

15th International Workshop on Greenhouse Gas Measurements from Space

June 3 (Mon) – 5 (Wed), 2019

The Frontier Research in Applied Sciences Building, Sapporo Campus,

Hokkaido University

Sapporo, Hokkaido, Japan

Oral Sessions: 2F Lecture Hall

Poster Sessions: 2F Foyer

Agenda

Day 1 (June 3 (Mon), 2019)

8:30 – 9:00 Registration

9:00 – 9:05 Opening Remarks (M. Nakajima, JAXA, Japan)

9:05 – 9:15 Logistics (T. Matsunaga, NIES, Japan, and K. Shiomi, JAXA, Japan)

9:15 – 10:15 Session 1 “Ongoing and Near-term Satellite Missions and Calibration”
[Chair : T. Yokota (NIES, Japan) and D. Crisp (JPL, US)]

1. Sentinel-5 Precursor Mission: Status and Results about the Methane, Nitrogen Dioxide, Cloud & Aerosol Information products (C. Zehner, ESA)
2. TROPOMI Methane, Water Vapor Isotopologue and Carbon Monoxide Total Column Measurements at Unprecedented Temporal and Spatial Resolution: Validation Results and Applications (J. Landgraf, SRON, Netherland)
3. Monitoring Global Carbon Dioxide from Space: the TanSat Mission and Carbon Flux Investigation Study in China (Y. Liu, IAP, CAS, China)
4. In-Flight Performance of the TanSat Atmospheric Carbon Dioxide Grating Spectrometer (Z. D. Yang, NSMC, CMA, China)

10:15 – 10:45 Coffee Break and Group Photo

10:45 – 11:45 Session 1 (Continued)

5. High-Resolution CH₄ Observations with GHGSat: Plume Detections with GHGSat-D and Next-Generation Satellite Characterization Results (D. Jervis, GHGSat, Canada)
6. Toward 20-year GHG Monitoring from Space by GOSAT: Operation, Calibration, Level 1 Dataset, Research Product, and Analytical Tools (A. Kuze, JAXA, Japan)
7. The Status and the Future Plan of GOSAT / GOSAT-2 Level 2 and 4 Products (T. Matsunaga, NIES, Japan)
8. The OCO-3 Mission: Measuring Carbon Dioxide from the International Space Station - Mission Goals and Instrument Status (A. Eldering, JPL, US)

11:45 – 13:15 Lunch Break

13:15 – 14:45 Session 2 “Retrieval Algorithms and Uncertainty Quantification”
[Chair : Y. Yoshida (NIES, Japan) and H. Irie (Chiba Univ., Japan)]

1. Accelerated MCMC for OCO-2’s CO₂ Retrieval (O. Lamminpää, FMI, Finland)
2. Recent Progress of GOSAT and GOSAT-2 SWIR L2 Products (Y. Yoshida, NIES, Japan)
3. PPDF-based Method to Account for Atmospheric Light Scattering in Spectroscopic Observations of Greenhouse Gases from Space: Basic Principles, Validation, and Comparison with Other Algorithms (S. Oshchepkov, INM, Belarus)
4. Errors in Retrieved Gases and Inferred Fluxes Arising from Non-uniform Scene Illumination: A Case Study for the GeoCarb Mission (S. Crowell, Univ. Oklahoma, US, on behalf of J. Nivitanont, Univ. Oklahoma, US)
5. Generation of Merged Level 2 and Level 3 XCO₂ Data Products from SCIAMACHY/ENVISAT, GOSAT and OCO-2 for the Copernicus Climate Change Service (M. Buchwitz, Univ. Bremen, Germany)
6. Retrieval of Aerosol Optical Properties Using GOSAT/TANSO-CAI and GOSAT2/TANSO-CAI2 Measurements over the Ocean (C. Shi, JAXA, Japan)

14:45 – 15:15 Coffee Break

15:15 – 16:45 Session 2 (Continued)

7. Efficient Multiscale Gaussian Process Regression for Remote Sensing Data (J. Susiluoto, MIT, US)
8. Detecting Methane Point Sources from Space Using Hyperspectral Surface Imagers (D. H. Cusworth, JPL, US)
9. Information Content of Methane Flux Estimates from Joint AIRS and GOSAT Lower-Troposphere Methane Retrievals (J. Worden, JPL, US)
10. Updates on AIRS CH₄ and N₂O Retrievals (J. Warner, Univ. Maryland, US)
11. Detection of XCO₂ Anomaly Changes in Space and Time at a Global (S. Zhang, CAS, China)
12. A Spectral-sorting Approach for Constraining Coastal Aerosol Profile Using OCO-2 O₂A Measurements (D. Crisp, JPL, US, on behalf of Z. C. Zeng, Caltech, US)

17:30 – 19:30 Ice Breaker at “Hokubu Shokudo” Cafeteria, Welfare Facilities, Hokkaido University.

