



Report from WG II (Satellite data and products)

JV Thomas, Heikki Pohjola (acting)
(Co-Chairs)

Paolo Ruti, Mitch Goldberg and Andrew Heidinger
(Rapporteurs)

Presented to CGMS-50 Plenary session, agenda item 4.5

Status on Chairs and Rapporteurs

- JV Thomas - ISRO Confirmed Chair for 2024
- Heikki (WMO) step down - CMA proposal Dr. XU Na
- Mitch Goldberg (Retired Rapporteur) - NOAA (Andy Heidinger)
- Paolo M Ruti - EUMETSAT Rapporteur

Proposed Change of ToR

- Currently WGII ToR defines that other co-chair shall be nominated from WMO. There is no definition for the other WGII co-chair position.
- WGII meeting proposes to Plenary to remove clause in ToR for WMO co-chair.

Proposed Change of ToR

- Proposed change in the text:

"WGII is co-chaired by two Chairs supported by two rapporteurs, all appointed by the CGMS Plenary. One of the two co-chairs is selected from the Asia-Pacific region. ~~The other co-chair is provided by WMO.~~ NOAA and EUMETSAT provide each one of the rapporteurs. WGII representatives are nominated by each CGMS Member who shall promote continuity and foster active contribution. WGII chairs, WGII rapporteurs and CGMS Secretariat shall be informed by CGMS Members of the names of WGII representatives and any changes prior to the respective CGMS Plenary meetings. CGMS Secretariat shall maintain an updated list of WGII representatives in the corresponding WGII CGMS web page."

HIGHLIGHTS FROM SPACE AGENCIES



HIGHLIGHTS FROM SPACE AGENCIES



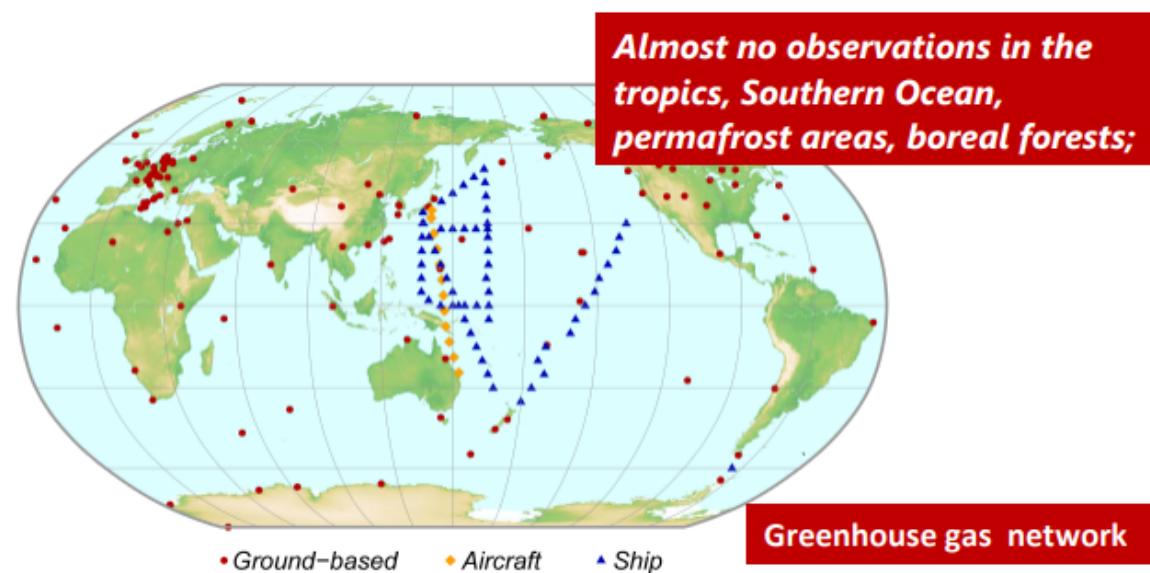
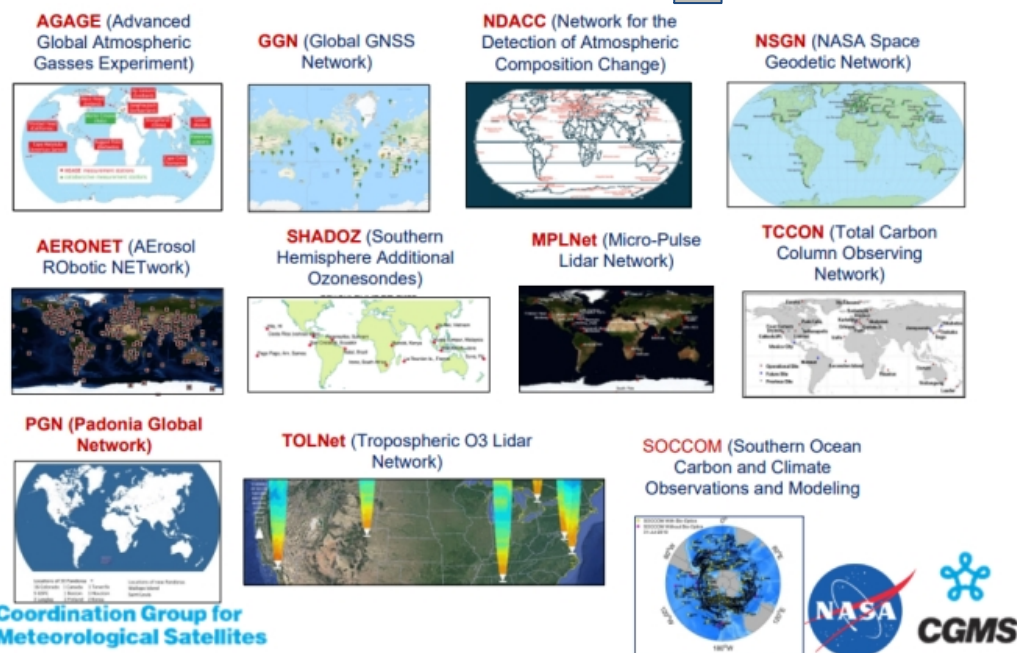
Towards an Operational Carbon System

- The WMO GHG Watch - approved by WMO Congress to support the implementation of the 2015 COP-21 Paris Agreement, which aims to reduce anthropogenic GHG emissions
 - aims to create a system of global, near-real time observations of CO₂ from both satellite and ground-based systems.
 - This would be coupled with GHG model which would output CO₂, CH₄ and N₂O concentrations at a (initially) 100 km grid-resolution, with an aim to bring this down to ~1 km within 10 years
 - Additional interactions between WMO and CGMS needed to understand the operational requirements
 - Will this initiative trigger a better coordination among ground based measurement networks and facilitate fit to purpose solutions
- No one single constellation will be able to reach the OSCAR time resolution requirements (1 h), calling for a major coordination among satellite operational agencies for existing and future initiatives (i.e. CO2M, OCO-2/3, GOSAT).

Ground based truth



Knowledge and
Validation Gaps



Climate News

The CEOS-CGMS Joint Working Group on Climate met in Tokyo for its 18th meeting, Feb 2023.

- developing the Space Agency Response to the 2022 GCOS Implementation Plan (IP)
- releasing an updated version of the Essential Climate Variable (ECV) Inventory
- releasing a merged Gap Analysis Report (v3/4.1) for the Inventory

A proposal for a dedicated GeoRing session at CGMS 52

Small and Cube Sat World

The MW Hyperspectral case

- Soundings improve significantly with hyperspectral capabilities. Even greater advantages when clouds are present but still working on details
- A fairly simple hyperspectral setup at 23 GHz is very capable of detecting even small RFI signals
- Hyperspectral capabilities at 183 GHz, when used during coincident overpasses with small radiometers can significantly improve inter-calibration capabilities.
- Good tech maturity however a small sat platform is needed

News from the International WG

- IPWG is designing a OSSE framework to assess sensor capabilities (channels, resolution, sampling)

News from agencies

- NASA recently launched TROPICS. Commercial provider Tomorrow.IO is planning to use TROPICS design
- CMA was developing a Small- or CubeSat programme, and the CMA responded that although nothing had been decided yet operationally speaking, there was an on-going scientific project.

