



Sentinel-5P Mission Status

CEOS AC-VC Meeting

27 May 2026

SRON, Leiden (NL)

Timon Hummel on behalf of the Sentinel-5P Team

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Sentinel-5P - First Atmospheric Sentinel



PROGRAMME OF THE
EUROPEAN UNION



- **Launched:** 13 October 2017, Plesetks
- **Launcher:** Rockot
- **Main Payload:** TROPOMI (co-funded by The Netherlands and ESA) - Hyper-spectral push-broom imaging spectrometer, 4 spectrometers with 2D detectors with 4000 spectral channels
- **Orbit:** Altitude of 820 km, 227 orbit repeat cycle
- **Daily Global Coverage:** 13:30 ascending node crossing time
- **Spatial Sampling:** 5.5 x 3.5/7.0 km (mission requirement: 7 x 7 km)
- **Mission Control:** ESOC
- **TROPOMI Mission Planning:** KNMI
- **Ground Stations:** Svalbard (NOR) and Inuvik (Canada)
- **Operational Data Processing:** DLR (on behalf of ESA)
- **Mission Design Life Time:** ~7 years
- **National co-funding during Routine Operations** (e.g. on Algorithm Development/QA Monitoring): Belgium, Germany, and The Netherlands
- **Operations Funding:** end 2027
- **Key User:** Copernicus Atmosphere Monitoring Service (ECMWF)



Operational Products

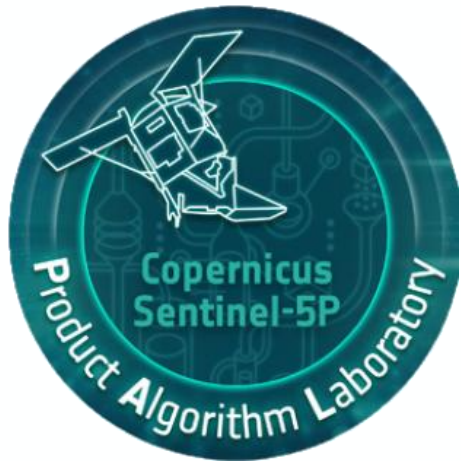
Level-1B

- Radiance
- Irradiance

Level-2

Operational Core Products

Ozone total and tropospheric column and profile, Nitrogen Dioxide total and tropospheric columns, Sulphur Dioxide total column, Carbon Monoxide total column, Methane total column, Formaldehyde total column, Cloud information, UV Aerosol Index, Aerosol Layer Height - <https://dataspace.copernicus.eu/>



Pre-operational Products

Level-2

Pre-operational Products

Aerosol Optical Thickness, Bromine Monoxide, Chlorine Dioxide, Glyoxal, Isotopic Water Vapour, Sun-Induced Fluorescence, Ocean Colour, Sulphur Dioxide product using the Covariance-Based Retrieval Algorithm (COBRA), Surface Reflectance, Water Vapour, Nitrous Acid - <https://data-portal.s5p-pal.com>

Level-3

Gridded data

Gridded data produced at varying time averaging scales, ranging from daily to yearly products. Maps of the gridded data are provided on the PAL Mapping portal at <https://maps.s5p-pal.com>

➤ Satellite and Instrument:

- ✓ The satellite and the TROPOMI instrument continue to perform excellent in orbit, with a theoretical mission extension until at least ~2033.

➤ Mission Operations:

- ✓ Sentinel-5P operations secured until end of 2027; Discussions on possible extension on-going
- ✓ The loose formation with S-NPP will end by Q4 2026, with no expected impact on data quality.

➤ Complementarity with Sentinel-5:

- ✓ Afternoon (S5P, ~13:30 LTAN) and morning (S5, ~09:30 LTDN) orbits provide two daily atmospheric observations.

➤ Scientific benefit:

- ✓ Dual overpasses enable diurnal variability studies (e.g. NO₂ traffic peaks, ozone production, biomass burning) and improve model assimilation, forecasts, and emission estimated.

