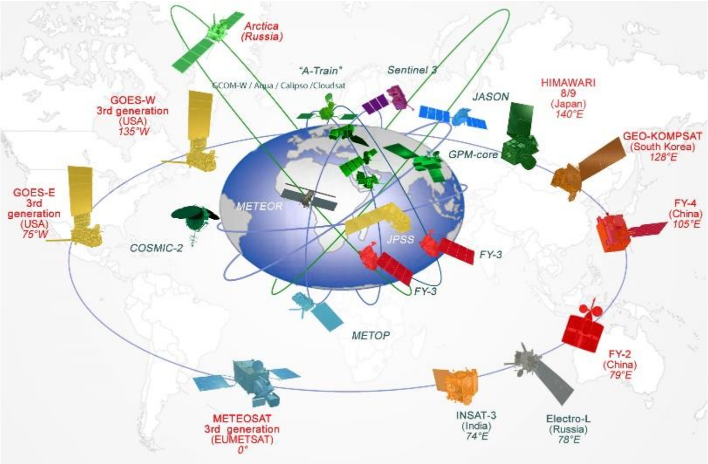


Agency highlights on GHG initiatives at the CGMS-49 WGII meeting

CGMS-49 plenary, agenda item 6

Coordination Group for Meteorological Satellites

CGMS

Supporting the implementation of the Paris Agreement throughout a sustained systematic observation of the climate system

Key topics

1. Improving GHG monitoring from space
2. Synergies and auxiliary observations
3. Supporting facilities

Improving GHG monitoring from space: today

CMA/CNSA

- TanSat XCO2 bias corrected products
- GHG in FY-3D Mission, GAS interferometer → CO2, CH4, NO2
- Gaofen-5 (GF-5) satellite as part of the China High-resolution Earth Observation System mission. Greenhouse Gas Monitoring Instrument - spectroscopy →CO2 and CH4.

JAXA

- A-decade-long GHG observation by Greenhouse gases Observing SATellite series: GOSAT (2009-now) & GOSAT-2 (2018-now) → CO2, CH4, CO

Roshydromet

- Retrieval of CO2 concentration in the atmosphere
- IKFS-2 Meteor-M N2 datadata

NASA

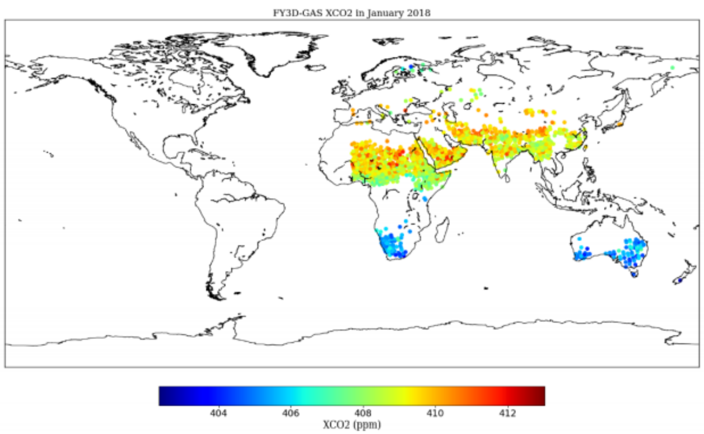
- Orbiting Carbon Observatory-2 (OCO-2) - first NASA satellite designed to measure atmospheric carbon dioxide (CO2) to detect CO2 sources and sinks
- Orbiting Carbon Observatory-3 (OCO-3) installed on the International Space Station (ISS) on 10 May 2019

ESA

- Sentinel 5P – TROPOMI

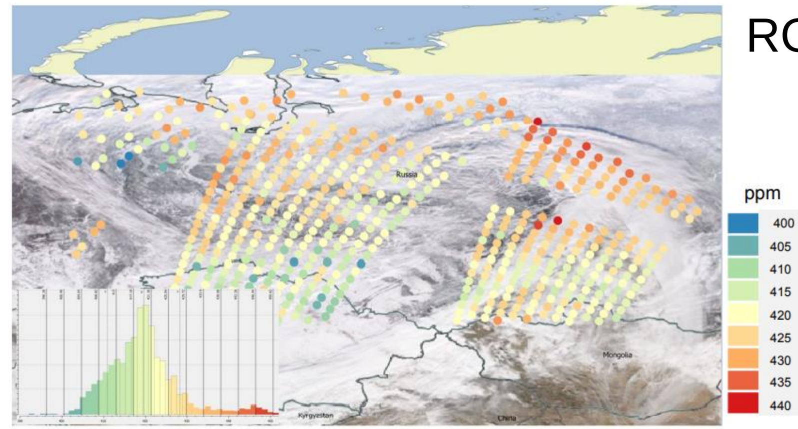
Improving GHG monitoring from space: today

CMA/CNSA



XCO2 by GAS in Jan 2018 (Ground based XCO2 from TCOON used for removing abnormal SNR in O2-A band, quality control and data verification is unfinished).