Day 2 (June 4 (Tue), 2019)

8:30 – 9:00 Registration

9:00 – 10:15 Session 3 “Validation and Supporting Observations”

[Chair : I. Morino (NIES, Japan) and K. Shiomi (JAXA, Japan)]

1. First Validation Results of the Sentinel-5P Methane Using Global TCCON and NDACC-IRWG Data (M. K. Sha, BIRA-IASB, Belgium)
2. Evaluation of Greenhouse Gas Satellite Observations at High Northern Latitudes (H. Lindqvist, FMI, Finland)
3. GOSAT Observations of Tropospheric CO₂ and CH₄ Concentrations over Permafrost Regions and Comparison with In situ Measurements of the ASCENDS/ABOVE 2017 Airborne Science Campaign (N. Kikuchi, JAXA, Japan)
4. Real or Spurious? An Examination of the OCO-2 Version 9 XCO₂ Data Set, and Curious Features Therein (C. O'Dell, CSU, US)
5. A First Step Toward the Validation of the Merlin Satellite Mission: Magic Campaigns and Spatiotemporal Variability of Methane (C. Bès, CNES, France)

10:15 – 10:45 Coffee Break

10:45 – 11:00 Invited Lecture [Chair : K. Shiomi (JAXA, Japan)]

Introduction to Hokkaido University (A. Konno, Hokkaido Univ., Japan)

11:00 – 11:30 Session 4 “Flux Inversions from Space-based Greenhouse Gas Measurements” [Chair : S. Maksyutov (NIES, Japan) and T. Saeki (NIES, Japan)]

1. Ongoing Efforts to Develop Top-Down Atmospheric Flux Inventories for CO₂ and CH₄ (D. Crisp, JPL, US)
2. CO₂ Inverse Modeling with Satellite XCO₂ Retrievals, Ground-based Observations and High-resolution Tracer Transport (S. Maksyutov, NIES, Japan)

11:30 – 12:30 Lunch Break

12:30 – 13:45 Poster Session (1)

13:45 – 15:00 Session 4 (Continued)

3. Constructing a Carbon Flux Estimation System with Bias Corrected Satellite Data (T. Maki, JMA/MRI, Japan)
4. Global and Regional Methane Budgets Derived from GOSAT Retrievals and Ground-based Observations Using CTE-CH₄ Atmospheric Inverse Model (A. Tsuruta, FMI, Finland)
5. Constraining Carbon Fluxes in Northern Regions by Combining Constraints from Multiple Atmospheric CO₂ Observing Systems (B. Byrne, JPL, US)
6. Resolving the Information in Large-scale Inversions: Application to CMS-Flux (K. Bowman, JPL, US)
7. Exploring Constraints on a Wetland Methane Emission Ensemble with GOSAT (R. J. Parker, Univ. Leicester, UK)

15:00 – 15:30 Coffee Break

15:30 – 16:45 Session 4 (Continued)

8. Difference of Detecting Anthropogenic CO₂ Emission by GOSAT and OCO-2 Observations in China (M. Sheng, CAS, China)
9. The Potential of the XCO₂ High Resolution Imagery for the Monitoring of CO₂ Emissions from Large Cities and Industrial Plants: An Overview of the Studies at LSCE (G. Broquet, LSCE, France)
10. Plume Detection and Characterization from XCO₂ Imagery: Potential of Gaussian Methods for Analyzing and Estimating Plant and City Fluxes in the Context of MicroCarb and GeoCarb (C. Camy-Peyret, IPSL, France)
11. Quantifying Methane Emissions from Individual Coal Mine Vents with GHGSat-D Satellite Observations (D. J. Varon, Harvard Univ., US)
12. Trends and Interannual Variation of African CH₄ Fluxes Inferred from GOSAT XCH₄ Retrievals (L. Feng, Univ. Edinburgh, UK)

Day 3 (June 5 (Wed), 2019)

8:30 – 9:00 Registration

9:00 – 10:15 Session 5 “Solar-induced Chlorophyll Fluorescence (SIF)” and Session 6 “Related Ground-based, Ship-borne, and Air-borne Measurements” [Chair : H. M. Noda (NIES, Japan) and A. Kuze (JAXA, Japan)]

