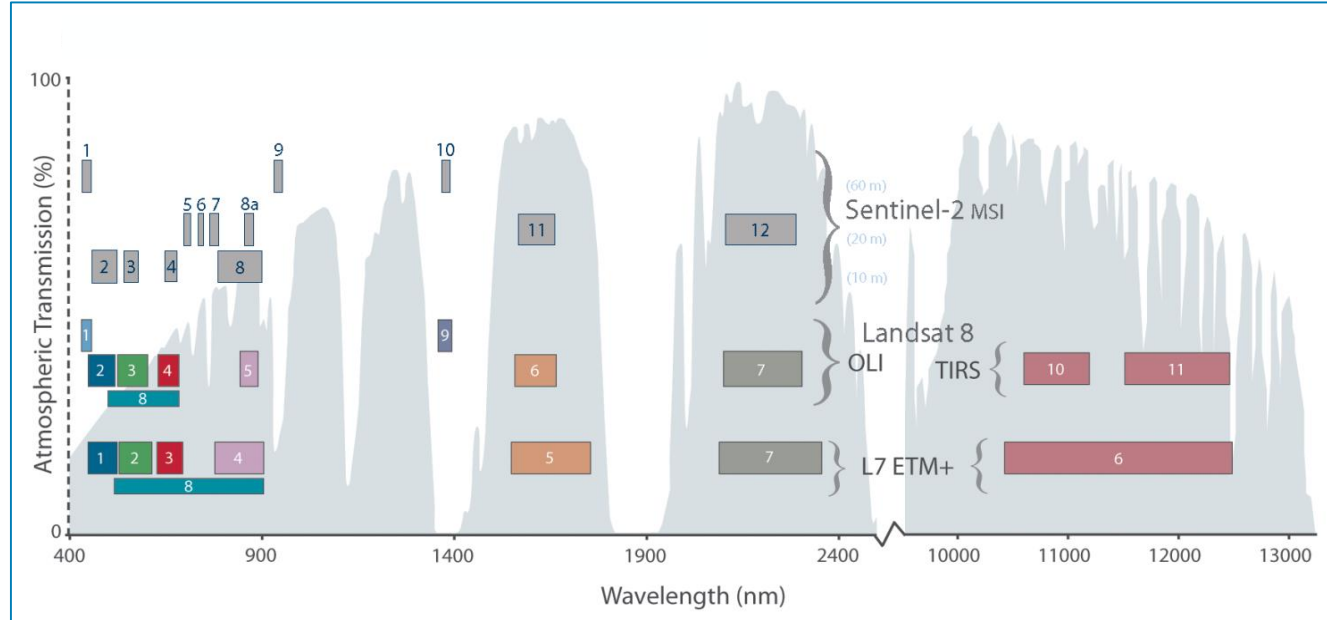# Sentinel-2 Mission

Ferran Gascon

Copernicus Sentinel-2 Mission Manager

20 September 2021

Sentinel-2 Mission
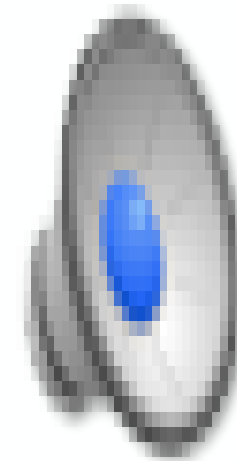
✓ Optical multi-spectral mission for the monitoring of land and coastal regions.

✓ Constellation of two satellites (Sentinel-2A and Sentinel-2B).

✓ Polar sun-synchronous orbit at an altitude of 786km, with LTDN 10h30.

✓ Swath of 294km.

✓ Free & open products for feeding a large range of applications.

Sentinel-2 Mission Status Highlights

✓ Good health of both Sentinel-2A and Sentinel-2B satellites.

✓ Sentinel-2 operated beyond the initially required observation scenario.

✓ Top European EO mission (e.g. in terms of scientific peer-reviewed publications and data volume distributed).

