The 21st meeting of the CEOS Atmospheric Composition Virtual Constellation (AC-VC), held on 9-13 June 2025 in Takamatsu, Japan, is kindly hosted by the National Institute for Environmental Studies (NIES) of Japan.

The meeting is jointly set up with the 21st International Workshop on Greenhouse Gas Measurements from Space (IWGGMS-21) and the Atmospheric Composition Sub-Group of the CEOS Working Group on Calibration and Validation (WGCV-ASCG).

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| **Date** | **Room** | **IWGGMS** | **AC-VC** | **WGCV-ACSG** |
| Mon 09 June | Kagawa International Conference Hall | 1 GHG Missions Overview |  |
| Tue 10 June | Small Hall 1/ Sunport Hall Takamatsu |  | 2 Tropospheric Ozone |
| Wed 11 June | Small Hall 1/ Sunport Hall Takamatsu |  | 3 AQ Trace Gases |
| Thu 12 June | Small Hall 1/ Sunport Hall Takamatsu |  | 4 AQ aerosol  |
| Thu 12 June | Small Hall 1/ Sunport Hall Takamatsu |  | 5 General Discussion |
| Fri 13 June | Shoko-Shorei-Kan Hall, Ritsurin Garden |  | 6 GHG |
| Fri 13 June | Shoko-Shorei-Kan Hall, Ritsurin Garden |  | 7 AC-VC Wrap Up |  |

The Session 1 covering GHG Missions Overview is set up jointly with the IWGGMS and will be held in the Kagawa International Conference Hall in the Takamatsu Symbol Tower, on the 6th floor. The Session 1 agenda can be found at

<https://www.nies.go.jp/soc/en/events/iwggms21/acvc21/index.html>

The Sessions 2, 3, 4 and 6 cover the AC-VC activity areas including greenhouse gases, air quality trace gases and aerosol, and ozone. Related presentations and discussions on Cal/Val are planned jointly with the WGCV-ASCG. These sessions will be held in the Small Hall 1 at the Sunport Hall Takamatsu, in the Takamatsu Symbol Tower (Hall building), on the 4th floor. The detailed agenda for Sessions 2 to 7 is given at the end of this document.

# Remote Connection

The AC-VC#21 is set up as a hybrid meeting. **The meeting link for remote participation will be distributed to registered participants.**

Remotely connected participants are kindly requested to

* Join using an accurate name using the convention: Given\_name Family\_name (organization\_acronym).
* Raise your hand or send a chat message if you have comments or questions.
* Stay muted unless invited to speak and switch off your video connection.

Remotely connected speakers are kindly requested to

* Upload your presentation prior to the meeting.
* Connect early to resolve potential technical issues. The meeting will be started 15 minutes before the scheduled start time each day.
* The slides will be presented from a local device. The presenter navigates by requesting “next slide” etc.
* Keep the allocated presentation time and respect the time keeping warnings (“one minute” etc.) by the organisers.

The meeting will not be recorded. The chat logs will be saved and used to prepare meeting minutes.

# Upload Presentations and Material

All presenters are asked to upload presentation (and background material that may be linked to speed talks for off-line viewing) **by Friday 30 May**. Please upload your presentations and material to the shared drive. The detailed information will be provided later by email. **The link to upload slides will be distributed to registered participants.**

In case you encounter problems with the uploading, please email your material to the session chairs (John Worden for GHG, Ben Veihelmann for AQ trace gas, Diego Loyola for O3, Shobha Kondragunta for AQ aerosol, Hiroshi Tanimoto for the general discussion topics).

Please name the presentations using the convention:

***AC-VC\_Talk-ID\_Last-Name\_version-number.pptx (or .pdf as appropriate)***

taking the **Talk-ID from the meeting agenda**. For background material please apply the same naming convention and append 'background' (such that presented material and background material are unambiguously linked).

Please note that Speed Talks of 3 min should be limited two slides. You are encouraged to refer to background material for off-line viewing.