Nowcasting Applications

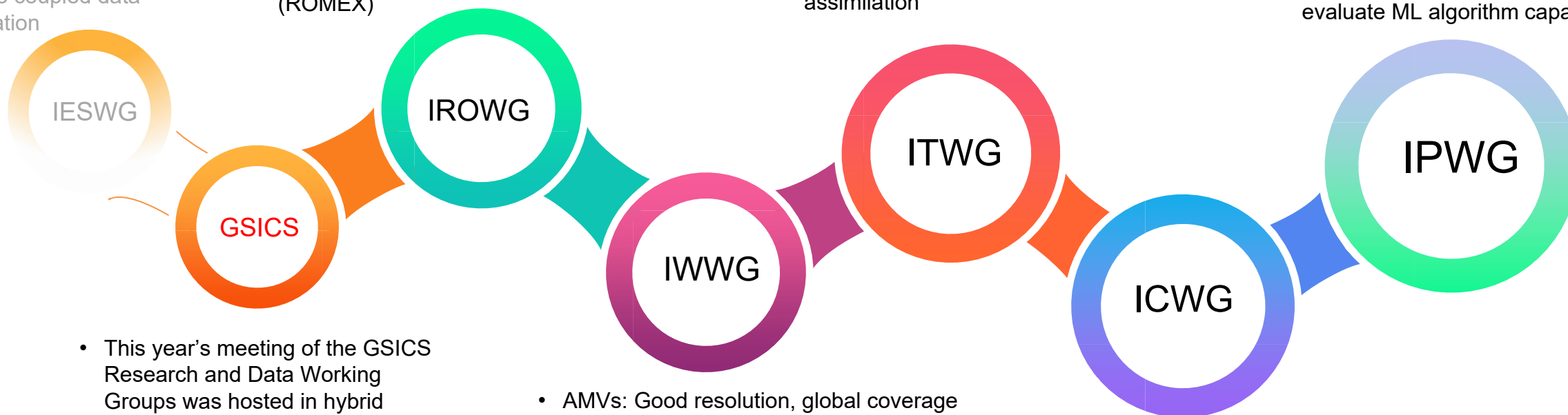
- Early Warning for All - approved by WMO Congress
- African example - difficult to cover such a continent with radar data - New techniques and methods (high-resolution satellites, e.g. MTG) coupled with new methods to process the data (e.g. AI/ML), and ways to directly communicate and integrate weather information into the lives of ordinary citizens.
- NOAA developed new ProbSevere LightningCast AI/ML model which uses visible, near-infrared, and long-wave infrared channels aboard GOES ABI to predict the probability of lightning in the next 60 minutes - being used by NOAA/NWS.

The IESWG aims at receive operational strategic element needed by global centers to integrate Earth Observation data with particular focus at Land-Atmosphere interface with the overall goal to advance coupled data assimilation

- New Co-chair Dr. Hui Shao from UCAR/Joint Center for Satellite Data Assimilation
- 20,000 occultation/day figure, which had recently been reaffirmed by study, is still not closed to being reached
- Radio Occultation Modeling Experiment (ROMEX)

- ITWG held the ITSC-23 in Tromso, Norway in March 2023
- AI/Machine Learning applications
- Small- and CubeSat data assimilation
- GEO Hyperspectral Sounder data assimilation

- A strategy for a uniform quality radar/gauge database, with inputs from QPE experts
- OSSE framework to assess CUBE sat sensor capabilities
- developing a standard training and independent test data set to evaluate ML algorithm capabilities



- This year's meeting of the GSICS Research and Data Working Groups was hosted in hybrid mode by NOAA at College Park, MD, USA 27 Feb – 3 March 2023.
- Expanding GSICS to provide inter-calibration for: Space Weather; GHG constellation; Ocean Surface Vector Winds

- AMVs: Good resolution, global coverage and no gaps; error in height assignment
- Surface winds from Scatterometers:
- DWL gives a direct measurements of winds speed at high vertical resolution
- 3D winds from IR sounders
- Stereo Winds
- Optical flow methods as novel technique

- New co-chairs of the ICWG (NOAA and DWD)
- ICWG-3 planning (Feb 2024): A dedicated session on using lightning; combining all datasets from CGMS agencies' GEO satellites into one
- A new report to be released on an inter-comparison of cloud properties from GEO and polar-orbiting satellites.



International Earth Surface Working Group (IESWG)

Presented to CGMS-51 Working Group II session, agenda item 3.7

IESWG Co-chairs: Benjamin Ruston (UCAR/JCSDA), Gianpaolo Balsamo (ECMWF)
Rapporteur: Benjamin Ruston (UCAR)

Executive summary

Updated [IESWG ToR](#) iterated between the CGMS WG-II, IESWG and ITWG

The IESWG continues to work towards CGMS recognition as there is a need for a group with the unique combination of data assimilation and Earth surface modeling experts to fully exploit existing and future observations.

The IESWG has a distinct vocation towards earth surface data assimilation, observation operators and modelling developments that can advance coupled land-atmosphere assimilation in numerical weather prediction and climate/environmental reanalyses.

The three main topical areas in the IESWG are:

- 1) Snow ice and cryosphere-atmosphere interaction
- 2) Vegetation and land-atmosphere fluxes
- 3) Soil moisture, river-discharge and water cycle

Additional Details

Continue to plan for [IESWG-5 meeting 26-28Sep2023](#)

Conducting [survey of land surface DA systems](#) for IESWG-5

The IESWG participants typically report on Earth surface-atmosphere coupling and data assimilation with particular focus on methodologies, algorithmic and modelling advances that can enhance satellite observations uptake from present missions and prepared for upcoming ones.

Focusing on operational oriented product development, guaranteeing the uniqueness of the international contribution vs other international groups (i.e., CEOS Land Product Validation subgroup)

The planned activities within IESWG will include modelling and assimilation preparatory for future missions such as EPS-SG, FLEX, CIMR, CRISTAL, BIOMASS, CO2M ... to list a few. As well as existing missions like SMOS and SMAP for which data uptake has been suboptimal.

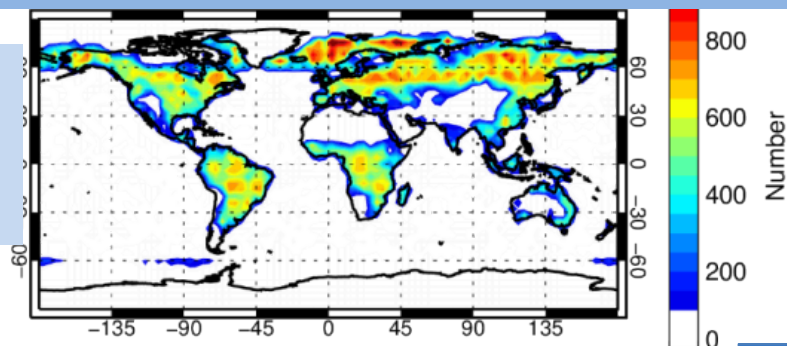
Which key issues of relevance to CGMS will be crucially supported by the IESWG:

- ☐ **CGMS HLPP 1.2.6** Work towards ensuring low frequency microwave imagery ... from at least 2 sun-synchronous orbits;
- ☐ **CGMS HLPP 1.2.7** Establish observational requirements for microwave observations (sounder and imager) for NWP and precipitation and perform gap analysis against CGMS baseline;
- ☐ **CGMS HLPP 4.6.3** continue to improve microwave radiative transfer models to include complex surfaces (e.g. snow, desert, etc.) ... to support improved algorithm development for current and future sensors;
- ☐ **IESWG/(P)A50.01** - Create ToR and proposal to establish a new CGMS International Science Working Group, propose Benjamin Ruston as rapporteur

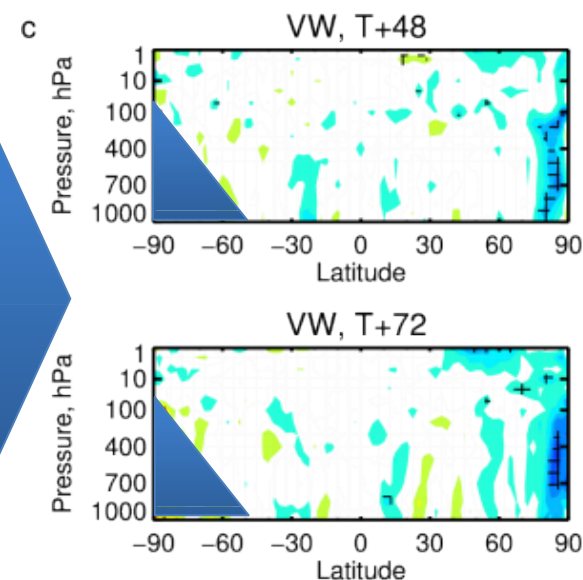
Operational example of IESWG relevance : All-sky All-surfaces data assimilation