1. Solar-induced Chlorophyll Fluorescence from the Geostationary geoCARB Instrument (P. Somkuti, CSU, US)
2. Seasonal Trends of GOSAT-SIF in Temperate Vegetations (H. M. Noda, NIES, Japan)
3. What Can We Learn About Effectiveness of Carbon Reduction Policies from Interannual Variability of Carbon Emissions? Applying ODIAC Emission Estimates from East Asia of the 2010s (L. D. Labzovskii, NIMS, Korea)
4. The COllaborative Carbon Column Observing Network (COCCON): Overview and Current Status (M. Frey, KIT, Germany)
5. Airborne Demonstration of Atmospheric CO₂ Concentration Measurements with a Pulsed Multi-wavelength IPDA Lidar (J. Mao, Univ. Maryland, US)

10:15 – 10:30 Coffee Break

10:30 – 11:15 Session 6 (Continued)

6. Characterization of Aerosol Absorption over South Asia Based on Multi-platform Measurements and CAI-2 Retrieval of AOD and Soot Volume Fraction (M. M. Gogoi, ISRO, India)
7. Low-resolution FTIR Spectrometers Supplementing TCCON for the Validation of Space-borne Observations of Greenhouse Gases (CO₂, CH₄) and CO (M. K. Sha, Royal Belgian Institute for Space Aeronomy, Belgium)
8. Development of MRV system of Methane emissions from rice paddies in the Mekong delta (H. Arai, Univ. Tokyo, Japan)

11:15 – 11:45 Session 7 “Status of Future Satellite Missions about GHG Monitoring” [Chair : Y. Honda (Chiba Univ., Japan), M. Nakajima (JAXA, Japan), and A. Eldering (JPL, US)]

1. The Evolving Space-based Greenhouse Gas Measurement Fleet (D. Crisp, JPL, US)
2. NASA’s Plans for Greenhouse Gas Observations from Space (K. Jucks, NASA, US)

11:45 – 12:45 Lunch Break

12:45 – 14:00 Poster Session (2)

14:00 – 15:00 Session 7 (Continued)

3. The GeoCarb Mission (B. Moore, Univ. Oklahoma, US)
4. The MicroCarb Project: Recent Achievements and Review of the Project Status (F. Buisson, CNES, France)
5. The MicroCarb L1 & L2 Products (D. Jouget, CNES, France)
6. Anthropogenic CO₂ Monitoring with the European Candidate Copernicus Mission (T. Fehr, ESA, on behalf of Y. Meijer, ESA)

15:00 – 15:30 Coffee Break

15:30 – 16:30 Session 7 (Continued)

7. EUMETSAT’s Contribution to the CO₂M Mission; Continuous Operations, Processing, Monitoring, and Cal/Val (R. Lang, EUMETSAT)
8. AIM-North: The Atmospheric Imaging Mission for Northern Regions (J. Mendonca, ECCC, Canada, on behalf of R. Nassar, ECCC, Canada)
9. Development and Field Validation of the PanFTS Instrument for Geostationary Measurements of GHGs, Trace Gases and SIF (D. Crisp, JPL, US, on behalf of S. Sander, JPL, US)
10. Measuring Carbon Dioxide from Space Using Lidar: Status and Updates from the NASA ASCENDS Development Activity (K. Jucks, NASA, US, on behalf of S. R. Kawa, NASA, US)

16:30 – 16:40 Announcement of IWGGMS-16 (R. Lang, EUMETSAT)

16:40 – 16:45 Closing Remarks (M. Oi, MOE, Japan)

Poster Sessions

Poster presenters should be present by your posters to answer questions about half of the poster session time, at least.

Poster Session 1 (Day 2 (June 4, 2019) 12:30 - 13:45)

Topic 1. Ongoing and Near-term Satellite Missions and Calibration

1. Spectral-radiance Inter-comparison between GOSAT/FTS, GOSAT-2/FTS-2, and OCO-2 (F. Kataoka, RESTEC, Japan)
2. Atmospheric Variations in Column Integrated CO₂ On Synoptic and Seasonal Time Scales Over the U.S. (Q. Wang, Univ. Oklahoma, US)
3. Sensitivity Evaluation of TANSO-FTS/GOSAT Using Principal Component Analysis (Y. Someya, NIES, Japan)
4. GOSAT-2 Cal/Val Phase Operation Plan for Ensuring the Consistency with GOSAT (K. Shiomi, JAXA, Japan)
5. The Ability of GeoCarb to Constrain the Interannual Variability of Carbon Gases over the Amazon (B. Weir, USRA, US)
6. Progress in Atmospheric Carbon Monitoring Using NASA's Goddard Earth Observing System (GEOS) Model and Data from the OCO and GOSAT Missions (B. Weir, USRA, US)
7. The OCO-3 Mission: Global Observations of CO₂ and Solar-Induced Fluorescence from the International Space Station - Snapshot Area Map and Target Mode Observations (T. Kurosu, JPL, US)