ROSHYD



Values of CO_2 concentration for the territory of Western and Eastern Siberia, 8 February 2021

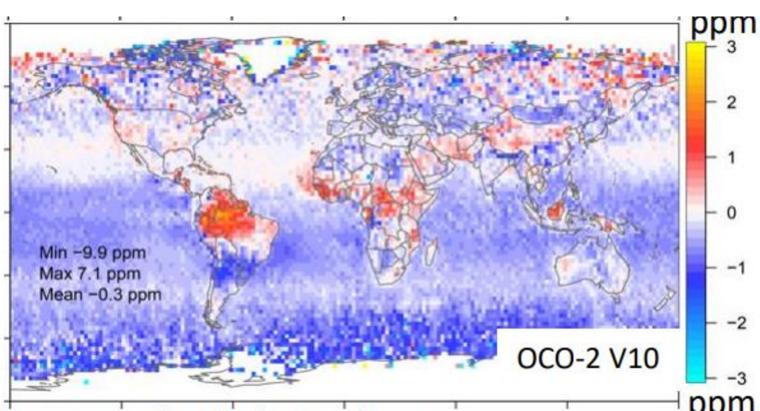
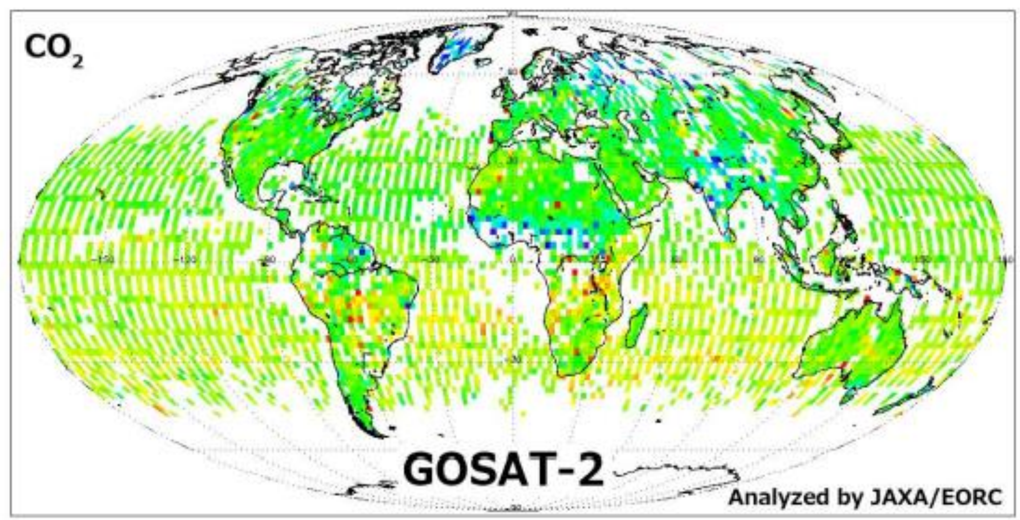


Image credit: Andy Jacobson.

NASA

JAXA



Improving GHG monitoring from space: tomorrow

Copernicus CO2M European Monitoring space mission (2025?) CO2, CH4, NO2, SIF

JAXA GOSAT-GW CO2 , CH4 , NO2 SIF(Solar-induced chlorophyll fluorescence) – 2023?

NASA GeoCarb Continental maps of CO2 , CH4 , CO – 2022/23?

CNES MicroCarb -atmospheric concentration of CO2 globally with a high degree of precision (on the order of 1 ppm) (2022/23?)

US MethaneSat development is funded by the Environmental Defense Fund and will track plumes from large point sources and urban centers (2022?)

MERLIN a French/German collaboration (Methane Remote Sensing Lidar Mission) with unique coverage for the nighttime Arctic and between clouds (2026?)

