

# Climate Working Group – developments since ITSC-23

*Co-chairs: Bill Bell (ECMWF), Nathalie Selbach (DWD)*

## *Interim Climate WG meeting*

- Took place on 23 February 2023
- Update on open actions and recommendations from ITSC-23 and earlier meetings, status updates provided by WG team
- No (major) new topics discussed during meeting
  
- Change in co-chairs in early summer 2022
  - Cheng-Zhi Zou (NOAA) left – many thanks for all your work!
  - Bill Bell (ECMWF) is new co-chair – welcome aboard!
  
- Following slides show update on status of actions since ITSC-23

## ***Status of actions since last meeting (ITSC-23)***

### **Global Observing System design**

**Action Climate-1 (ITSC-22) on Heikki Pohjola:** Provide information on the status of information about FCDRs in OSCAR to the Climate WG. This information will also be added to the Climate WG webpage.

### **Status at ITSC-24: ongoing**

Development work related to OSCAR/Space is continued, WMO has recently implemented a restful API to retrieve observation records in OSCAR/Space and return them as JSON records; Idea is to make OSCAR/Space WIGOS metadata record compatible allowing users to export information from the OSCAR/Space database based on the XML template, for example regarding the relationship between instruments and variables. The Joint Working Group Climate has been involved.

The respective information will be added to the Climate WG webpage.

## *Long-term continuity of OSCAR/Space*

- long-term continuity of OSCAR/Space as a primary tool to support the CGMS Risk assessment and the WMO Rolling Review of Requirements including gap analysis against observing system requirements for satellite data
- making OSCAR/Space the primary repository for WIGOS satellite metadata records generated by CGMS operators
- Updated OSCAR/Space planned to be released in Aug/Sep 2021 (making OSCAR/Space and WIGOS metadata compatible)

**Recommendation Climate-4 (ITSC-23) to WMO:** WMO to collect information on available FCDRs from data providers and include it in OSCAR.

-> related to Action Climate-1 from ITSC-22; Roger Saunders (retired from UK Met Office) started to work with WMO in fall 2021 to maintain and update their OSCAR-SPACE database

-> See also Heikki's poster (14p.01: The Current Status and The Future Development Plans of WMO OSCAR/Space

## ***Status of actions since last meeting (ITSC-23)***

### **Hyperspectral IR sounder uncertainties**

**Action Climate-5 (ITSC-22) on Climate WG members:** To determine the requirements for uncertainty information from all operational hyperspectral IR instruments and document.

**Status at ITSC-24: closed** – New recommendations have been added to the ITSC-23 WG on this topic (Recommendations Climate-8, Climate-9, and Climate-10)

## *Mitigation of the impact of identified degradation or loss of capabilities*

### **Impact on reanalysis**

- Observations from many different satellites are assimilated in reanalysis
- Observation system changes over period of reanalysis
- Studies needed to understand the impact of losing different sensors and assess on the possible loss of performance
- ECMWF is currently planning to perform such studies in preparation of the next generation of their reanalysis (ERA-6)

**Action Climate-1 (ITSC-23) on Bill Bell:** Bill Bell to report at the next meeting (Climate WG meeting at ITSC-24) about the plans at ECMWF and progress to-date concerning impact studies on losing different satellite sensors for assimilation in a reanalysis

### **Status at ITSC-24: ongoing**

Bill will give a presentation in the Climate WG meeting. ECMWF aims to start ERA-6 production in mid-2024, currently finalizing detailed R&D plans

## ***Coordination of data access and end-user support***

- Clear references to data records are important for transparency and citation
- Adequate metadata are important to allow using full potential of data; internationally accepted standards and best practices should be applied to improve interoperability and compatibility

**Recommendation Climate-5 to data record providers:** CDRs should be citable by e.g. having Digital Object Identifier (DOI) reference and being accessible to users. All data records should be accompanied by metadata that follows WIGOS standards

**Recommendation Climate-6 to data developers:** CDR development and stewardship shall follow guidance similar to [NCEI Data stewardship maturity matrix](#) or the [Copernicus Climate Change \(C3S\) convention](#) (including recommendations for metadata)

**Action Climate-2 (ITSC-23) to Climate WG co-chairs:** Add information on NCEI Data stewardship maturity matrix and C3S convention to Climate WG webpage

**Status at ITSC-24: suggestion to close**

The webpage has been updated in early 2022 (shortly after interim working group meeting), update also included correction of e.g. outdated links.

