CEOS-SIT-TW Side Meeting
GHG

Committee on
Earth Observation Satellites

WGCV for the CEOS GHG task team

17th October 2023

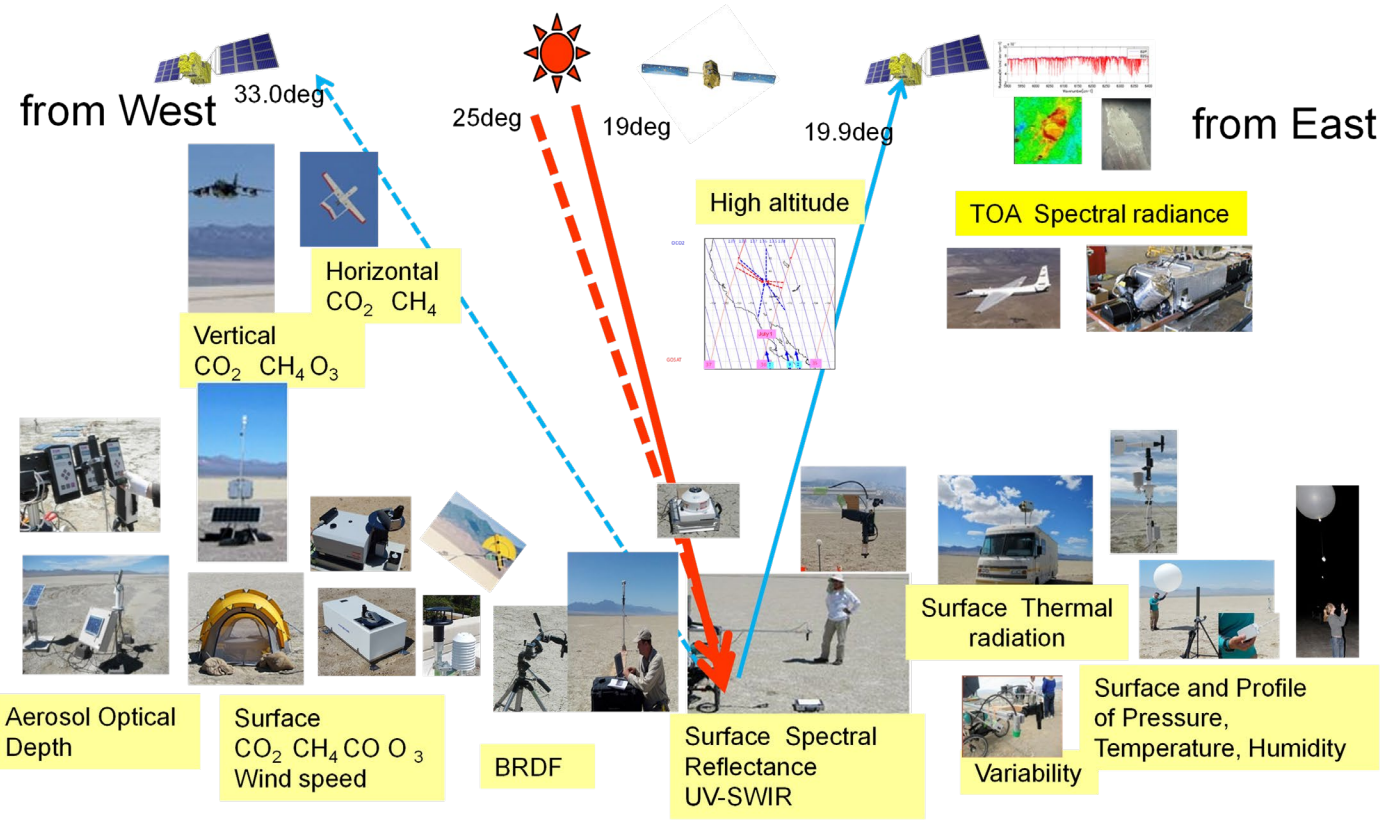
Cal-VAL related meetings

1. International Coordination Workshop on Detection of Anthropogenic Methane Emissions from High-Resolution Satellites 7 – 8 June 2023 – Harvard University, the UNEP International Methane Emissions Observatory (IMEO), in collaboration CEOS and with support from the Global Methane Hub
2. NDACC-IRWG / TCCON / COCCON annual meeting hosted by the Royal Belgian Institute for Space Aeronomy (BIRA-IASB) June 12-16.
3. CGMS plenary and GSICS June 29-30 in Tokyo hosted by JMA and JAXA
4. 15th Joint vicarious calibration in Railroad Valley, NV between June 27 and July 2. (preparing a joint paper)
5. 19th IWGGMS meeting July 4-6 in Paris hosted by CNES
6. OCO-TROPOMI-GOSAT Calibration Team Meeting #8, September 15 , WEBEX
7. ACVC and WGCV joint meeting in Brussel Oct. 23-27
8. GSISCS/WGCV-IVOS Lunar calibration workshop (Several GHG related presentations) hosted by EUMETSAT, Dec. 4-8.
9. CEOS Preflight Calibration workshop, Nov. 19-21, 2024