The GHGSat constellation is a private sector effort optimized for sampling large point sources (first sat launched in 2021)

Synergies and auxiliary observations

Existing capabilities

- Thermal-IR, Measurements of Opportunity → IASI, NOAA-SUOMI, AIRS
  - Combined thermal-IR and near-IR satellite measurements theoretically enable separation of boundary layer versus free-troposphere signals with rigorous data assimilation techniques
- Visible/UV spectrometer Air Quality and Aerosol data (see Joint WG2-3 report)
- Calibration coordination - GSICS

Future plans

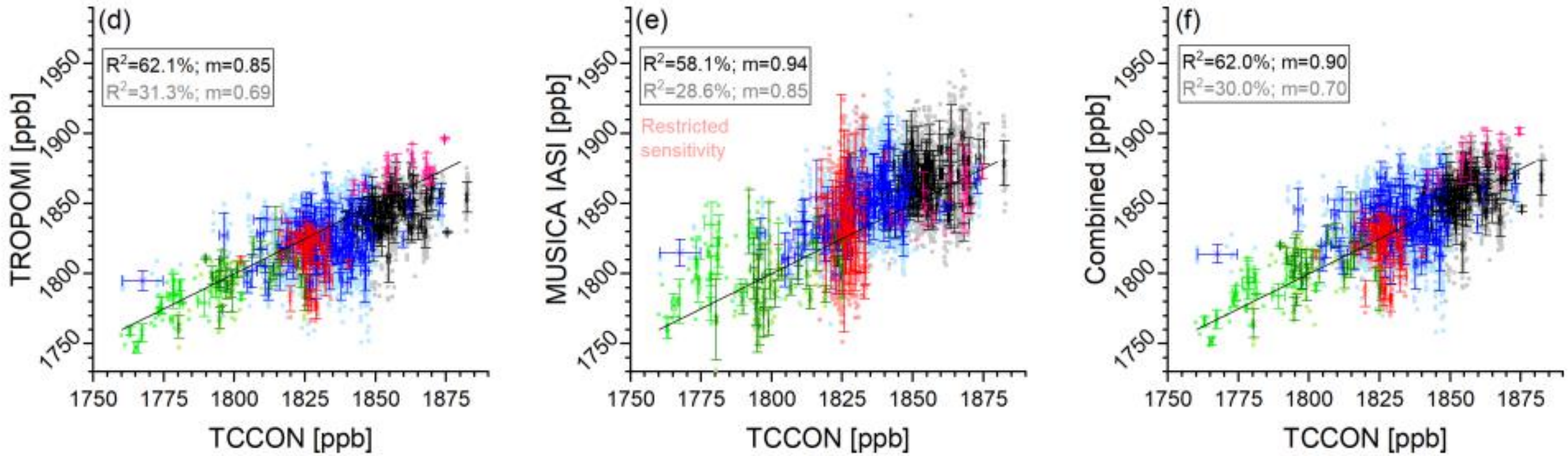
- Copernicus Sentinel-4 mission air quality parameters NO_2 (nitrogen dioxide) → Geostationary payload (2022-23)
- Copernicus Sentinel-5 mission, high resolution spectrometer system ultraviolet to shortwave infrared → CO, CH_4, air quality (NO2) 2023-24

Synergies and auxiliary observations

Thermal-IR: Measurements of Opportunity

Combined thermal-IR and near-IR satellite measurements theoretically enable separation of boundary layer versus free-troposphere signals with rigorous data assimilation techniques.

Methane Example



Matthias Schneider et al., Atmo Meas Tech 2021

Supporting facilities

- **Existing capabilities**
  - Data assimilation systems such as **NOAA's CarbonTracker** are used to estimate GHG emissions and removals.
  - **Copernicus CAMS** Greenhouse Gases Flux Inversions
  - **Jena CarboScope** provides CO2 flux estimates based on various types of measurements
  - **NASA mapper**
- **Requirements for an Expanded Global Greenhouse Gas Reference Network**
  - Ex. NOAA's Global Greenhouse Gas Reference Network provides extremely precise measurements of CO2 , CH4 , N2O and many other GHGs and process tracers.
  - Ex TCCON network of ground-based Fourier Transform Spectrometers → column-averaged abundance of CO2, CH4, N2O, HF, CO etc
  - International Coordination of in situ measurement efforts through WMO Global Atmosphere Watch

Key points

- Value of international coordination across CGMS and CEOS
- Strong integration between EO and Data Assimilation Systems
- Long term continuity of geostationary GHG monitoring capabilities – WGII and WGIII requested to address it
- Enhanced coordination towards Global Greenhouse Gas Reference Networks