✓ Towards Sentinel-2 Collection-1 (reprocessing of the archive).

✓ New pilot products available (Level-2H and Level-2F).

Normalised Difference Vegetation Index (NDVI) dynamic map by https://apps.sentinel-hub.com/digital_twin_sandbox/

Copyright: Contains modified Copernicus Sentinel data (2021) processed by Sinergise

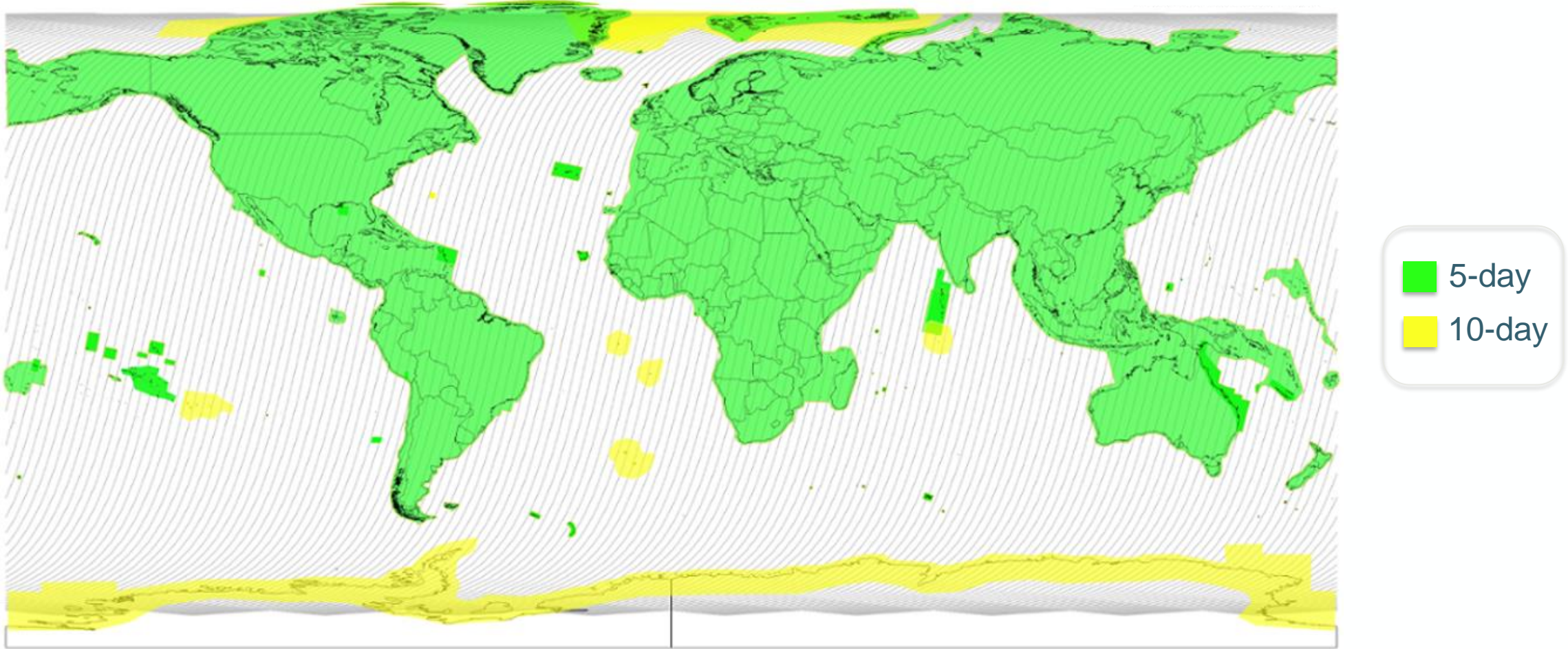→ THE EUROPEAN SPACE AGENCY

Schedule Overview

Sentinel-2 Products

Type	Code	Description	Users	Coverage	Distribution
Core Products	Level-1B	Top-of-atmosphere radiances in sensor geometry	Expert users	Alps and Norway	FTP (rolling archive) available on request
	Level-1C	**Top-of-atmosphere reflectances in cartographic geometry**	**All users**	**Global**	**Copernicus Data Hubs (full archive)**
	Level-2A	**Surface reflectances in cartographic geometry**			
Pilot Products	Level-2H	Harmonised Landsat-8+Sentinel-2 surface reflectances in cartographic geometry	Ad hoc	Pilot productions	FTP
	Level-2F	Fused Landsat-8+Sentinel-2 surface reflectances in cartographic geometry			

Observation Scenario

5-day
10-day

THE EUROPEAN SPACE AGENCY

Sentinel-2 products performance status

Data Product Quality Reports