Conclusions from the S5P Yearly Mission Review 2025

➤ Processor and Product evolution Q4 2025:

- ✓ A major processor upgrade was implemented in November 2025, with key improvements to calibration and product quality.
- ✓ A highlight is the introduction of the CH₄ Near Real Time service, expanding the usability of the methane product for applications such as CAMS and UN IMEO.



UNEP's IMEO : Methane Alert Response System (MARS)

Major Update of the ground-segment and processors (non-exhaustive):

- **New Near Real Time (NRT) Processing for Methane (CH₄):** A new NRT processing service was introduced for the Methane product, coupled with a machine learning–based quality assurance assessment. Further improvements planned for Q4 2026.
→ **97.7% within 3 hours**
- **Fallback Cloud Mask for Aerosol Layer Height (AER_LH):** A new fallback cloud mask, based on machine learning, has been added to the AER_LH product to ensure nominal quality even when the Suomi-NPP VIIRS data is unavailable.
- **Level-1B Processor Improvements:** The L1B processor includes dynamic straylight correction for Bands 1–2, residual background correction for Bands 1–6, and a correction for a sharp detector feature in Band 3.
- **Updated SO₂ and HCHO Products:** The Sulphur Dioxide (SO₂) and Formaldehyde (HCHO) products will implement new look-up tables for Air Mass Factor (AMF) variables, introduce a new surface albedo climatology (GE-LER), and feature improved QA-value calculation for snow and ice conditions. The SO₂ product will also gain a 3 km VCD product.



Satellite In-Orbit Performance Review 2026 Conclusions:

- Since launch in October 2017 the Sentinel-5P satellite has gone beyond nominal lifetime of 7 years and continues to deliver **nominal performance across all subsystems**.
- Continuous monitoring of key parameters and trends show **minimal ageing effects** and both the platform and payload are deemed to be in very good health.
- The main items marked as Life-Limited Items are :
 - As of Feb 2026 remaining **hydrazine** propellant 66.8kg (disposal allocation of 35.4kg) sufficient to support operations until at least **Q3 2038**.
 - **Tropomi Folding Mirror Mechanism (FMM)** reaches the design limit cycle allocation in **Q2 2026**. Detailed analysis of the FMM show no degradation in the operational performance of this mechanism and it is expected that the FMM **continues functioning well beyond the design limit**.
- Sentinel-5P complies with the applicable ESA Space Debris Mitigation Requirements.
 - Extensive investigations into Disposal strategies have been carried out by ADS-SAS. Various disposal scenarios have been investigated with the simplest **descend-and-forget uncontrolled re-entry** scenario ensuring **re-entry within 5 years** (revised propellant allocation of ~55kg).
 - Probability of Successful Disposal remains >0.95 at 15.3 years lifetime i.e. **Q1 2033** with **battery performance** driving this limit.