Increased use of **MW imagers** (e.g. **AMSR2** 89 GHz v-pol)

Observations used over **land surfaces and polar oceans** for the first time

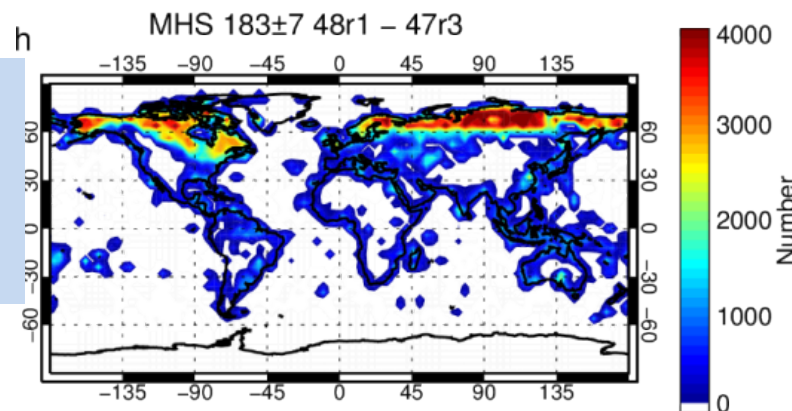


Reduced Wind Day+3
Forecast errors (RMSE) in
Northern Polar regions



Increased use of **MW humidity sounders** (e.g. **MHS** 183±7 GHz)

Observations used over **polar land and mixed scenes** (e.g. coasts, lakes) for the first time



European Centre for Medium-Range Weather Forecasts

To be considered by CGMS:

- ☐ Propose to establish a new CGMS International Science Working Group on the Earth Surface
- ☐ As for rapporteur of IESWG to be identified by September



Outcomes and Recommendations from the IROWG-9 Workshop

Presented to CGMS-51 Plenary, agenda item 6

Co-Chairs: Ulrich Foelsche (University of Graz)
Hui Shao (JCSDA)

Rapporteur: Tony Mannucci (NASA/JPL)

With contributions from the ROMEX team
and IROWG members



8 – 14 Sep.2022, Seggau Castle, Austria

IROWG-9 Meeting

- First in-person IROWG meeting since the pandemic
- More than 100 scientists, including representatives from all the major RO processing centers, space agencies, weather prediction centers, commercial data providers, and the research community
- 81 oral presentations, three opening talks, one keynote talk, and 21 posters
- Four working subgroup meetings: Numerical Weather Prediction (NWP); Climate; Receiver Technology and Innovative Occultation Techniques; Space Weather
- Dedicated specialist meetings: BUFR format revision; level 0 data format definition; and future radio occultation operator development.

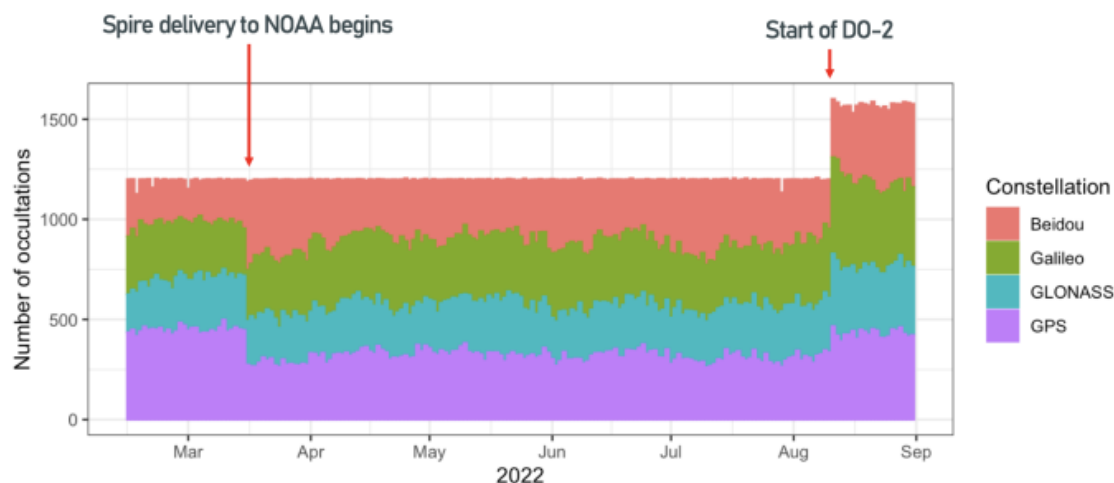


Full workshop minutes and CGMS working paper from IROWG-9 are available at <http://irowg.org/workshops/irowg-9/>

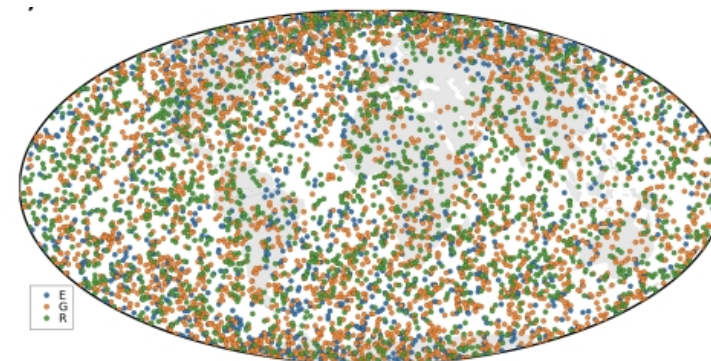
Workshop presentations at <https://opacirowg2022.uni-graz.at/en/>

IROWG-9 Science Highlights

The “GPS” RO Technique is now a true “GNSS” RO Technique, where **signals from all GNSS constellations** are being exploited.



Number of occultations during DO-1/2 by GNSS constellations for EUMETSAT commercial purchase

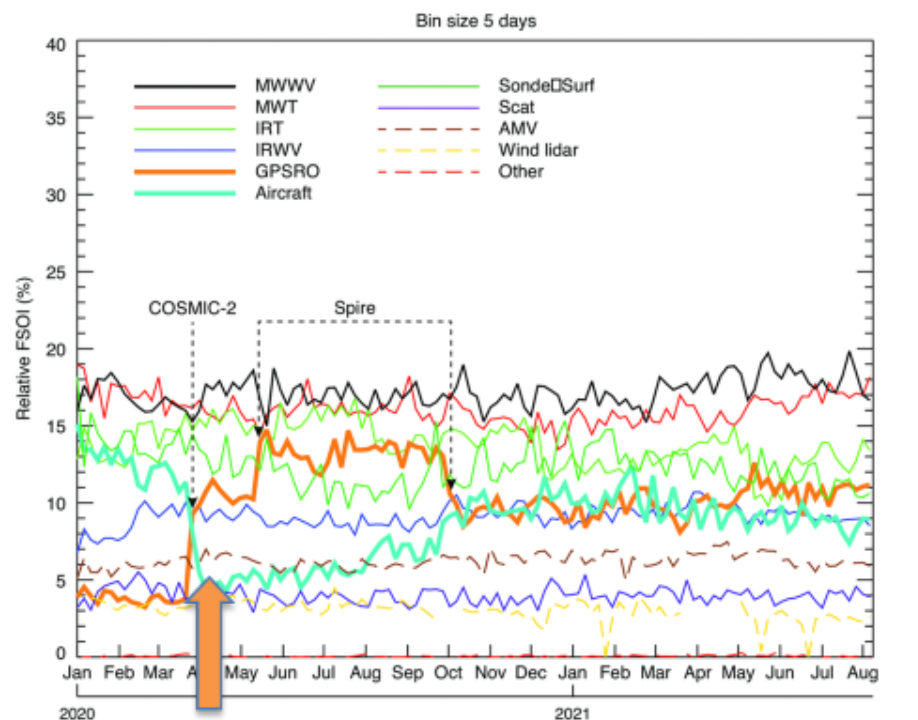


UCAR processing GPS, GLONASS, and Galileo occultations (color coded) since NOAA commercial order (Maggie Sleziak-Sallee (UCAR))