Agenda and presentations will be made available on the meeting websites <https://ceos.org/meetings/ac-vc-21/>

# Questions

Should you have any questions at all, please contact the leadership team by email:

* Barry Lefer barry.lefer@nasa.gov
* Ben Veihelmann ben.veihelmann@esa.int
* Hiroshi Tanimoto tanimoto@nies.go.jp
* Shobha Kondragunta shobha.kondragunta@noaa.gov (especially for aerosol session questions)
* Diego Loyola diego.loyola@dlr.de (especially for ozone session questions)
* John Worden john.r.worden@jpl.nasa.gov (especially for GHG session questions)
* Jean-Christopher Lambert jean-christopher.lambert@aeronomie.be (especially for Cal/Val session questions)

# Detailed Agenda

Times are specified in Japan Standard Time (JST). Corresponding times are listed for a few selected time zones:

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| --- | --- | --- | --- |
| Japan Standard Time (JST) | US Eastern Time (EST) | US Pacific Time (PST) | Central European Summer Time (CEST) |
| 8 | 19 previous day | 16 previous day | 1 |
| 10 | 21 previous day | 18 previous day | 3 |
| 12 | 23 previous day | 20 previous day | 5 |
| 14 | 1 | 22 previous day | 7 |
| 16 | 3 | 0 | 9 |
| 18 | 5 | 2 | 11 |

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| Time (JST) | ID | Topic | Presenter / Chair | Duration (min) |
|   |   | **Tuesday, June 10** |   |  |
|  |  | **Session Ozone (Part I)** | **Chair: Diego Loyola (DLR)** |  |
| 09:00 | 2.01 | Introduction / goals  | Diego Loyola (DLR) | 5 |
|  |  | **Tropospheric Ozone** |  |  |
| 09:05 | 2.02 | The Tropospheric Ozone Assessment Report (TOAR), Phase II | Helen Worden (UCAR) | 15 |
| 09:20 | 2.03 | TOAR II Advancing understanding of tropospheric ozone | Kazuyuki Miyazaki (JPL)  | 15 |
| 09:35 | 2.04 | TOAR II Chemical Reanalysis Working Group | Takashi Sekiya (JAMSTEC) | 15 |
| 09:50 | 2.05 | TOAR II Assessment of satellite ozone | Kazuyuki Miyazaki (JPL), Hubert & Keppens (BIRA-IASB) | 15 |
| 10:05 | 2.06 | Highlights of tropospheric ozone data harmonization | Arno Keppens (BIRA-IASB) | 15 |
|  |  | **Limb Ozone Missions (Part I)** |  |  |
| 10:20 | 2.07 | Ozone profile observations with OMPS Limb Profilers | Natalya Kramarova (NASA) | 10 |
| 10:30 |  | Coffee Break |  | 30 |
|  |  | **Session General Cal/Val** | **Chair: J.-C. Lambert (BIRA-IASB)** |  |
| 11:00 | 2.08 | Introduction / goals  | Jean-Christopher Lambert (BIRA-IASB) | 10 |
|  |  | **WGCV-ACSG Updates** |  |  |