Topic 2. Retrieval Algorithms and Uncertainty Quantification

8. Exploring Improvements to the Aerosol Parameterization in the OCO-2 XCO₂ Retrieval Algorithm (R. R. Nelson, JPL, US)
9. Validation of Cloud Judgements in TANSO-FTS FOVs by Using Himawari-8/AHI Data (K. Kitamura, Chiba Univ., Japan)
10. Carbon Dioxide Enhancement over Seoul from Space and Surface Measurements (C. Park, Seoul National Univ., Korea)
11. Regeneration of CO₂ Satellite Column Data Tailored to an Atmospheric Inversion Scheme (A. Webb, Univ. Leicester, UK)
14. Characterization of OCO-2 and ACOS-GOSAT Biases and Errors for Flux Estimates (S. Kulawik, BAER Inst., US)
15. Observing Patterns of Greenhouse Gases and Pollutants Across Cities Using Satellite Data (H. Park, Seoul National Univ., Korea)
16. Preliminary Results from the ESA CH₄TIR Project: Spectroscopy and Forward Model Error Improvement for CH₄ Retrieval in the TIR (C. E. Robert, IASB-BIRA, Belgium)
17. GOSAT-2/TANSO-CAI-2 and the Aerosol Product (M. Hashimoto, JAXA, Japan)
18. Assessing OCO-2 Northern High Latitude XCO₂ Retrievals Over Snow (J. Mendonca, ECCO, Canada)
19. A Journey of the OCO-2 XCO₂ Data Set from Version 9 to Version 10: the ACOS Retrieval Algorithm Validation (L. Kuai, JPL, US)
20. TanSat XCO₂ Retrieval, Inter-comparison and Validation (D. Yang, Univ. Leicester, UK)
21. Observing Water Vapour in the Planetary Boundary Layer from the Short-Wave Infrared (T. Trent, Univ. Leicester, UK)

- 22. Improvement and Application of PPDF-S Method for Retrieving XCO₂ over Aerosol Dense Areas (C. Iwasaki, Univ. Tokyo, Japan)
- 28. Variation of Carbon Dioxide at Upper Troposphere / Lower Stratosphere Derived from GOSAT TANSO-FTS TIR (A. Honda, Kyushu Univ., Japan)
- 57. Simulation-retrieval Experiments over the Western Hemisphere with the GeoCarb Greenhouse Gas Retrieval Algorithm (G. McGarragh, Colorado State Univ., US)

Topic 3. Validation and Supporting Observations

- 23. Variations in CO₂ and CH₄ in Upper Atmosphere: the Effects of Biomass Burning and Asian Monsoon Transport Inferred from GOSAT/TANSO-FTS TIR Data (N. Saitoh, Chiba Univ., Japan)
- 24. Greenhouse Gas Measurements at the Sodankyla; TCCON Site and Comparisons with the Satellite Borne Observations (R. Kivi, FMI, Finland)
- 25. Profiles of Greenhouse Gases Measured in the 2018 STEAM Field Campaign (Z. Cai, CAS, China)
- 26. Seasonal and Diurnal Opportunities for XCH₄, XCO₂, and XCO for the Amazonian Rainforest Region Allowing Sampling and Validation (R. Chatfield, NASA, US)
- 27. Progress on Validation of the GOSAT and GOSAT-2 FTS SWIR L2 Products (I. Morino, NIES, Japan)

Poster Session 2 (Day 3 (June 5, 2019) 12:45 - 14:00)

Topic 2. Retrieval Algorithms and Uncertainty Quantification

- 29. Validating Ratio Component XCH₄/XCO₂ of GOSAT Proxy Retrieval of Methane (H. Oshio, NIES, Japan)