The MPC-CC provides a monthly status of the quality of Sentinel-2 L1C and L2A products via respective Data Quality Reports (DQR). The DQRs provides information on the monitoring and measurement of L1C and L2A product performances against the proposed specification, viz:

Geometric Performance

- Geometric Calibration Status
- Absolute Geolocation
- Multi-Spectral Registration
- Multi-Temporal Registration

Radiometric Performance

- Radiometric Calibration Status
- Radiometric Uncertainty
- Noise
- Modulation Transfer Function

It also documents observed anomalies and known issues, the list of defective pixels, and any processing chain improvements resulting in an increment of the Processing Baseline.

L1C report: https://sentinel.esa.int/documents/247904/685211/Sentinel-2-L1C-Data-Quality-Report.pdf/336cc953-28fc-8de5-bb0a-9ce5ed002df0?t=1620402613979

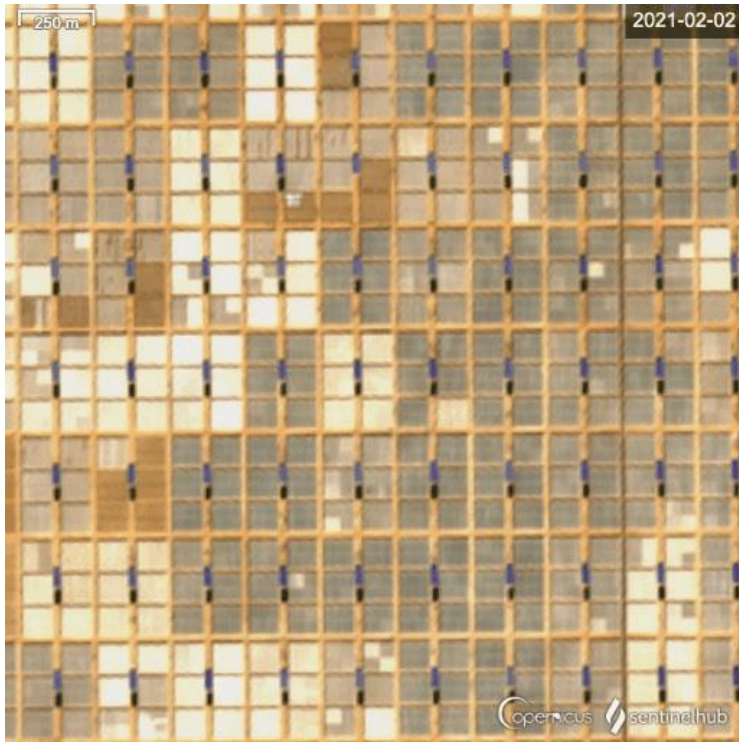L2A report: https://sentinel.esa.int/documents/247904/685211/Sentinel-2-L2A-Data-Quality-Report.pdf/8fbbe100-19ce-4d87-acac-a68fff5f57d0?t=1620402888754
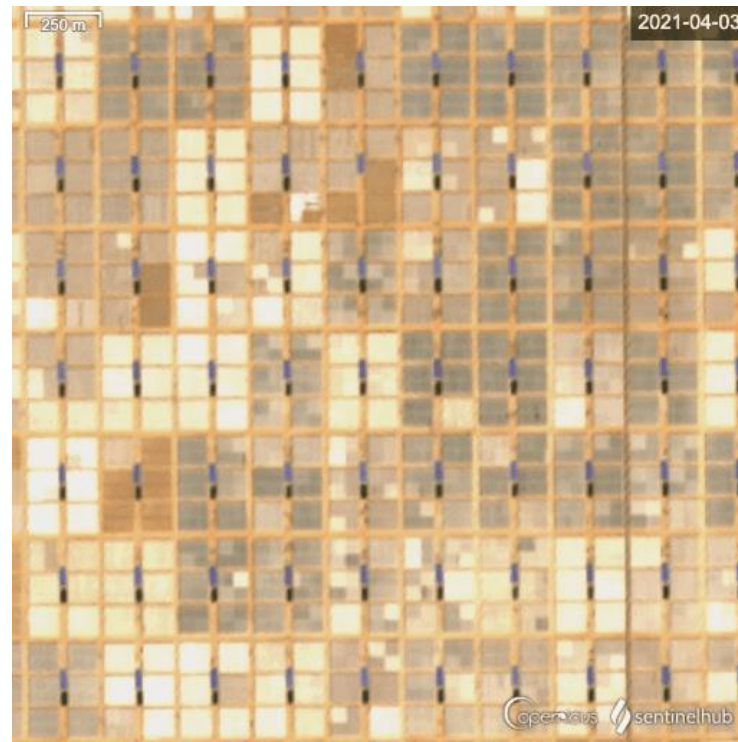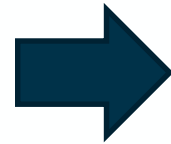
New Sentinel-2 products geometric refinement