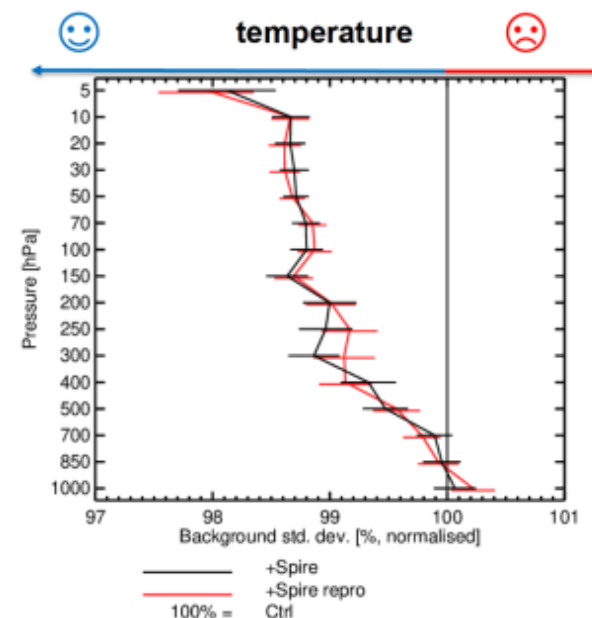
IROWG-9 Science Highlights

IROWG acknowledges and encourages the continuation of

- The efforts at NOAA and EUMETSAT for commercial purchase with global license, providing open data access to the global NWP community (NASA just joined this effort).
- Coordination and cooperation from the commercial providers to successfully incorporate their data effectively



Impact increases with # of RO profiles (S. Healy, ECMWF)



Improved analysis: fit to observations
after assimilating 11,000 Spire occultations
(Lonitz, Healy, Marquardt, IROWG-9, 9/2022)

IROWG-9 Science Highlights

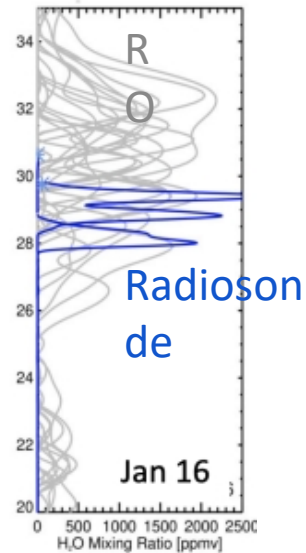
Use of GNSS RO for climate studies due to availability of observation archive (including low level data) - the need for **backbone missions** to provide stable, long-term, SI-traceable and reliable GNSS-RO observations

Radio occultation can detect >1000 ppmv of **stratospheric H₂O** from **Hunga Tonga-Hunga Ha'apai** (HTHH) eruption on 15/1/2022.

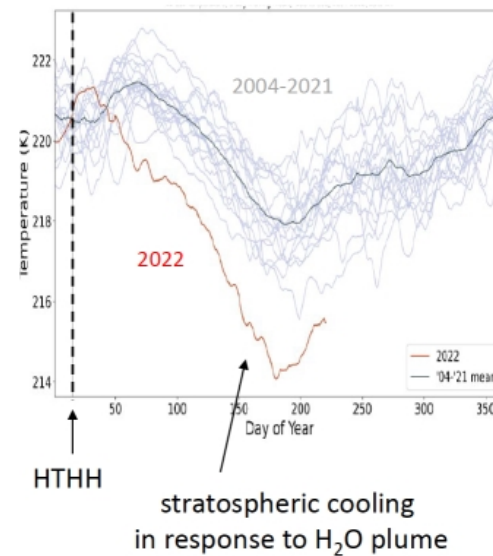
Large H₂O anomalies persist in the stratosphere, leading to large-scale cooling (William Randel, NCAR/UCAR/COSMIC)

GNSS RO (2002-2021) providing a detailed view on the thermal structure of **temperature trends** in Earth's atmosphere (Florian Ladstädter, Wegener Center)

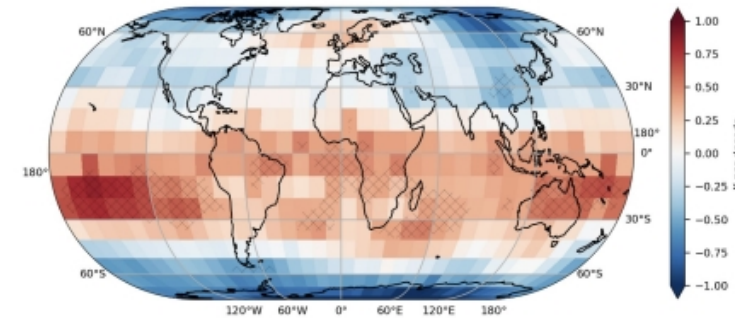
Water vapor from RO over Australia



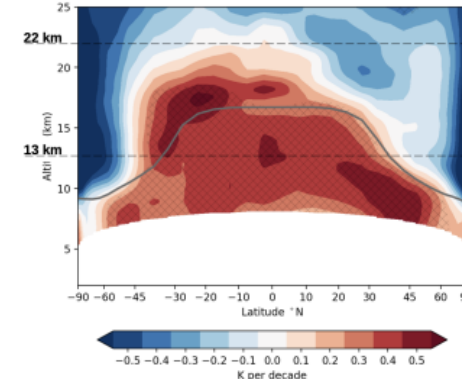
Temps at 10-50° S 26 km



RO@18 km

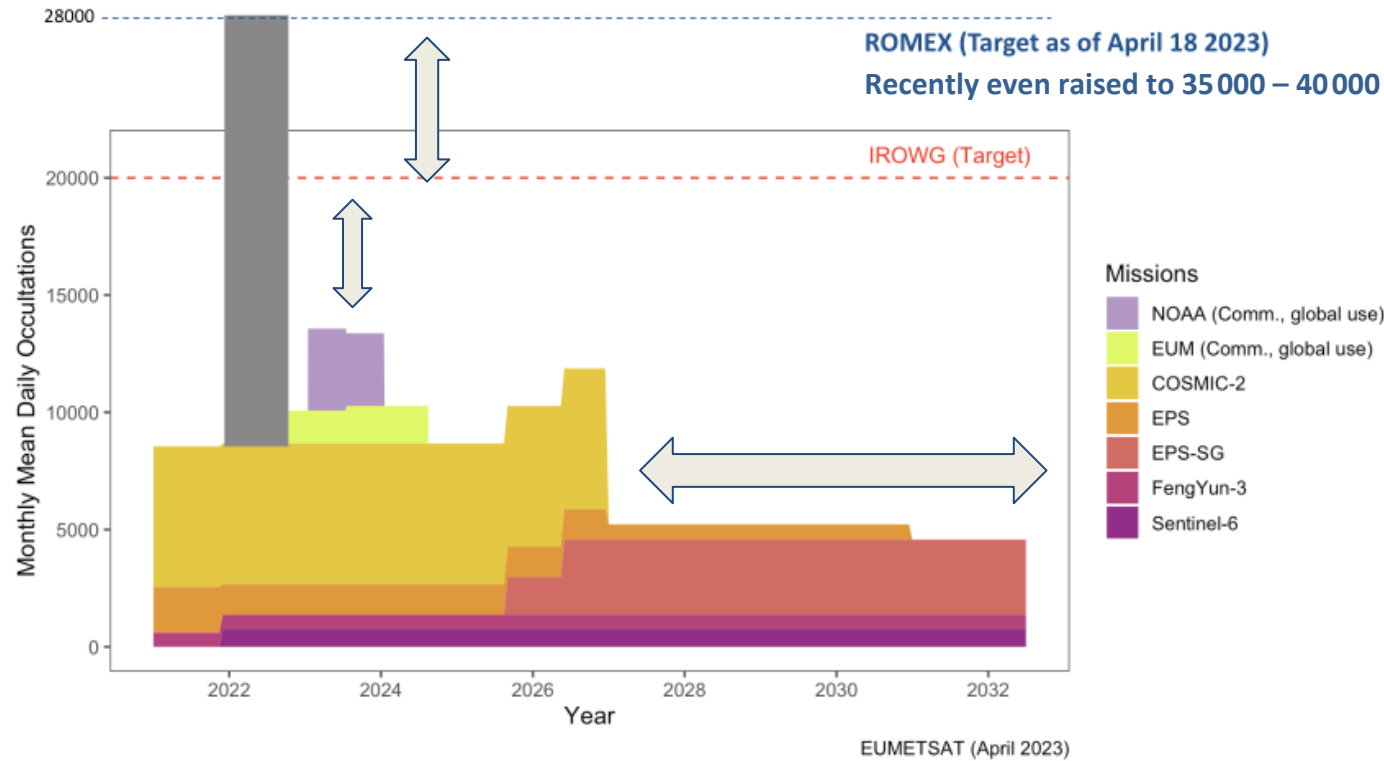


RO (ROM SAF)



