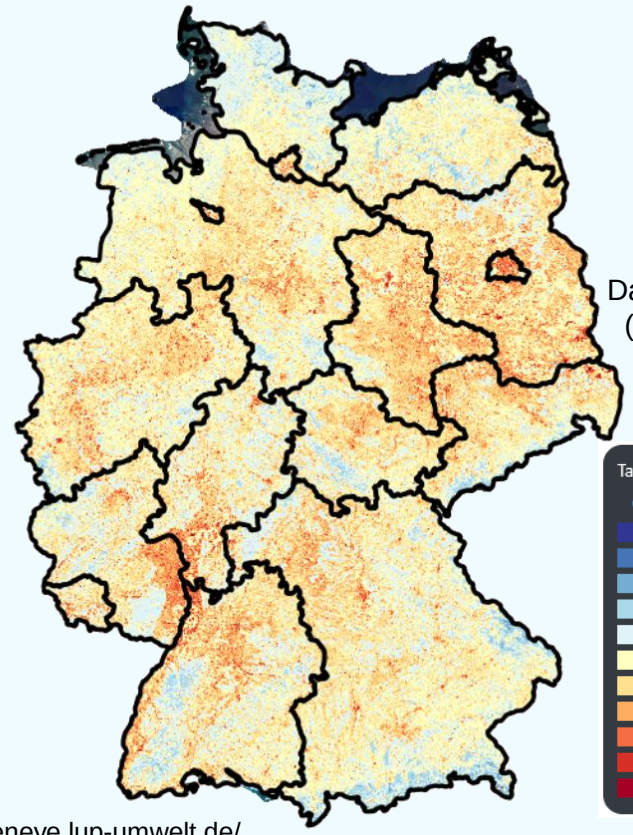
Data access and exploitation

- National platform for Copernicus and EO data

UrbanGreen Eye

Aim: Establish EO/Copernicus for climate adaptation as tool for action in municipalities

Urban Green Eye



Daily surface temperature (median of the summer months 2019-2024)

LUFTBILD UMWELT PLANUNG

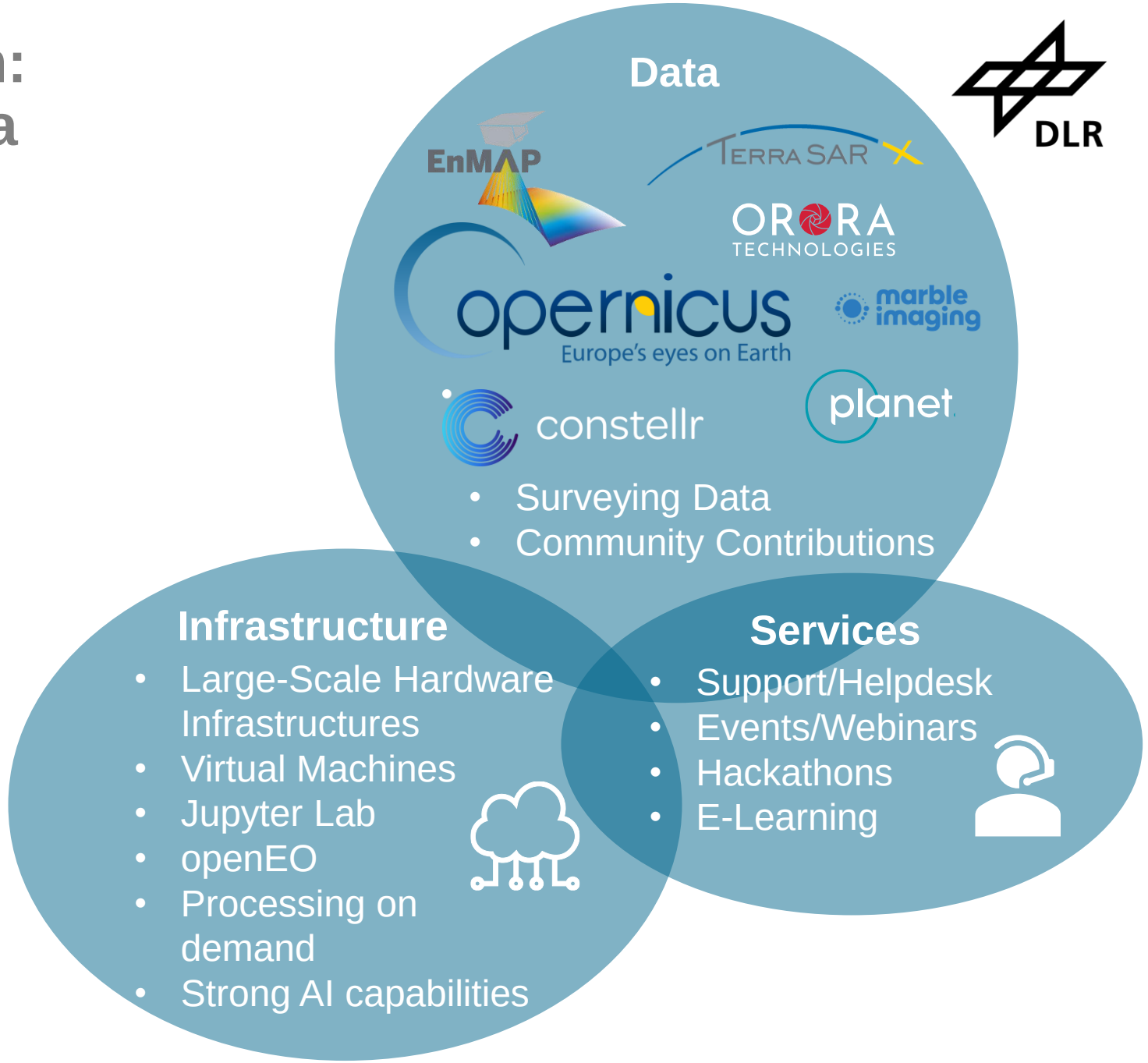
Stadt Leipzig

Credit: https://urbangreeneye.lup-umwelt.de/

National EO Data Platform: Bringing Users to the Data

Highlights for Phase 3:

- Full availability of all Sentinel data + much more at your fingertips, including many unique datasets
- Large free computing resources for German authorities and scientists
- New technologies (improved data viewer, OpenEO)
- Improved Federation with other offers (especially CDSE) → part of European EO cloud ecosystem
- Full scalability of the whole system according to user needs



Capacity Building & Education

Climate Data Entrepreneurial Club

- **Main objective**: Working with satellite data, building expertise in data analysis and AI, promoting entrepreneurship
- **Methods**: open workshops (for teachers) and hackathons (for students)
- **Achievements:** Incorporation of Earth observation and computer science/data analysis (including the materials provided in the project) into the curriculum in schools in Germany

EO-College

- **Main objective:** Europe largest portal of free EO-MOOC‘s and learning material
- **Methods**: Research into new learning methods
- **Achievements**: Integration of online courses and research findings into university teaching
- **Partnerships**: CEOS WGCapD, EOTEC DevNet