| 11:10 | 2.09 | CEOS Working Group on Calibration and Validation | Cody Anderson (USGS), Medhavy Thankappan (GA) | 15 |
| 11:25 | 2.10 | Atmospheric Composition Cal/Val updates | Jean-Christopher Lambert (BIRA-IASB) | 15 |
| 11:40 | 2.11 | SI-Traceable Satellite (SITSat) Task Group update | Nigel Fox (UKSA/NPL), Yolanda Shea (NASA) TBC | 15 |
| 11:55 | 2.12 | CEOS-FRM Maturity Assessment Framework v2 | Paolo Castracane (Starion for ESA) | 15 |
| 12:10 | 2.13 | CEOS Guidelines on Aerosol, Cloud, and Precipitation Profiles Validation (ACPPV) | Rob Koopman (ESA) | 15 |
| 12:25 | 2.14 | Copernicus Cal/Val Solution (CCVS) Gap Analysis | Tijl Verhoelst (BIRA-IASB) | 10 |
| 12:35 | 2.15 | General discussion WGCV and AC-VC collaboration | All | 15 |
| 12:50 |  | Lunch |  | 70 |
| 14:00 | 2.16 | Validation challenges for upcoming limb missions | Kaley Walker (U.Toronto) | 10 |
|  |  | **Operational Validation Capacity** |  |  |
| 14:10 | 2.17 | ESA Atmospheric Validation Data Centre (EVDC) | Ann Mari Fjaeraa (NILU) | 10 |
| 14:20 | 2.18 | Atmospheric Toolbox (CODA, HARP, VISAN, AVL) | Sander Niemeijer (s[&]t) | 10 |
| 14:30 | 2.19 | AERIS Atmosphere Data and Services Centre | Sébastien Payan (IPSL) / Patrice Henry (CNES) | 10 |
| 14:40 |  | Coffee Break |  | 30 |
| 15:10 | 2.20 | NOAA PROducts Validation System (NPROVS) | TBC | 10 |
| 15:20 | 2.21 | EPA operational validation plans | Jim Szykman, Luke Valin, Barron Henderson (EPA) | 10 |
| 15:30 | 2.22 | ESA/Copernicus ATM-MPC routine validation service | Arno Keppens, J.-C. Lambert (BIRA-IASB) | 10 |
| 15:40 | 2.23 | EUMETSAT operational validation plans | Frank Ruethrich, Rasmus Lindstrot (EUMETSAT) | 10 |
| 15:50 | 2.24 | General discussion on operational validation capacity - Tracking needs and gaps  | All | 10 |
|  |  | **Session Ozone (Part II)** | **Chair: Diego Loyola (DLR)** |  |
|  |  | **Limb Ozone Missions (Part II)** |  |  |
| 16:00 | 2.25 | ALTIUS mission | Emmanuel Dekemper (BIRA-IASB) | 10 |
|  |  | **GEO Ozone Missions** |  |  |
| 16:10 | 2.26 | GEMS ozone products  | Jae Hwan Kim (Pusan Uni.) | 15 |
| 16:25 | 2.27 | TEMPO ozone products  | Xiong Liu & Joonsung Park (SAO) | 15 |
| 16:40 | 2.28 | Sentinel-4 total ozone | Klaus-Peter Heue (DLR) | 10 |
| 16:50 | 2.29 | Sentinel-4 tropospheric ozone | Richard Siddans (RAL) | 10 |
| 17:00 | 2.30 | GIIRS ozone  | Zhao-Cheng Zeng (PKU) | 10 |
| 17:10 | 2.31 | IRS ozone | Dorothee Coppens (EUMETSAT) | 10 |
| 17:20 |  | General ozone discussion | All | 10 |
| 17:30 |  | **Adjourn** |  |  |