IROWG-9 Science Highlights

Presentation and agreement to coordinate a **Radio Occultation Model Experiment (ROMEX)** among the IROWG community to help answer pressing technical and programmatic questions and help inform near- and long-term strategies for RO missions and acquisitions by all CGMS partners



EUMETSAT RO mission projection provided by Christian Marquardt (EUMETSAT)

IROWG-9 Science Highlights - ROMEX

ROMEX seeks to quantify the **benefit of increasing the quantity of RO observations** using additional observations which were not available to weather centers for their real time operational systems. The IROWG community has gained approval from their respective institutions to perform **data assimilation experiments** with the additional RO measurements over the designated time period.

The effort concept, was first introduced Dr. Richard Anthes in May 2022, in **response to questions from by NOAA for input on future RO needs**. The resulted discussion led to a proposal for the Radio Occultation Modeling Experiment (ROMEX), which was endorsed by the IROWG in September, 2022 (IROWG-9).

The experiment results provide guidance to the CGMS partners to answer pressing technical and programmatic questions facing the numerical weather prediction (NWP) community. This will help inform near- and long-term strategies for RO missions and acquisitions by all CGMS partners.

The **initial data distribution within ROMEX** is expected to be in **July 2023**, followed by data quality assessment and NWP experiments in following months. Intermediate and final reports are expected to be presented in the upcoming **CGMS 52/WGII** meeting and at **IROWG-10, Sept. 2024**.

Questions from/for the RO community

1) Data Quantity

How many RO profiles per day are needed?

Using the supplemental ROMEX data is there a fall-off or asymptote in the cost-benefit curve? With roughly 30 thousand profiles per day being collected today, the experiment can measure improvements up to that daily volume.

2) Geographic / Temporal Sampling

How should RO observations be distributed around the globe and in local time?

Should the tropics or other specific latitude regions receive relatively more focus? How important is local-time sampling to NWP and climate applications?

3) Data Quality

Are there systematic differences in the GNSS-RO sources and their processing algorithms?

What is the value of higher SNR? How to best exploit the various quality aspects, such as penetration depth? How can ROMEX help quantify the impact of the quality aspects to help CGMS partners form data requirements?

4) Make vs. Buy

How much can CGMS partners rely on commercial services to provide operational data?

Issues include total cost per observation, restrictions on data, robustness of system and long-term stability, level of transparency, and value of additional capabilities (e.g., space weather data and neutral atmosphere observations combined).

Recommendations from IROWG-9

- IROWG strongly supports an **open data policy** towards the purchase of commercial RO data and recommends that all agencies follow this model. IROWG stresses the importance of **free and unrestricted access to essential RO** data including archived raw or low-level data
- IROWG recommends **operational** Global Navigation Satellite System (GNSS) RO missions for continuous global climate observations to be established and maintained as a **backbone to ensure continuity and long-term availability of climate quality RO**
- IROWG continues to support the previous recommendations that GNSS-RO data - with **at least 20,000 occultations per day** - are **globally distributed** and **provide full sampling of the diurnal cycle**. IROWG also recommends further **investigation of the value of increased target observation quantities**, to provide a sound basis for future statements on the desirable number of observations and insights on satellite mission planning and coordination
- IROWG recognizes the importance of **space weather applications** of RO data. IROWG recommends that **RO and non-RO missions that use dual-frequency GNSS receivers for their orbit determination** needs should make available to the operational and research communities all necessary low-level (level 0) data and metadata required to produce accurate **overhead TEC data from the GNSS receiver**
- IROWG encourages technology and retrieval developments for improving **planetary boundary layer profiling** from GNSS-RO and their utilization in NWP data assimilation as well as the further **exploitation of RO-derived water vapor**.



Status Report of the International Wind Working Group Activities – Key Recommendations

Presented to CGMS-51 Plenary

Co-Chairs: **Iliana Genkova** (*Lynker@NOAA/NCEP/EMC*)
Feng Lu (*CMA/NSMC/NARSSDC*)

Rapporteur: **Jaime Daniels** (*NOAA/NESDIS*)

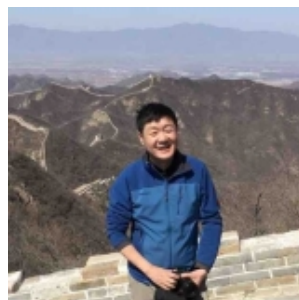
New IWWG Co-Chairs

Iliana Genkova (Lynker@NOAA/NCEP/EMC, Task Lead Observations Processing) and **Feng Lu** (CMA/NSMC/NARSSDC, Chief Designer of FY-4 GS) are the new incoming co-chairs for the IWWG, endorsed by CGMS-50 Plenary in June 2022.

Jaime Daniels (NOAA) will continue as the CGMS rapporteur.



Iliana Genkova



Feng Lu



16IWW webpage:

<https://www.ssec.wisc.edu/meetings/iwwg/2023-meeting/>

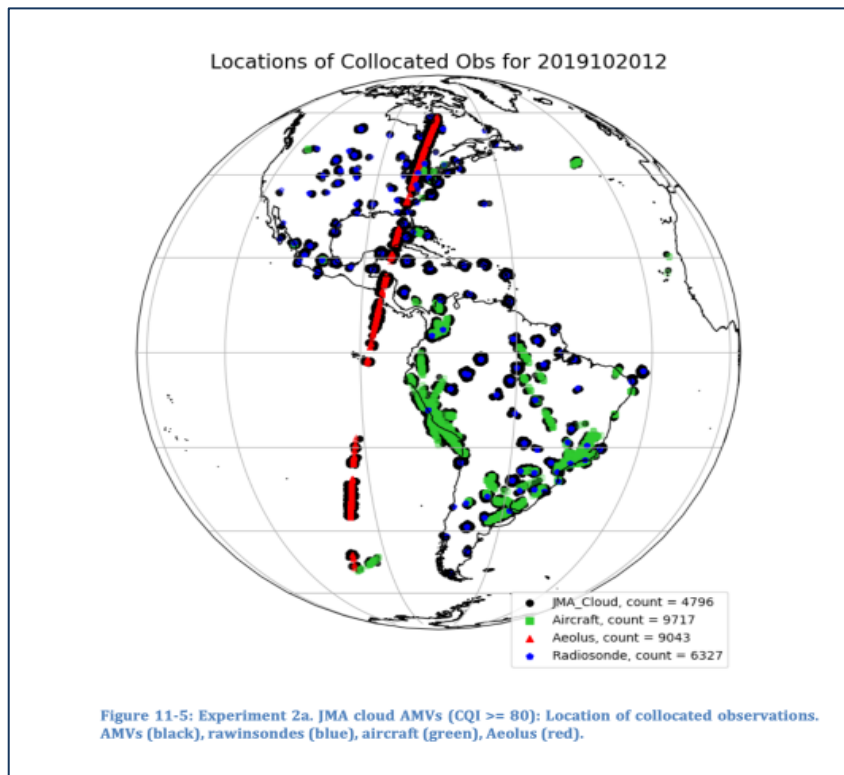
IWW16 Update

- **May 8-12, 2023**
- **Location:** Université du Québec à Montréal (UQAM), Montréal, Canada
- **Host:** Stéphane Laroche, Environment and Climate Change Canada (ECCC)
- **Co-Chairs:** Regis Borde (EUMETSAT) & Steve Wanzong (Univ. of Wisconsin)
- **Meeting Format:** Hybrid (45 In-Person; 25 Virtual)
- **Talks - 49 , Posters – 11**
- **Sessions Covered:**
 - Status of operational winds
 - AMV derivation and quality
 - Use of satellite derived winds in NWP
 - Ocean surface winds
 - Aeolus, 3D winds, and future missions
 - Reprocessing and climate applications
- **Poster session:** Popular addition to winds workshops
- **Plenary Discussions**
 - 4th AMV Intercomparison Results
 - Progress in ocean surface vector winds
- **Working Groups**
 - Wind extraction methods
 - Data assimilation

HLPP 4.2.1: Establish commonality in the derivation of AMV for global users where appropriate (e.g., through sharing of prototype algorithms) and consider backwards compatibility when designing AMV algorithms for the 16-channel imagers, so that present state-of-the-art algorithms can be applied to old imagery.