Reprocessing: Enhanced global SO₂ retrievals



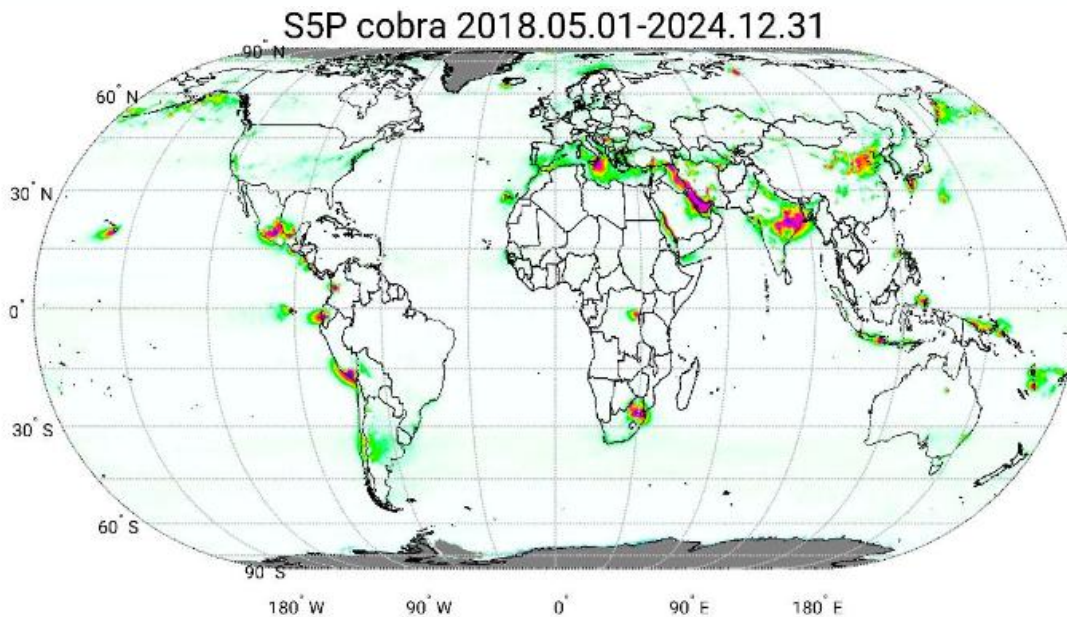
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copernicus
Europe's eyes on Earth

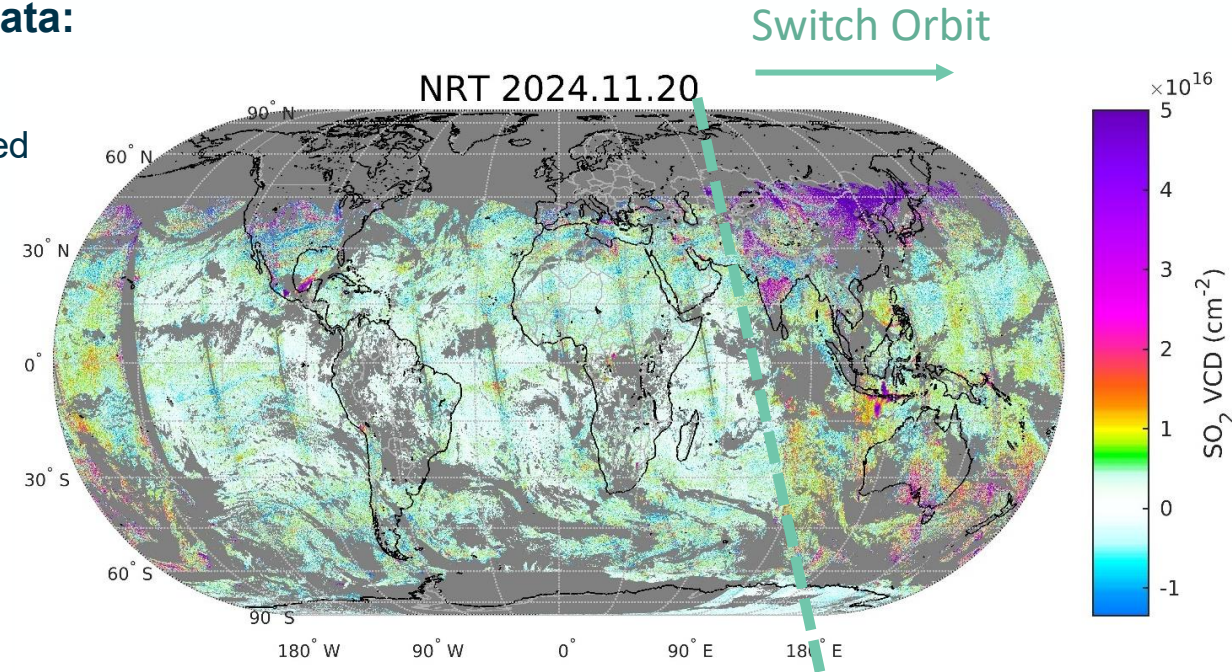
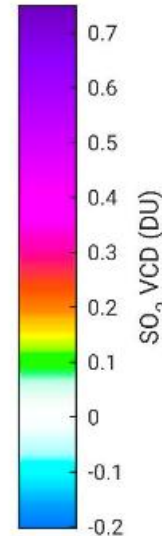