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| Time (JST) | ID | Topic | Presenter / Chair | Duration (min) |
|   |   | **Wednesday, June 11** |   |   |
|  |  | **Session AQ Trace Gases** | **Chairs: Ben Veihelmann (ESA), Barry Lefer (NASA), Hiroshi Tanimoto (NIES)** |  |
| 08:30 | 3.01 | Introduction / goals  | Ben Veihelmann (ESA), Barry Lefer (NASA), Hiroshi Tanimoto (NIES) | 5 |
| 08:35 |  | **Brief Status of Missions in Orbit** |  |  |
|  | 3.02 | S5P/TROPOMI status | Pepijn Veefkind (KNMI) | 10 |
|  | 3.03 | GEMS status | Jhoon Kim (Yonsei Uni), Jeong-Ah Yu (NIER) | 10 |
|  | 3.04 | TEMPO | Xiong Liu (Harvard, CFA) | 10 |
|  | 3.05 | IASI&CRIS | Cathy Clerbaux (LATMOS/CNRS), Helen Worden (UCAR) | 10 |
|  | 3.06 | Geostationary Interferometric Infrared Sounder (GIIRS): CO, NH3, and VOCs  | Zhao-Cheng Zeng (PKU) | 10 |
|  | 3.07 | High resolution NO2 ML/AI product from the OCI sensor on PACE | Joiner Joanna (NASA/GSFC), Zachary Fasnacht (NASA/GSFC) | 10 |
|  | 3.08 | Hyper Local Monitoring of NO2 from TEMPO  | Shobha Kondragunta (NOAA) | 10 |
| 09:45 |  | **Brief Update on Future Missions** |  |  |
|  | 3.09 | Sentinel-4 & Sentinel-5  | Ben Veihelmann (ESA), Rasmus Lindstrot, Frank Rüthrich (EUMETSAT)  | 10 |
|  | 3.10 | IASI-NG | Cyril Crevoisier (LMD) | 10 |
|  | 3.11 | IRS  | Cathy Clerbaux (LATMOS/CNRS) | 10 |
|  | 3.12 | GeoXO  | Joanna Joiner (NASA), Shobha Kondragunta (NOAA)  | 10 |
| 10:30 |  | Coffee Break |  | 30 |
| 11:00 |  | **Geo AC Constellation: towards global coverage** |  |  |
|  | 3.13 | Goals, whitepaper status, way forward  | Helen Worden (UCAR), Ali Omar (NASA) | 15 |
|  | 3.14 | Observational Needs for South America | Arlindo da Sila (NASA/GSFC), Paulo Artaxo | 10 |
|  | 3.15 | Observational Needs for the Middle East | Omar Emam (Intospass) | 10 |
|  | 3.16 | Observational Needs for Africa | Helen Worden (UCAR) | 10 |
|  |  | Discussion way forward | All | 15 |
| 12:00 |  | **Validation** |  |  |
|  | 3.17 | S5P/TROPOMI validation update | Jean-Christopher Lambert (BIRA-IASB) | 15 |
|  | 3.18 | TEMPO validation highlights | Laura Judd (NASA), Barron Henderson (EPA)  | 15 |
|  | 3.19 | EPA validation activities  | Barron Henderson Luke Valin, Jim Szykman (EPA) | 15 |
|  | 3.20 | GEMS validation campaign results and Asia Air Pollutants Network (AAPN) | Limseok Chang (NIER) | 15 |
| 13:00 |  | Lunch |  | 90 |
| 14:30 | 3.21 | PEGASOS & Geo-Ring: Consistency TEMPO-GEMS-S5P  | Ronny Lutz (DLR), Arno Keppens (BIRA-IASB) and PEGASOS team | 15 |
|  | 3.22 | CINDI-3 intercomparison campaign | Michel v. Roozendael (BIRA-IASB), Karin Kreher (BKS), Jean-Christopher (BIRA-IASB) | 15 |
|  | 3.23 | Pandora/PGN status  | Thomas Hanisco (NASA, GSFC), Alexander Cede (Luftblick) | 15 |
|  | 3.24 | India Pandora and EM27  | Hiroshi Tanimoto (NIES), Isamu Morino (NIES), Mahesh Sha (BIRA-IASB) | 15 |
| 15:30 | 3.25 | Global Analysis of NO2 and HCHO Column Densities from the Pandora Global Network (PGN): Variability and Implications for Satellite Validation | Sang-Woo Kim (SNU) | 15 |
| 15:45 |  | Coffee Break |  | 30 |
| 16:15 | 3.26 | Progress with MAX-DOAS observations to validate TROPOMI Collection 03 and GEMSv3 NO2  | Yugo Kanaya (JAMSTEC) | 15 |
| 16:30 |  | Discussion on validation topics | All | 15 |
| 16:45 |  | **Data Use** |  |  |
| 16:45 | 3.25 | An update on JPL MOMO-Chem air quality research | Kazuyuki Miyazaki (JPL) | 15 |
| 17:00 | 3.26 | CAMS | Antje Inness (ECMWF/CAMS) | 15 |
| 17:15 | 3.27 | GEOS Constituent DA | Brad Weir (Morgan State Uni; NASA GMAO) and Lesley Ott (NASA GMAO) | 15 |
| 17:30 |  | Discussion on data use |  | 15 |
| 17:45 |  | **Adjourn**  |  |  |