4th AMV Intercomparison Study Completed

- Participants included: JMA, CPTEC/INPE, EUMETSAT, KMA, NOAA and NWCSAF.
- A common GOES-16 ABI data set was used.
- New reference (truth) data sets include aircraft and Aeolus winds.
- Good progress in meeting the goal of this HLPP. **The different AMV algorithms are becoming more similar**, resulting in better agreement in the AMVs as compared to each other and to rawinsondes and NWP analysis
- Main drivers of differences are height assignment and internal quality control. To be further explored in the next Intercomparison Study



2021 AMV Intercomparison Study report direct link is located here:
<https://www.nwcsaf.org/aemetRest/downloadAttachment/6869>

HLPP 4.2.2: Investigate the best configurations to be used by the AMV producers for use in global & regional NWP models respectively, and clearly define the appropriate requirements for each of them.

A46.03: AMV producers to adopt the latest AMV BUFR template

A46.04: NWP community to define best configuration to be used by the AMV producers for use in global and regional NWP models.

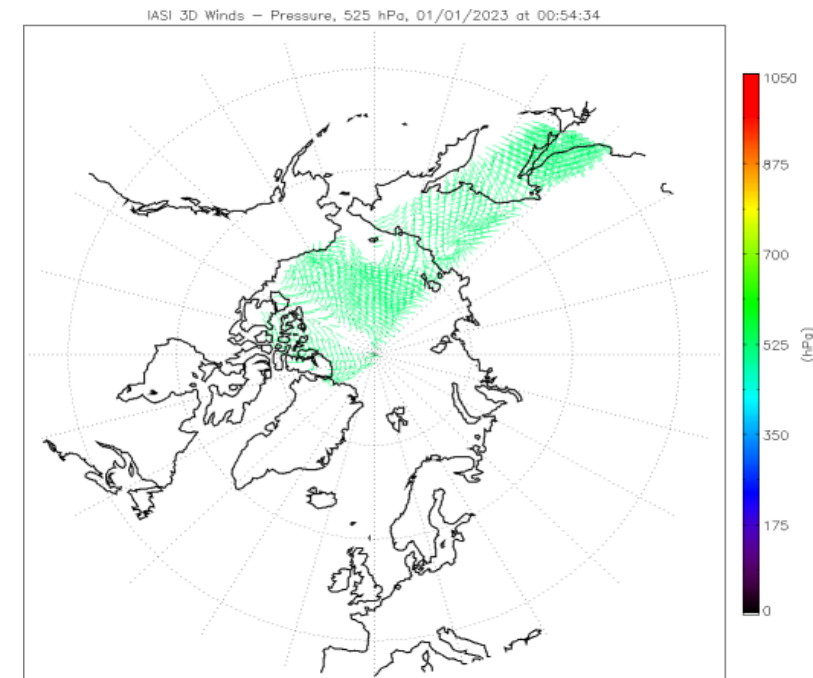
A46.06: IWWG to look at improving quality indicators for high resolution wind derivation for mesoscale and regional applications.

- A set of best configurations to be used by the AMV producers (e.g., in their AMV derivation schemes) for use in global and regional NWP models has been developed and reviewed at IWW16.
- **Great progress made by AMV producers to adopt the latest AMV BUFR template.**
 - Most AMV producers have completed the transition and others are in progress. The delayed roll-out has not caused too many difficulties for NWP users.
 - NWP centers noted a preference for satellite operators to complete the transition to the new BUFR template so that **NWP centers can gain access to, assess, and use new information (e.g., tracking uncertainty) on AMV derivation and auxiliary cloud information (e.g., cloud type/phase, cloud top height error/uncertainty estimates)**. Increased coordination with the satellite cloud community is encouraged to leverage the new cloud information for AMV QC.
- Progress in the above items has **contributed to further homogenization of AMV datasets** produced by satellite operators.

HLPP 4.2.3: Assess the value of winds from GEO Hyperspectral IR.

- EUMETSAT has a 3D wind algorithm ready for MTG/IRS
 - MTG/IRS 3D winds expected in < 1 year after satellite commissioning (2025)
 - **IASI 3D demonstration winds are available** (Jan to Apr 2023 and growing)
 - At least 5 NWP centers noted interest in evaluating these
- CMA has made GIIRS GEO hyperspectral data available on CMA website, for use by users.
- NOAA funded Univ. of Wisconsin effort underway to demonstrate the feasibility of tracking features in global profiles (humidity, ozone) derived from AIRS and CrIS radiances on Aqua, NOAA-20, and NOAA-21.
- There remains uncertainty over whether the long term option will be to assimilate the derived winds or only the radiances (with the wind information coming through the assimilation scheme).
- Other satellite operators planning for a future GEO sounder include JMA (2029), NOAA (2032), KMA (2034)

IASI 3D winds at 525 hPa over the North pole on 01/01/2023.



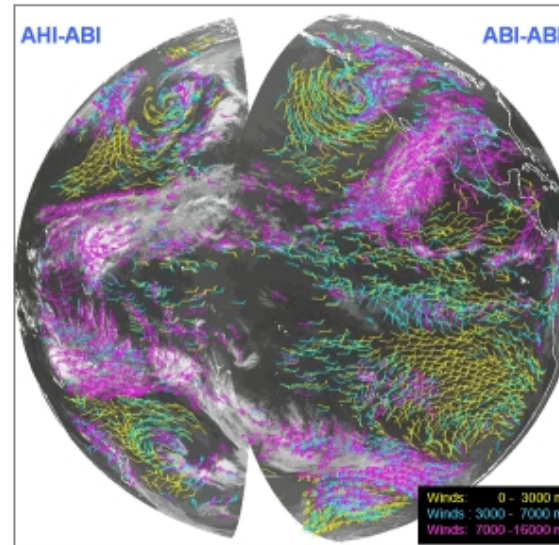
New IWW16 Recommendation: NWP users to evaluate IASI 3D winds in preparation for MTG-IRS. To particularly consider where we see most impact on the wind fields and understand the synergy between this approach and DWL.

Items on Interest to CGMS Plenary

- A marked increase in the development and demonstration of novel wind retrieval approaches
 - Stereo Winds (GEO-GEO; GEO-LEO)
 - Dense Optical flow winds

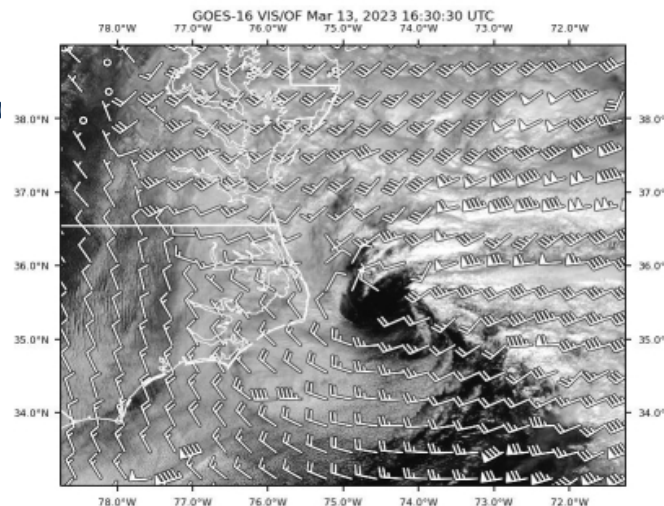
Related to this is a **IWW16 Recommendation to NWP users:** *To consider evaluating stereo AMV products and particularly to understand how the height assignment compares to existing approaches and model best-fit pressure.*