Validation: NDACC-IRWG / TCCON / COCCON Draft Actions

1. **NETWORKS DESIGN AND EVOLUTION:** to support gap analysis studies with a view to tailoring existing monitoring networks to the Cal/Val needs of the GHG satellite constellation: land/ocean, low/high albedo…
2. **INSTRUMENT DEPLOYMENT:** (i) to further develop low-cost LR FTIR instruments; (ii) to support standardized production of enclosures for their deployment in the field; (iii) to maintain a supply of spare parts.
3. **CALIBRATION:** to support the development of and maintain mutually consistent calibration and QA/QC of the GHG networks. Key actions: (i) more regular and network-wide deployment of traveling standard; (ii) facilitate AirCore deployment; (iii) establish a central AirCore data archive.
4. **DATA PROCESSING:** to support GHG Cal/Val network data processing improvements needed to maintain FTIR data precision/accuracy and meet future goals: formal intercomparison exercise of the GGG and PROFFAST retrieval algorithms, development and standardization of profile retrievals, spectroscopy studies.
5. **DATA ACCESS:** to establish a central GHG Constellation Cal/Val data archive of tailored network data (co-located, traceable, metadata…) and 'hidden' data (e.g. campaigns)
6. **TIMELINESS:** to organize concertation between stakeholders and with networks data providers to support rapid and continuous availability and improved access to networks-wide GHG data.
7. **CENTRAL PROCESSING FACILITY (CPF):** to establish a central processing facility for network data which will directly support harmonized calibration **(3)**, data processing, QA/QC and tailoring **(4-5)** and timeliness **(6)**.
8. **GHG EMISSIONS AND ATTRIBUTION:** to support the development of new protocols for the Cal/Val of satellite derived GHG emissions, in collaboration with relevant bodies and initiatives (IMEO, global stocktakes, New Space) Consider co-located measurements of GHG and AQ data for better attribution.

Joint Campaign: Free and Open calibration and validation data for multiple satellites



GOSAT · OCO-2 · TROPOMI · OCO-3 · GOSAT-2

https://www.eorc.jaxa.jp/GOSAT/GHGs_Vical/index.html

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- Every year in June, 5 US-Europe-Japan sensors target the Railroad Valley (RRV) desert playa, in Nevada.
- RRV2023 campaign added polarization measurements to estimate uncertainties in surface reflectance.
- From next year TEMPO from the geostationary orbit will be added. New Space Sensors are welcome.

GHG Task Team: Status of updating the Annex C in CAL-VAL

1. There is no perfect instrument. But the updated GOSAT L1 and L2 products are providing 14-year, wide spectral range, CO_2 and CH_4 with partial column densities (related to CV1)
2. Current issues on lunar calibration database for high resolution SWR spectrometers (related to CV-2)
3. GEO TEMPO (SIF, NO2) will join the intercomparison (CV-3)
4. Intercomparison of calibrated radiance spectra with a common forward model and data base such as TSIS (CV-4)
5. NDACC / TCCON / COCCON meeting identified “as it is” and “issues” of data, coverage, and quality. (CV-5)
6. GHG VCAL meeting with OCO-SP5-GOSAT and Future missions, GSICS, has been discussing the following items. (Related to Annex C CV-6 and 7）(7th April 2023, 8th, Sep. 15, 9th Jan. 19, 2024) The analytical results of joint campaigns to be uploaded to the COES GHG VCAL portal prepared by JAXA.

CV-1 Address existing CEOS Action by Q1 2020 on “Greenhouse gas reference standards for interoperability”: Develop a list of reference standards for CO_2 and CH_4 products that are suitable for use in inter-comparison of multiple missions.
CV-2 Identify the current shortcomings/gaps/sustainability in GHG calibration and validation capabilities, and formulate recommendations on the medium- to long-term way forward, that is with a specific focus on GHG Fiducial Reference Measurement (FRM).
CV-3 Identify gaps and suggest improvements in the inter-calibration of a future LEO/GEO constellation of GHG sensors
CV-4 Define protocols for comparing and validating GHG retrieval algorithms
CV-5 Identify gaps and suggest improvements in ground-based and airborne validation infrastructure (i.e. geographical/geophysical gaps for FRM) and other long-term validation needs (at horizon 2025-on).
CV-6 Work towards an operational reporting on the quality of space-borne GHG measurements and the underlying calibration and validation infrastructure.
CV-7 Identify a repository for hosting quality-controlled CO2 and CH4 products - see Rec#13: CEOS and CGMS agencies should consider a [centralized or possibly geographically distributed] repository for hosting quality-controlled CO_2 and CH4 products, with internal capability for product inter-comparison