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| Time (JST) | ID | Topic | Presenter / Chair | Duration (min) |
|  |  | **Thursday, June 12** |  |  |
|  |  | **Session AQ Aerosol** | **Chairs: Shobha Kondragunta (NOAA), Ben Veihelmann (ESA)**  |  |
| 08:30 | 4.01 | Welcome |  | 5 |
| 08:35 | 4.02 | Aerosol Layer Height panel discussion | Panelists: Shobha Kondragunta (NOAA), Vijay Natraj (JPL), Jun Wang (U Iowa), Jim Szykman (EPA), Ruben Delgado (Hampton University), Mitch Goldberg (CCNY), Jhoon Kim (Yonsei University), Siyuan Huang (NOAA) | 55 |
| 09:30 | 4.03 | PM2.5 Roadmap Update | Shobha Kondragunta (NOAA) and Ben Veihelmann (ESA) | 30 |
| 10:00 |  | **Applications Part I** |  |  |
| 10:00 | 4.05 | Aerosol DA for PM2.5 (JCSDA) | Jerome Barre (JCSDA) | 15 |
| 10:15 | 4.06 | Aerosol DA for PM2.5 (NASA) | Pawan Gupta (NASA) | 15 |
| 10:30 |  | **Coffee Break** |  | 30 |
| 11:00 | 4.07 | Aerosol DA for PM2.5 (NOAA NWS) | Cory Martin (NOAA) | 15 |
| 11:15 |  | **Applications Part II** |  |  |
|  | 4.08 | AirFuse | Barron Henderson (EPA) | 15 |
|  | 4.09 | EUMETSAT PM2.5 work | Julien Chimot (EUMETSAT) | 15 |
|  | 4.10 | Estimating PM2.5 with remote sensing aerosol observations and auxiliary variables with machine learning models at global scale: promises, challenges, and pitfalls | Tianle Yuan (NASA) | 15 |
| 12:00 |  | **Applications Part II** |  |  |
|  | 4.11 | TEMPO dust and smoke case studies | Amy Huff (NOAA) | 15 |
|  | 4.12 | TEMPO PM2.5 product development and validation | Hai Zhang (NOAA) | 15 |
| 12:30 | 4.13 | **Updates on Current/Future Missions** |  |  |
|  | 4.14 | JPSS and NEON Mission Update | Satya Kalluri (NOAA) | 15 |
|  | 4.15 | Metop-SG Mission Update | Julien Chimot (ESA) | 15 |
| 13:00 |  | **Lunch Break** |  | 90 |
| 14:30 | 4.16 | TEMPO Aerosol Update | Shobha Kondragunta (NOAA) | 15 |
| 14:45 | 4.17 | GEMS Aerosol Update | Jhoon Kim (Yonsei University) | 15 |
| 15:00 | 4.18 | PACE Aerosol Update | Meng Gao (NASA) | 15 |
| 15:15 | 4.19 | MAIA Aerosol Update | Dave Diner (NASA) | 15 |
| 15:30 | 4.20 | NASA Aerosol Update | Rob Levy (NASA) | 15 |
| 15:45 |  | **Coffee Break** |  | 30 |
| 16:15 | 4.21 | Luce mission update | Chip Trepte (NASA) | 15 |
| 16:30 | 4.22 | CO2M Aerosols | Yasjka Meijer (ESA) | 15 |
| 16:45 | 4.04 | Aerosol DA for PM2.5 (CAMS) | Johannes Flemming (ECMWF) | 15 |
| 17:00 |  | **End of AQ Aerosols Session** |  |  |
| 17:00 |  | **AC-VC General Discussion** |  |  |
| 17:00 | 5.01 | Tracking gaps and issues for validation systems and networks  | Jean-Christopher Lambert (BIRA-IASB) | 15 |
| 17:15 | 5.02 | WMO Expert Team on Network Design and Evolution (GAW report 307) | Rich Eckman or Hiroshi Tanimoto (NIES)  | 15 |
| 17:30 | 5.03 | by Thomas August (ESA) on the role of SI- traceable satellites for enhancing radiometric inter-calibration consistency  | Thomas August (ESA)  | 15 |
| 17:45 |  | **Adjourn** |  |  |