Topic 4. Flux Inversions from Space-based Greenhouse Gas Measurements

- 30. Comparison between MOPITT and OCO-2 Flux Inversions: Analyze of CO-CO₂ Correlation (H. Peiro, Univ. Oklahoma, US)
- 31. What Biogeochemical Processes Drive the Large Decrease of Atmospheric CO₂ Growth Rate in 2017? (J. Liu, JPL, US)
- 32. Characteristics of Atmospheric Carbon Dioxide Concentrations Based on GOSAT and Its Relations to Biomass Burning in China (Y. Shi, CAS, China)
- 33. Mesoscale Atmospheric Inversion of the CO₂ Natural Fluxes in Amazonia Using GeoCarb and MicroCarb Data (S. K. Singh, LSCE, France)
- 34. Assessing Errors and Uncertainties in a Global, High-resolution, Fossil-fuel CO₂ Emission Dataset (T. Oda, NASA, US)
- 35. Solving Methane Fluxes at Northern Latitudes using Atmospheric and Soil Earth Observations Data (H. Lindqvist, FMI, Finland)
- 36. Relationship between Methane Enhancements Observed by GOSAT and Country Scale Anthropogenic Emissions in Asia (R. Janardanan, NIES, Japan)
- 37. Characterizing and Mitigating the Impact of Model Transport Errors on CO₂ Flux Estimates in the Assimilation of XCO₂ Data from OCO-2 (D. Jones, Univ. Toronto, Canada)
- 38. The Seasonal and Inter-annual Variations of Regional CO₂ and CH₄ Fluxes Estimated from GOSAT Data (H. Takagi, NIES, Japan)
- 39. Comparing National Methane Emissions Inventories with Estimates by the Global High-resolution Inverse Model (F. Wang, NIES, Japan)

40. Inverse Modeling of Anthropogenic Methane Emissions Based on Ground-based Monitoring and GOSAT Satellite Retrievals (A. Tsuruta, FMI, Finland)

Topic 5. Solar-Induced Chlorophyll Fluorescence (SIF)

41. Retrieval of Solar-induced Chlorophyll Fluorescence from TanSat Space Measurements (L. Yao, CAS, China)
42. Long-term Evaluation of Zero-level Offset in GOSAT FTS O₂ A-band and Consistency of the Derived SIF with OCO-2 SIF (H. Oshio, NIES, Japan)
43. Assessing the Temporal Dynamics of Satellite-derived Photochemical Reflectance Index (PRI) and Solar-induced Fluorescence (SIF) in Climate-changing Mongolia (T. Kiyono, NIES, Japan)
44. Solar induced Fluorescence (SIF) Mapping from the Copernicus Anthropogenic CO₂ Monitoring Mission (H. Boesch, Univ. Leicester, UK)
45. Implementing SIF Estimation Process to the Terrestrial Ecosystem Model VISIT and Applying the Radiation Transfer Model (T. Miyauchi, NIES, Japan)

Topic 6. Related Ground-based, Ship-borne, and Air-borne Measurements

46. Methane Isotopologue Parameter Assessment of Multiple Spectral Databases Using TCCON (E. Malina, ESA)
47. In situ Measurement of Vertical Distribution of CO₂ and CH₄ in the Troposphere by Aircraft and Tethered Balloon (X. Sun, CAS, China)
48. Measuring In-situ CO₂ Profile and Comparison with Satellites and Model (Y. Yi, CAS, China)
49. Provision of GOSAT Data from the WDCGG Website (A. Kinoshita, JMA, Japan)
50. Intercomparison of XCO₂, XCH₄, XCO Measurements Using EM27/SUN and IFS125HR in Xianghe (K. Che, CAS, China)
51. Towards Tracking East Asian Transport of Pollution Using the Burgos TCCON Site and the GOSAT Series Satellites (V. A. Velazco, Univ. Wollongong, Australia)
52. Intercomparison between TCCON XCO₂ and XCH₄ data in Japan and Philippines via a Portable Fourier Transform Spectrometer (H. Ohyama, NIES, Japan)
53. Ground-based Measurement of Solar-induced Chlorophyll Fluorescence with High-resolution Spectrum in Paddy Field Ecosystem, Japan (K. Buareal, Hokkaido Univ., Japan)
54. Quick Look Algorithm for GHG Source Detection by Using Airborne Imaging Spectrometer Suite (T. Kawashima, RESTEC, Japan)

Topic 7. Status of Future Satellite Missions about GHG Monitoring

55. A Multi-wavelength Integrated Path Differential Absorption Lidar to Measure XCO₂ from Space: Status (J. B. Abshire, NASA, US)
56. NASA's Carbon Cycle OSSE Initiative - Informing future space-based observing strategies through advanced modeling and data assimilation (L. Ott, NASA, US)