➤ COBRA algorithm update for Sentinel-5P/TROPOMI SO₂ data:

- ✓ (1) Significantly reduced noise & bias
- ✓ (2) Enables detection of anthropogenic SO₂ plumes co-located with NO₂ (previously not possible)



(2) Credits: N. Theys – BIRA/DLR Teams



(1) Credits: N. Theys – BIRA/DLR Teams

✓ Full-mission (2018–2024) reprocessed and validated SO₂ products now available on CDSE.

This includes SO₂ Layer Height data sets for the first time in the official SO₂ product.

Complementarity with Sentinel-5

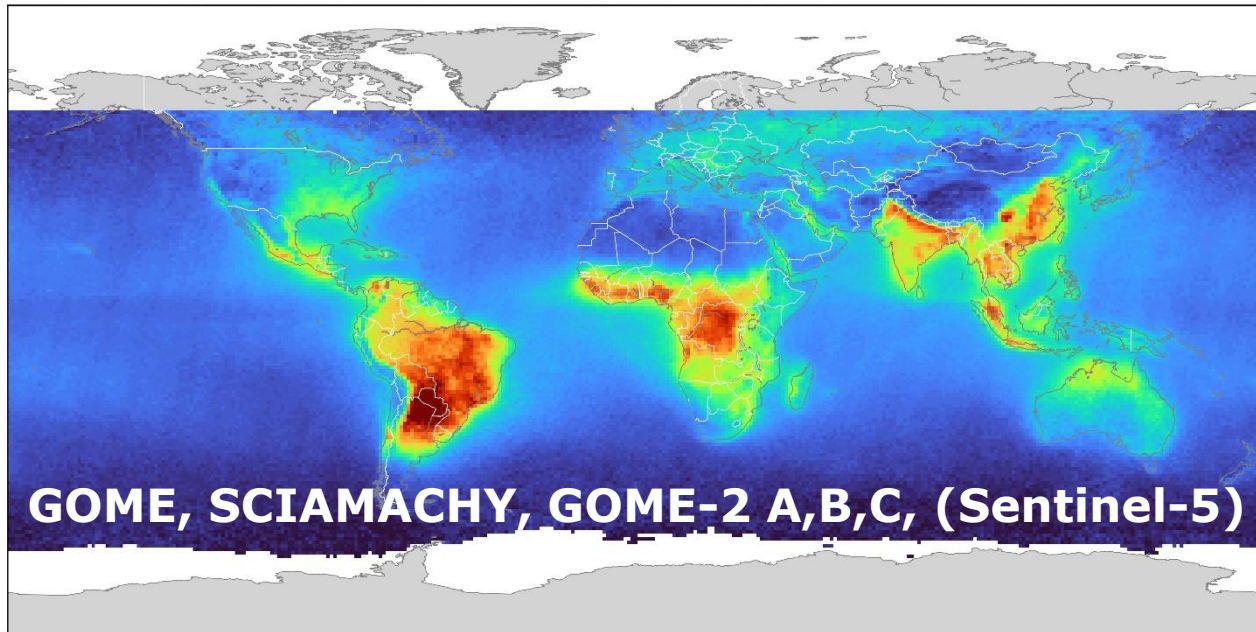


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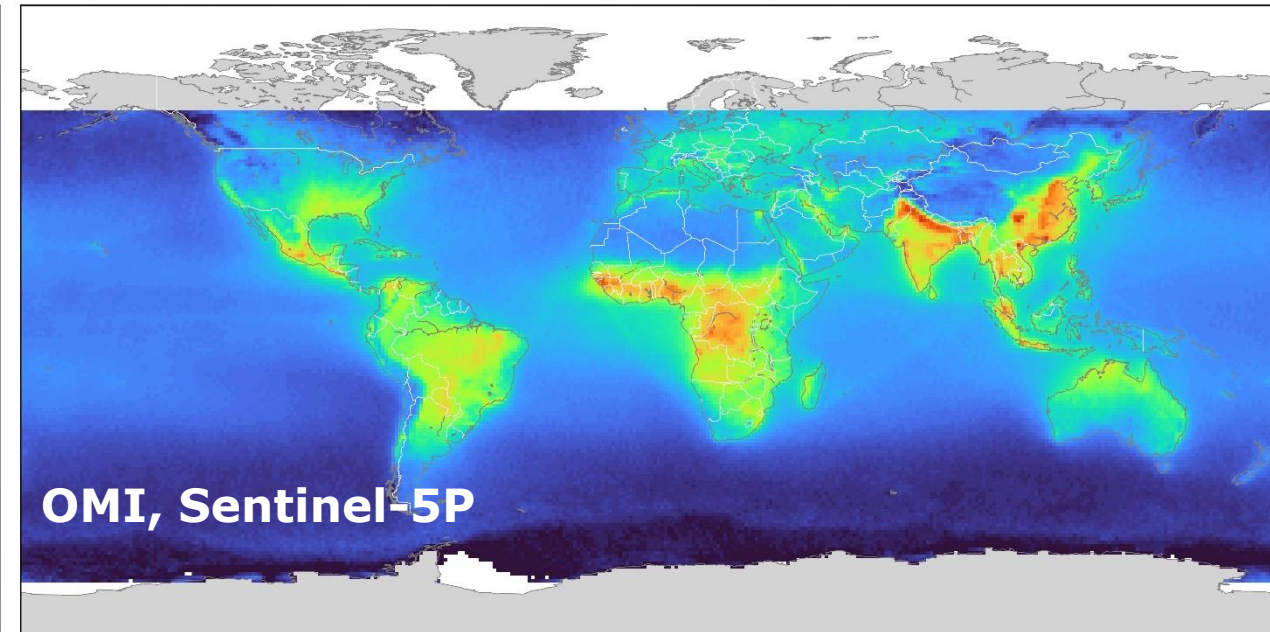
Morning CDR

Average of tropospheric_HCHO_column_number_density_clear [Pmolec/cm²] between 2005-01 and 2023-12



Afternoon CDR

Average of tropospheric_HCHO_column_number_density_clear [Pmolec/cm²] between 2005-01 and 2023-12



Credit: v. Roozendaal (BIRA-IASB)

Same period: 2005-2023
Same resolution = 1°

- Larger morning columns in South America & Africa
 - Good agreement in Asia
 - Larger afternoon columns in US/Europe
- ➔ simultaneous observations by S5P and S5 will provide a new insight in the diurnal variations of HCHO (and others).



→ THE EUROPEAN SPACE AGENCY

Sentinel-5P/TROPOMI is a **Game Changer** for atmospheric monitoring from Space:

- **Daily Global Coverage**
- Spatial Resolution of **5.5 x 3.5 km** (UV-VIS,NIR), **5.5 x 7.0 km** (SWIR)
- Excellent instrument sensitivity – **accuracy of products**
- **High number of products** (23 – Nitrous Acid (HONO) recently added to the S5P PAL portfolio)
- Key **Cal/Val contributions** to Sentinel-4/5
- **Synergistic** data exploitation with Sentinel-5 (morning/afternoon orbits)
- **Synergistic** data exploitation with Sentinel-4 (proven already with the GEMS mission)
- Excellent in orbit performance (limited number of anomalies, expected lifetime – including controlled de-orbiting - is **2033**)
- Continued evolution of algorithms and processors – next update planned for Q4 2026.