Improvement of previous in-flight performances :

✓ Absolute geolocation accuracy from 11m improved to **8 m** (CE95).

✓ Multi-temporal co-registration accuracy from 12m improved to **5 m** (CE95).

Not Refined Geometry

Refined Geometry

Egypt's former desert

Copyright: New China TV

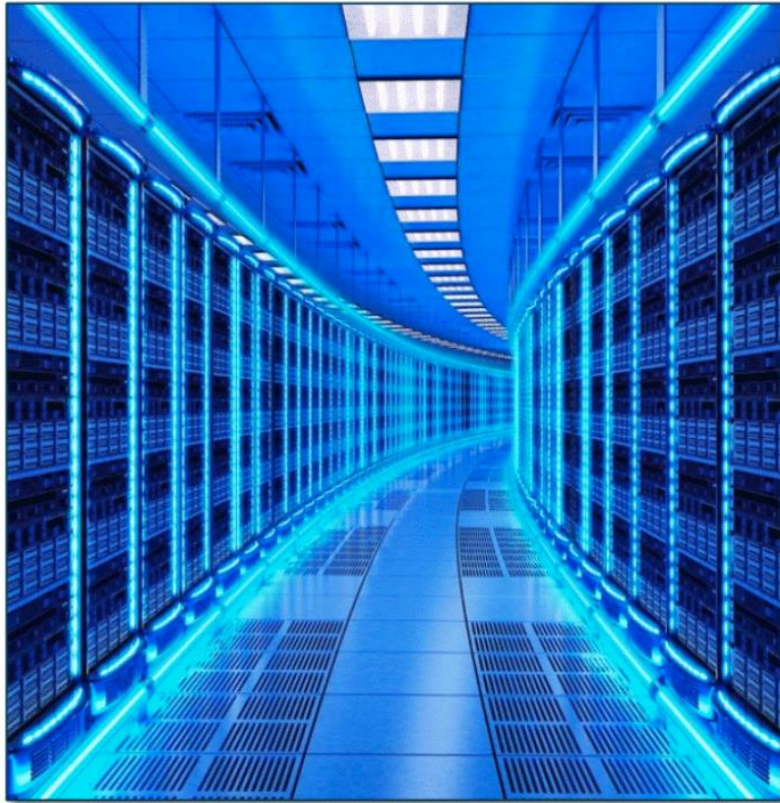*Copyright: contains modified Copernicus Sentinel data (2020), processed with Sentinel Hub EO Browser*

Mission Outlook (up to 2022)

✧ Sentinel-2 archive reprocessing to generate Collection-1 (pending EC approval).