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| Time (JST) | ID | Topic | Presenter / Chair | Duration (min) |
|  |  | **Friday, June 13** |  |  |
|  |  | **Session Greenhouse Gases** | **Chairs: John Worden (JPL), Abhishek Chatterjee (JPL)** |  |
| 8:30 |  | **Overview Session** | John Worden (NASA) |  |
|  | 6.01 | Introduction / Schedule | John Worden (NASA) | 5 |
|  | 6.02 | CEOS GHG Road Map Updates | Yasjka Meijer (ESA) | 15 |
|  | 6.03 | IWGGMS Mission Summary | Ray Nassar (ECCC) | 15 |
|  |  | Discussion/Questions | All | 10 |
| 9:15 |  | **Validation and Calibration L0 to L2** | Abhishek Chatterjee (JPL) |  |
|  | 6.04 | IWGGMS Cal-Val session summary | Hirofumi Ohyama (NIES), Mahesh Sha (BIRA-IASB) | 10 |
|  | 6.05 | TCCON status and needs | Debra Wunch (U. Toronto) | 10 |
|  | 6.06 | COCCON status and needs | Mahesh Sha (BIRA-IASB) | 10 |
|  | 6.07 | NDACC | Jim Hannigan (NCAR) | 10 |
|  | 6.08 | Vicarious Calibration | Kei Shiomi (JAXA) | 10 |
|  | 6.09 | Validation Supersites | Abhishek Chatterjee (JPL) | 10 |
|  |  | Discussion | All | 15 |
| 10:30 |  | **Coffee Break** |   | 30 |
| 11:00 |  | **L2 Algorithms** | David Crisp (Crisp Spectra LLC) |  |
|  | 6.10 | IWGGMS Algorithm session summary | Yu Someya (NIES) | 10 |
|  | 6.11 | L2 Intercomparison | Chris O'Dell (CSU) | 20 |
|  |  | Discussion | All | 20 |
| 11:50 |  | **Observations to Information / Stakeholder Needs** | Yasjka Meijer (ESA) |  |
|  | 6.12 | Summary from IWGGMS | Lesley Ott (NASA GSFC) | 10 |
|  | 6.13 | IMEO | Itziar Irakulis-Loitxate (IMEO) | 15 |
|  | 6.14 | G3W and I3GIS Developments | Jocelyn Turnbull (GNS) | 15 |
|  |  | Discussion | All | 15 |
| 12:45 |  | **Lunch** |   | 75 |
| 14:00 |  | **Facility Scale Needs and Validation** | John Worden (NASA) |  |
|  | 6.15 | Summary from IWGGMS | Julia Marshall (DLR) | 10 |
|  | 6.16 | MEDUSA Overview | Ilse Aben (SRON) | 10 |
|  | 6.17 | State of Practice and Future Needs | Evan Sherwin (LBNL/ Stanford) | 15 |
|  | 6.18 | Community Accepted Practices CEOS + paper update | Paul Green (NPL) | 5 |
|  |  | Discussion | All | 30 |
| 15:10 |  | **Area Fluxes** | Kevin Bowman (JPL) |  |
|  | 6.19 | Summary from IWGGMS on Fluxes | Sara Mikaloff-Fletcher (NIWA) and Kevin Bowman (JPL) | 10 |
|  | 6.20 | Area Flux Validation Approaches | Junjie Liu (JPL) | 15 |
|  |  | Discussion | All | 15 |
| 15:50 |  | **Coffee Break** |   | 20 |
| 16:10 |  | **Identification of measurement gaps**  | Abhishek Chatterjee (JPL) |  |
|  | 6.21 | Setting the stage | Abhishek Chatterjee (JPL) | 5 |
|  | 6.22 | Measurement Gaps | David Crisp (Crisp Spectra LLC) | 20 |
|  |  | Discussion | All | 15 |
| 16:50 |  | **Walk On / Extra** | Abhishek Chatterjee (JPL) |  |
|  | 6.23 | Summary of Multi-Species Observations | Jochen Landgraf (SRON), Helen Worden (NCAR) | 10 |
|  |  | Any additional topics? TBD |  |  |
| 17:00 | 6.24 | **Discussion / GHG Session Wrap up** | John Worden (NASA), Abhishek Chatterjee (JPL) | 15 |
|  |  | **End of GHG Session** |  |  |
| 17:15 |  | **AC-VC Meeting Wrap up**  | Hiroshi Tanimoto (NIES), Ben Veihelmann (ESA), Emma Knowland (NASA) | 15 |
| 17:30 |  | **Adjourn** |  |  |