- Numerous ongoing assessments of different approaches (ie., satellite constellation configurations; active LIDARs) to fill the global gap of vertical wind profiles



(Figure courtesy of Jaime Daniels (NOAA))

Stereo winds generated from GOES-16/GOES-17 and GOES-17/Himawari-8 LWIR (11.2um) imagery



(Figure courtesy of Jason Apke (CIRA))

GOES-16 0.64μm imagery plotted with optical flow winds (white barbs) over a low-pressure system off the southeast coast of the United States



2022

ITWG activity updates and recommendations

Presented to CGMS-51 Plenary
JMA Headquarters, Tokyo, 26-28 June 2023

ITSC-24 held in Tromsø, 16-22 March 2023

- 166 participants (in-person only)
- 78 oral presentations + 1 invited talk
- 92 posters (displayed during all the conference)
- 17 NWP centre reports (1st time to reach that number)
- 4 Space Agency reports
- Information from other WGs
IPWG and IESWG

New sessions on

- Artificial Intelligence and Machine Learning
- Small Satellites Assimilation
- Geo Hyperspectral Sounder Assimilation
- Earth System Approach



Recommendations

- Recommendation ITSC24-AS-8 to space agencies and data providers: to expand the backbone system with 3 additional orbits between the current 1330, 0930, and 0530 local times
- Recommendation ITSC24-IIFS-3 to CGMS: to advance the implementation of the WIGOS Vision 2040 for passive IR and MW sounding with agency commitments beyond the established 3-orbit baseline. Noting recent assessments of expected impact, the WG recommends complementing the 3-orbit CGMS baseline with a further 3-orbit system that features at least MW sounding capabilities, with equator-crossing times between those of the 3-orbit baseline to optimize time-to-coverage of the overall system.
- Recommendation ITSC24-NWP-5 to CGMS and WMO members: When commercial satellite data is purchased, ensure provision to users of the necessary data and meta-data required to make use of the data in applications, as early as possible
- Recommendation ITSC24-IIFS-10 to space agencies involved in reference missions (CLARREO, TRUTHS, LIBRA): To work towards harmonized product definitions to make the use of these products easier for inter-calibration exercises



2022

IPWG Activity Updates and Recommendations

Presented to CGMS-51 Plenary
JMA Headquarters, Tokyo, 26-28 June 2023

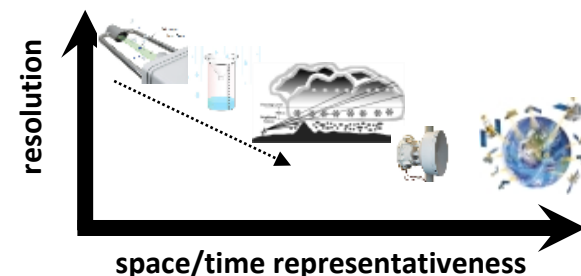
Takuji Kubota (JAXA, Japan) and Chris Kummerow (CSU, Colorado, US), IPWG Co-Chairs
F. Joseph Turk (JPL/Caltech), IPWG rapporteur to CGMS

International Precipitation Working Group (IPWG) Summary

- ⇒ IPWG-10 meeting took place during 13-17 June 2022 at Colorado State University
- ⇒ IPWG activities broken into four Working Groups (only first two are discussed):
 - 1) The **Baseline Surface Precipitation Network** (BSPN) Working Group is drafting a strategy for a uniform quality radar/gauge database, with inputs from QPE experts
 - 2) The **CubeSat/SmallSat Constellation** Working Group has proposed an OSSE framework to benchmark existing and proposed system capabilities (sensors, channels, resolution, sampling)
 - 3) The **Multi-Satellite precipitation** Working Group is soliciting user needs from global product producers, and global product producer needs from the research community
 - 4) The **Machine Learning** Working Group is developing a standard training and independent test data set for individuals to evaluate ML algorithm capabilities in a consistent fashion.
- ⇒ New hosts for IPWG website (JAXA) and email list (US, Univ. of Maryland)
- ⇒ Planning for IPWG-11 as Tokyo, Japan, in July 2024

WG 1: Baseline Surface Precipitation Network (Co-Chairs: Pierre Kirstetter, Kazumasa Aonashi)

- **Goal:**
 - Produce a document that outlines the steps needed to produce a Quantitative Precipitation Estimation (QPE) product of uniform quality from diverse radars/radar networks for use in satellite precipitation validation
 - To collect periods of uniform quality radar or radar network data from as many regimes as possible into a common database for satellite product and model developers.
- **Structure:**
 - Patterned after the template used from the successful Baseline Surface Radiation Network (BSRN) that specifies:
 - ☐ PI involvement in the project
 - ☐ Calibration requirements for the project
 - ☐ Product generation requirements for the project
 - ☐ Reporting requirements



Still studying feasibility of fully distributed archive (i.e. at PI site) vs hybrid schemes that include multiple options to meet the needs of data providers (e.g. central repository for some data sets; software to process data from already archived datasets, etc).

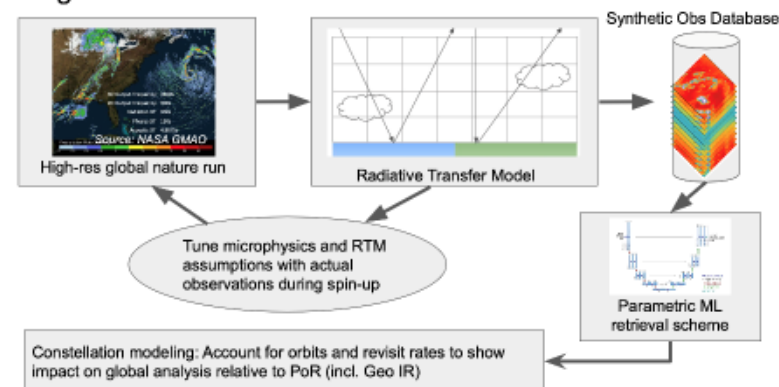
Hope to start approaching potential providers by Aug/Sep 2023.

WG 2: CubeSat/SmallSat for Precipitation

(Co-chairs: Joe Munchak, Chris Kidd)

- **Goal:**
 - Produce a tool to allow CGMS agencies and the community to assess impact of additional satellites/sensors on precipitation products.—
- **Activities:**
 - Encourage high resolution Nature runs, fast radiative transfer codes and parametric ML algorithms needed for successful benchmarking tool.
 - Still looking for CGMS endorsement/support for benchmarking tool. This cannot be a volunteer activity.
- **Proposed activities (support from CGMS):**
 - Use Observing System Simulation Experiments (OSSEs) being currently developed to simulate proposed sensors and sensor constellations to:
 - Assess the additional benefit of proposed satellites over the current program of record (e.g., CGMS baseline)
 - Assess the benefit of satellite configurations and inclusion of small/cubesats

Using retrieval OSSEs to inform future constellations



Highlight: NOAA-Sponsored Satellite Precipitation Workshop

- Online workshop, 1-2 March 2023
- Organized between Univ. of California-Irvine and the NOAA JPSS Project Office (Satya Kalluri)
- 100 participants, including international agencies (JAXA, EUMETSAT)
- 17 Presentations **including the IPWG co-chairs**
- Similar to the NOAA MW Sounder Workshop in July 2021
- Workshop report forthcoming

Workshop on Precipitation Estimation from LEO Satellites: Retrieval and Applications

A Report of The Virtual NOAA Workshop on Precipitation Estimation using LEO Satellite Information

Center for Hydrometeorology and Remote Sensing,
University of California, Irvine
March 1-2, 2023