✧ Improvement of Level-1C and Level-2A products (as baseline for Collection 1 and beyond).

✧ Further expansion of the Observation Scenario (pending feasibility analysis).

✧ Generation of additional Level-2H and Level-2F pilot productions for evaluation.

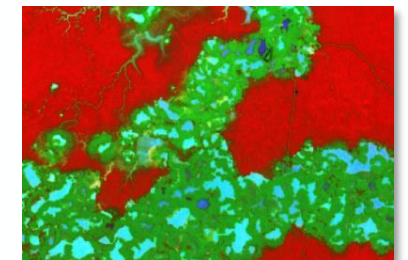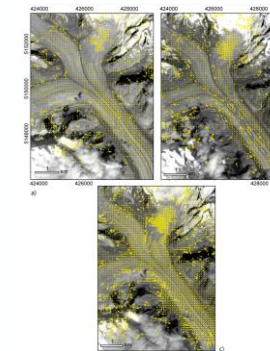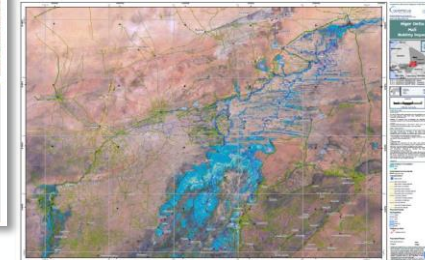✧ Distribution of Sentinel-2 GRI (Global Reference Image) as a free & open product.

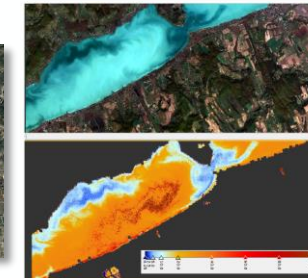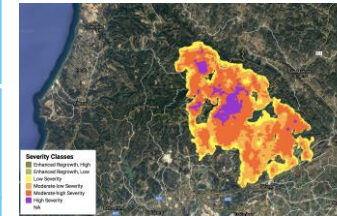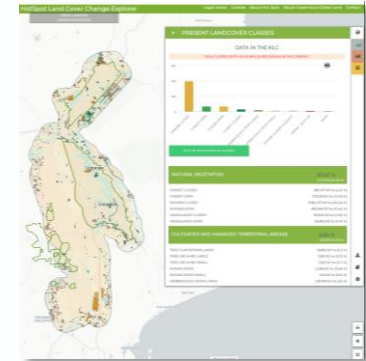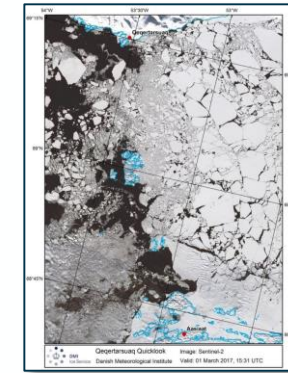→ THE EUROPEAN SPACE AGENCY

Towards Sentinel-2 Collection 1

o Collection 1 will be generated reprocessing full S2 archive for both Level-1C and Level-2A products.

o Reprocessing campaign foreseen to start during Q4 2021 (pending approval by the European Commission) and data available to users during 2022.

o New processing baselines for Level-1C and Level-2A products.

o Collection 1 will be CEOS Analysis Ready Data for Land (CARD4L) compliant (cf. http://ceos.org/ard).