# *Calibration*

## **Bias Monitoring**

The NOAA Product Validation System (NPROVS) currently store collocated radiosonde (high-density) and hyper-infrared/advanced microwave instrument measurements for every GRUAN radiosonde that falls within 2 hrs of a MetOp or NOAA (SNPP, N20) overpass. These include radiosondes from the JPSS dedicated radiosonde program targeting NOAA satellites. The Climate WG supports these activities

**Recommendation Climate-7 to EUMETSAT:** The Climate WG recommends that EUMETSAT consider funding its own dedicated radiosonde program targeting MetOp satellites

Information on status and EUMETSAT plans provided by EUMETSAT (Thomas August, Axel von Engel), details on next slide



# Calibration

## Information from Thomas August and Axel von Engeln

1. EUMETSAT operates a dedicated facility to monitor the performance of the Polar sounding products against radiosondes (MONA LiSA ), will be extended for IASI-NG and MTG-IRS.
2. EPS-SG MWI/ICI instruments require dedicated, collocated radiosondes for instrument calibration, this will happen during the commissioning / Cal/Val phase of the EPS-SG B1 satellite ( $\geq 2025$ ); currently expected to last about 3 months. EUMETSAT is currently contacting providers of radiosonde observations as quite a few sondes needed for this calibration
3. EUMETSAT is exploring possibilities to extend this dedicated campaign above into a long / longer term monitoring of EUMETSAT satellites. Tentative: considering to have about 5 launches per week, over different latitude bands, EUMETSAT is in contact with GRUAN regarding such a service.
4. GRUAN is currently determining costs per sonde launch, service contract costs, and EUMETSAT is further detailing required inputs to points 2 and 3, e.g. how many sondes are needed, what type, what weather conditions (in particular for point 2) etc.

## ***Error characteristics of satellite data and products***

- Common vocabulary and methodology with appropriate error propagation to include the errors associated with validation data is important in order to better understand and trace uncertainties when interpreting long time series of e.g. ECVs.

**Recommendation Climate-11 to satellite data product developers:** Report statistical uncertainties of the CDR trends together with the calibration uncertainties.

-> new capability for determining a rigorous estimate of the CrIS measurement Radiometric Uncertainty (RU) for any individual spectrum available, details on next slide

## ***Error characteristics of satellite data and products***

- A new capability for determining a rigorous estimate of the CrIS measurement Radiometric Uncertainty (RU) for any individual spectrum from NASA L1b, Version 3, calibrated radiance files has been created; improved V4 will become available later in 2023.
- RU is an upper bound of the bias with respect to the true radiance (coverage factor  $k=3$  or 3-sigma, not including noise), and is scene and instrument environment dependent.
- RU for any selected spectra can be calculated using the L1b radiance data and a small amount of ancillary information provided in a static file.
- CrIS NASA L1b Radiometric Uncertainty Tool documentation, sample code, and static RU parameters file are now available via NASA GES-DISC procedure

DOIs for the respective GES DISC landing pages for CrIS Version 3 data:

NOAA-20 FSR: [10.5067/LVEKYTNSRNKP](https://doi.org/10.5067/LVEKYTNSRNKP)

SNPP NSR: [10.5067/OZZPDWENP2NC](https://doi.org/10.5067/OZZPDWENP2NC)

SNPP FSR: [10.5067/ZCRSHBM5HB23](https://doi.org/10.5067/ZCRSHBM5HB23)

- See also talk by Joe Taylor on the CrIS RU and the NASA L1b tool for calculating the RU for any CrIS spectrum (2.07 "Rigorous and Traceable Assessment of the CrIS Radiometric Calibration Uncertainty")

## ***Advancing architecture for space-based monitoring of climate***

- CEOS/CGMS [ECV Inventory Questionnaire Guide](#) identified about 30 ECVs, consisting of nearly 100 individual physical variables
- Current CEOS/CGMS [ECV inventory](#) includes nearly 800 CDRs
- [Gap analysis](#) of the existing ECV Inventory: some key ECVs, particularly GHG, are still under-represented in the current ECV inventory

**Recommendation Climate-12 to space agencies:** Support the further development of ECVs and GHG CDRs to enrich the ECV inventory for climate change monitoring.

ECV inventory v4.1 is now available based on data collected last year to support Gap Analysis exercise,

Updates are now possible at any time and a new version is released after the CEOS/CGMS Climate WG meetings. From the webpage: “The inventory has been continuously updated by data producers and curators, with the latest versions of the database published on a yearly basis to provide the users with more up-to-date information, and to support Gap Analysis exercises. For any question or to provide your contribution, please contact [ecv\\_inventory@eumetsat.int](mailto:ecv_inventory@eumetsat.int).”