US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service

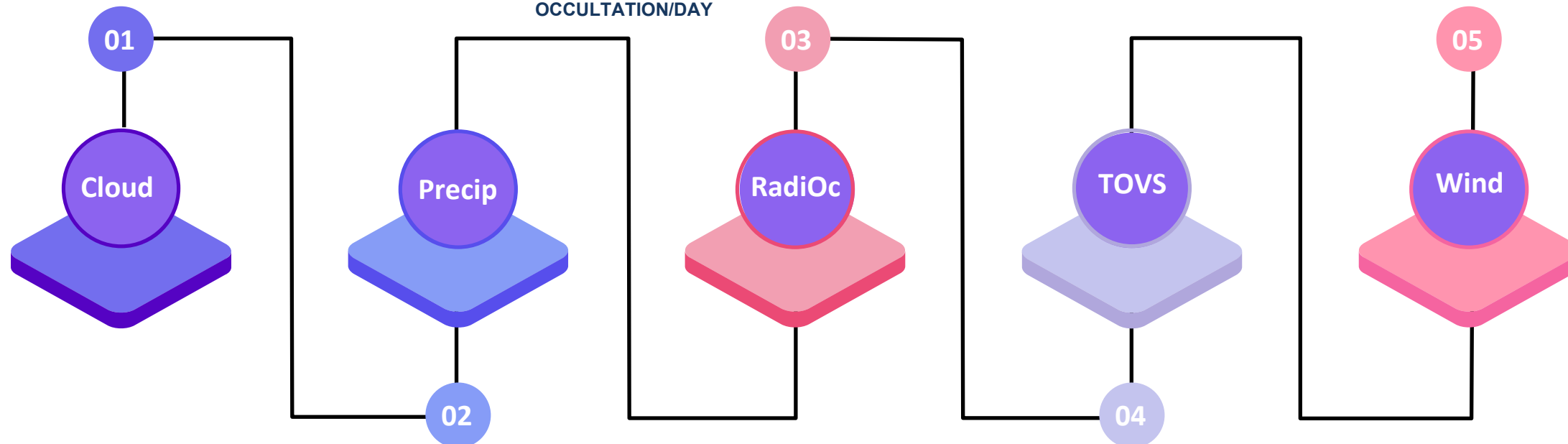
<https://www.nesdis.noaa.gov/events/virtual-workshop-precipitation-estimation-leo-satellites-retrieval-and-applications>

Coordination Group for Meteorological Satellites - CGMS

SPACE AGENCIES ARE ENCOURAGED TO PARTICIPATE IN THE FORMULATION AND TESTING OF THE ISCCP-NG L1G AND TESTING OF L2 CLOUD PRODUCTS

1. SUPPORT TO AN OPEN DATA POLICY TOWARDS THE PURCHASE OF COMMERCIAL RO. THE IMPORTANCE OF FREE AND UNRESTRICTED ACCESS TO ESSENTIAL RO DATA INCLUDING ARCHIVED RAW OR LOW-LEVEL (LEVEL 0) DATA
2. RECOMMENDS OPERATIONAL GLOBAL NAVIGATION SATELLITE SYSTEM RO MISSIONS FOR CONTINUOUS GLOBAL CLIMATE OBSERVATIONS TO BE ESTABLISHED AND MAINTAINED
3. IROWG CONTINUES TO SUPPORT THE PREVIOUS RECOMMENDATIONS THAT GNSS-RO DATA - WITH AT LEAST 20,000 OCCULTATION/DAY

1. ENCOURAGEMENT AND SUPPORT FROM SATELLITE AGENCIES WOULD ACCELERATE THE EFFECTIVE USE OF THE OSW WITHIN NWP
2. SCATTEROMETER TO BE ASSESSED THE CONTINUITY OF AFTERNOON ORBIT



1. GEOSTATIONARY IR TO BE LISTED AS HAVING PRECIPITATION CAPABILITIES IN EITHER THE HLPP AND BASELINE
2. SUPPORT FOR BASELINE SURF PRECIP NETWORKS – MEMBERS PROVIDING 1-2 YEARS OF GRIDDED RADAR QPE

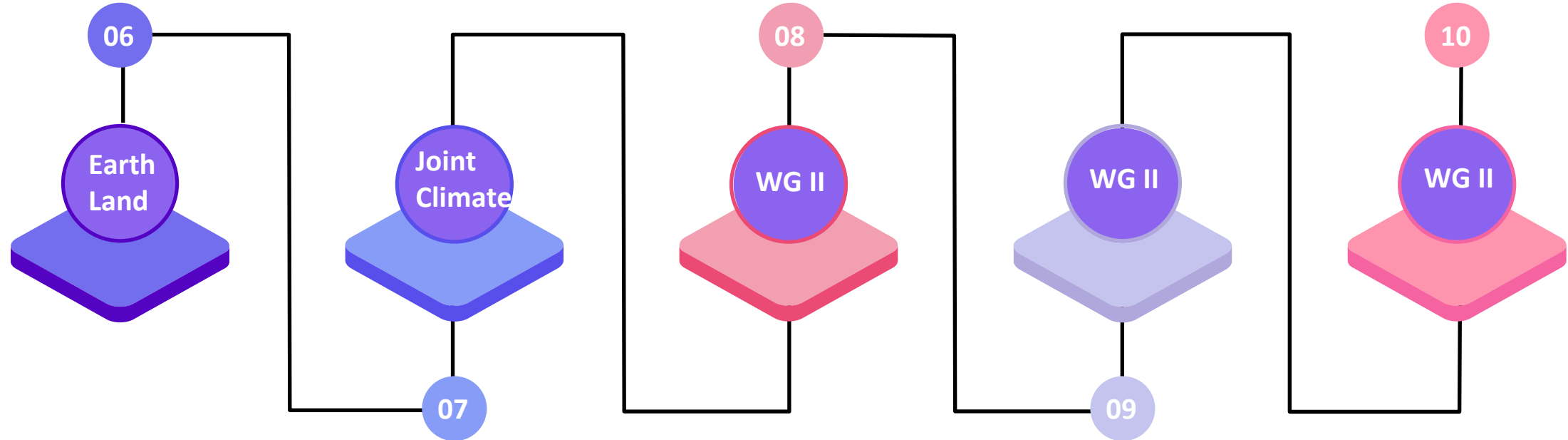
1. EXPAND THE BACKBONE SYSTEM WITH 3 ADDITIONAL ORBITS BETWEEN THE CURRENT 1330, 0930, AND 0530 LOCAL
2. COMPLEMENTING THE 3-ORBIT CGMS BASELINE WITH A FURTHER 3-ORBIT SYSTEM THAT FEATURES AT LEAST MW SOUNDING CAPABILITIES
3. WHEN COMMERCIAL SATELLITE DATA IS PURCHASED, ENSURE PROVISION TO USERS OF THE NECESSARY DATA AND META-DATA
4. TO SPACE AGENCIES INVOLVED IN REFERENCE MISSIONS (CLARREO, TRUTHS, LIBRA): TO WORK TOWARDS HARMONIZED PRODUCT DEFINITIONS

Coordination Group for Meteorological Satellites - CGMS

IESWG TO APPROVE THE CREATION AND TOR - THE INTERNATIONAL EARTH SURFACE WORKING GROUP AIMS AT ENHANCING THE USE OF EARTH OBSERVATION (EO)-DATA FOR BIOSPHERE AND CRYOSPHERE MODELLING APPLICATIONS FROM ACTIVE/PASSIVE REMOTE SENSING WITH THE AIM OF ADVANCING DATA ASSIMILATION FOR OPERATIONAL APPLICATION IN WEATHER AND CLIMATE

CGMS WG2 RECOGNISES THE RELEVANCE OF WMO INITIATIVE ON OPERATIONALIZING GHG MONITORING (GHG WATCH). WMO CAN PLAY A VERY IMPORTANT ROLE IN COORDINATING SEVERAL MEASUREMENT NETWORKS AND ENSURING NRT AVAILABILITY OF DIVERSE OBSERVATIONS USED IN DIFFERENT COMPONENT OF THE VALUE CHAIN (REMOTE SENSING PROCESSORS, VALIDATION, DATA ASSIMILATION)

APPROVAL OF CHAIR, RAPPORTEUR
WGII MEETING PROPOSES TO PLENARY TO REMOVE CLAUSUL IN TOR FOR WMO CO-CHAIR



WGCLIMATE CAPACITY AND WORK PLAN ARE STRONGLY LIMITED BY THE NUMBER OF ACTIVE REPRESENTATIVES IN THE GROUP. THE GROUP ENCOURAGES ALL AGENCIES TO CONSIDER SUPPORT OPPORTUNITIES.

WORKING GROUP II RECOGNIZES THE NEED FOR ADVANCING SPACE-BASED OBSERVATIONS FOR CRYOSPHERE, POLAR AND HIGH-MOUNTAIN AREAS AND RECOMMENDS WMO TO ENSURE THE PROPER MECHANISM TO FOSTER SUCH ACTIVITIES

Thanks

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