→ THE EUROPEAN SPACE AGENCY

Sentinel-2 used in most Copernicus Services...

esa

Service	Applications
CEMS Copernicus Emergency Management Service	- Emergency response to rapid mapping (burnt area, flood, landslides, volcanoes) - Risk recovery (e.g. crop change, floods) - Validation (e.g. fires, floods, landslides) - EFFIS/GWIS (Burned area mapping, fire severity and vegetation recovery
CMEMS Copernicus Marine Environment Monitoring Service	- Sea-ice charting - Coastal waters Turbidity - Coastal waters Total Suspended Matter
CLMS Copernicus Land Monitoring Service - Global and Pan-European Components	- Hot Spot Monitoring for EU field projects and international policies - Global Mosaics - Inland waters Turbidity - Inland waters Total Suspended Matter - Biophysical products - Land cover products
CSS Copernicus Security Service Copernicus Maritime Surveillance Service European Maritime Safety Agency / CleanSeaNet	- Oil spill detection and polluter identification (CleanSeaNet) - Maritime surveillance (e.g. ship detection, search and rescue, anti-piracy)
CSS – SEA Copernicus Security Service Support to External Action	- Up-to-date background information - Integration with very high resolution imagery - Feature of interest extraction
C3S Copernicus Climate Change Service	- Glaciers mapping - Glaciers flow velocities

... as well as in national services, and the scientific and commercial domains
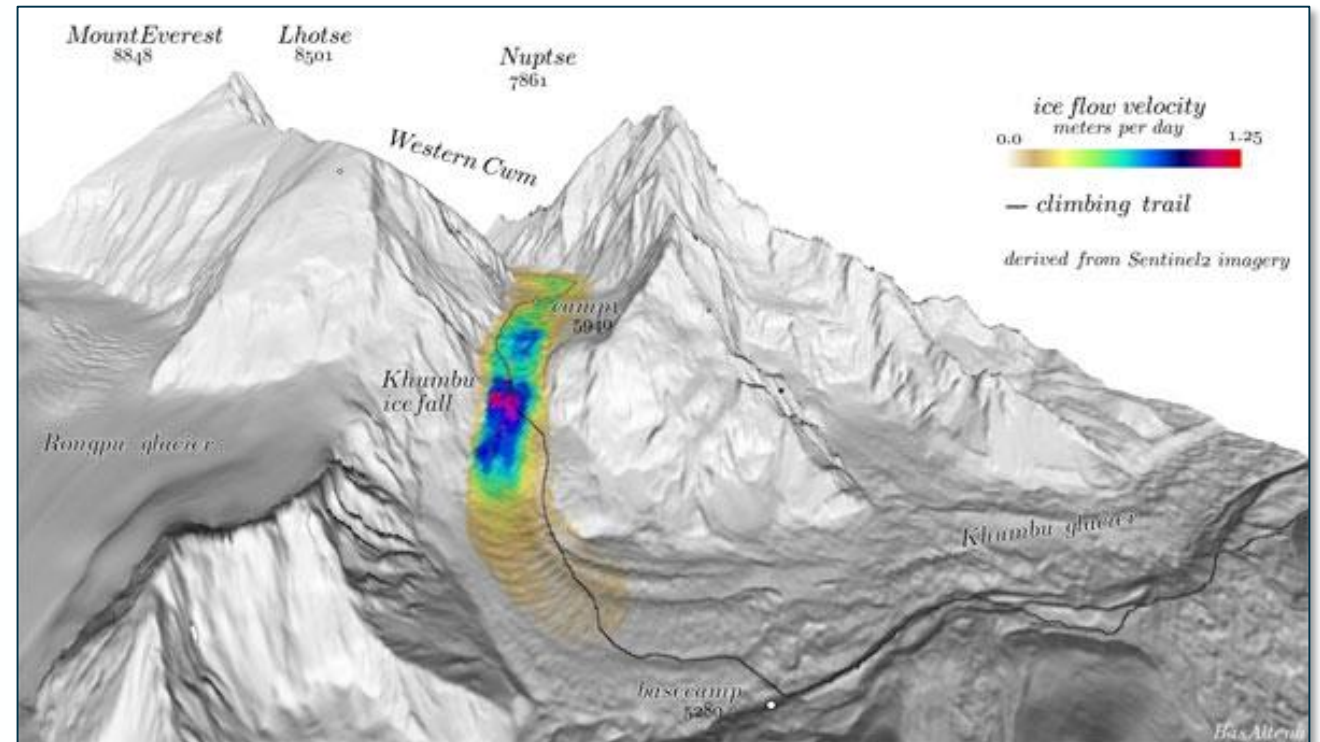
THE EUROPEAN SPACE AGENCY

Sentinel-2 monitors glacier icefall

- Researchers from the University of Oslo extract the flow velocity of Khumbu icefall in the Nepalese mountains, from a collection of Sentinel-2 data — helping climbers ascend Mount Everest.

Climbers in the Khumbu icefall on Mount Everest (Christian Kober/Robert Harding World Imagery/Corbis)
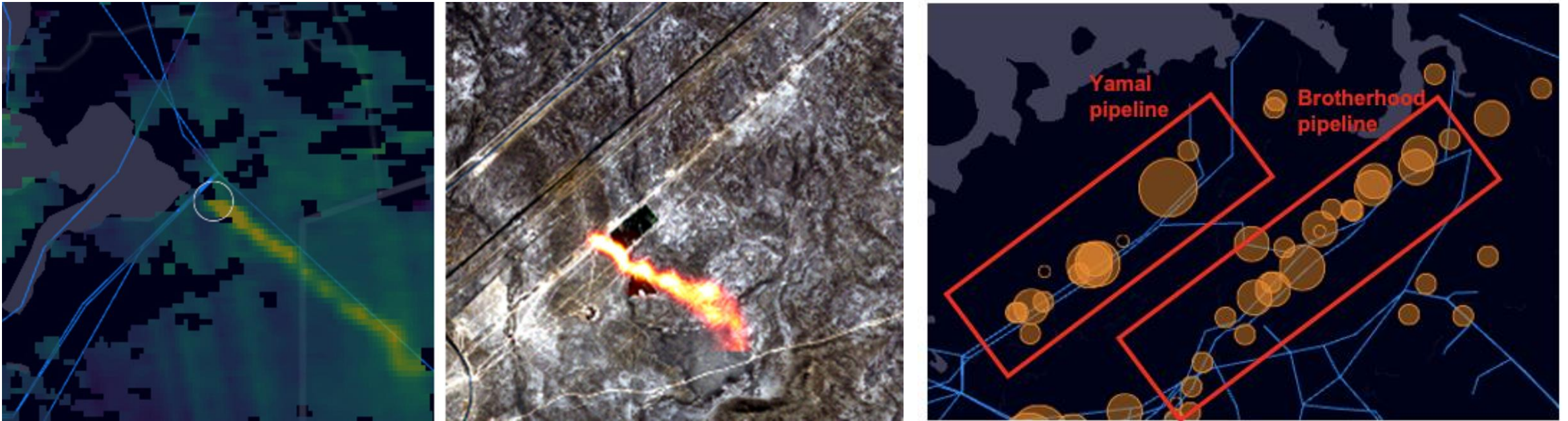

Copyright: Bas Altena, University of Oslo. Contains modified Copernicus Sentinel data (2020)

https://sentinel.esa.int/web/sentinel/missions/sentinel-2/news/-/article/copernicus-sentinel-2-monitors-glacier-icefall-helping-climbers-ascend-mount-everest

→ THE EUROPEAN SPACE AGENCY

Sentinel-2 mapping high-resolution methane emissions

- Sentinel-2 used to detect individual methane plumes leaking from natural gas pipelines around the globe.
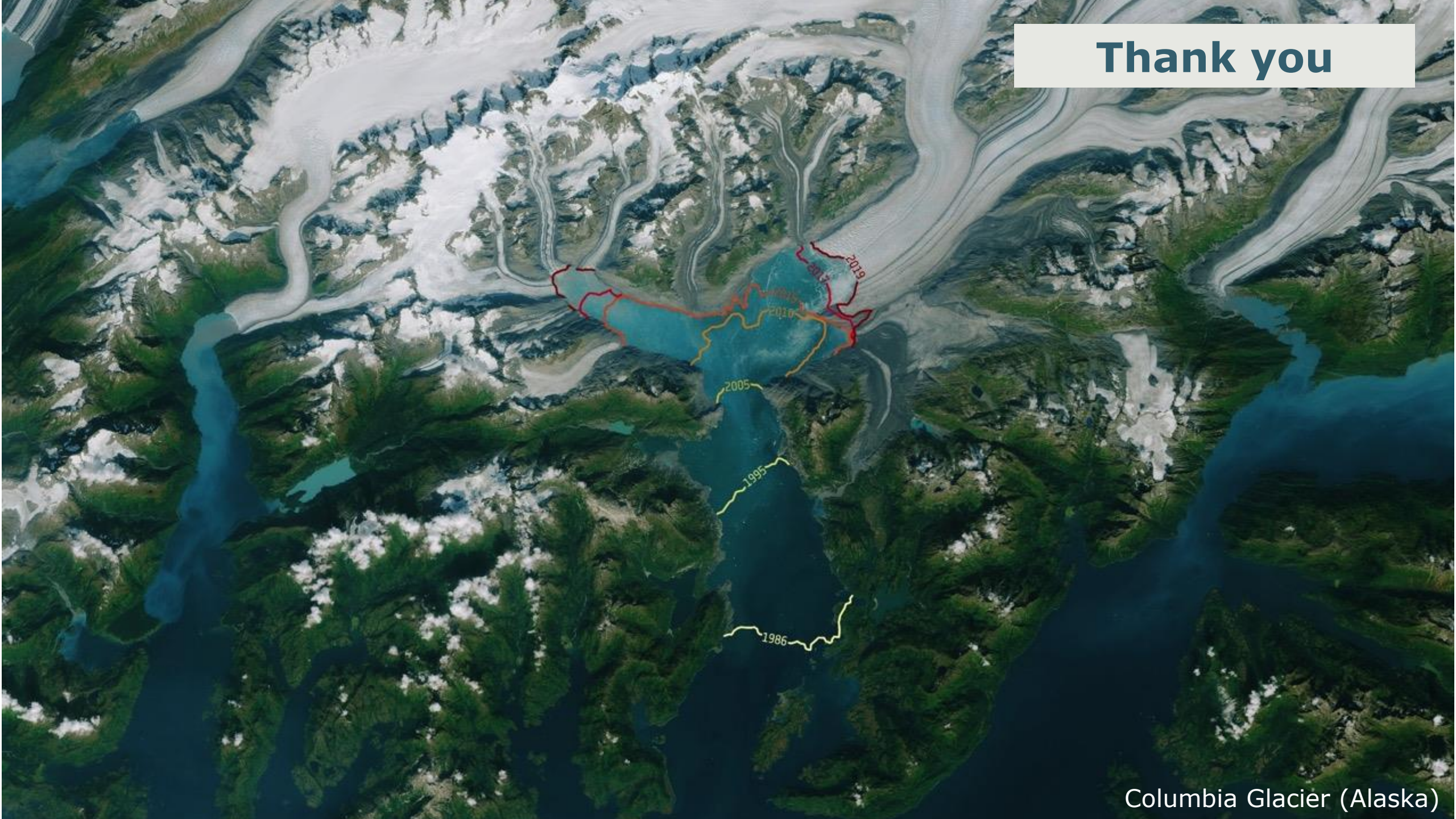

Copyright: Contains modified Copernicus Sentinel data (2020) processed by Kayrros

https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-5P/Monitoring_methane_emissions_from_gas_pipelines

→ THE EUROPEAN SPACE AGENCY

Thank you

Columbia Glacier (Alaska)