



Climate Working Group

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Most past actions now closed except one:

Action Climate 1 from ITSC-21 on WG co-chairs:

Establish how requirements from climate community are collected as input for development of new satellite sensors and provide the information to the group. Establish whether there is a clear role for ITWG-Climate group on definition of climate requirements for new satellite sounding sensors

Status: ongoing

Requirements are collected for ECVs or Level-2/3/4; responsibility for this process lies with GCOS. For sensor data at Level-1 this is normally done at each individual agency during its mission planning

-> Need to figure out whether climate requirements are considered systematically by agencies in mission planning

-> Further discussion in Climate WG sub-group, input from satellite agencies appreciated

ITSC-22 Recommendations and Actions:

Global Observing System design

OSCAR has been quite stable, no new features have been added since about two years, but there are plans at WMO to update OSCAR with new features.

Action Climate-1 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.

Action Climate-2 on Co-Chairs: Provide information on the CEOS/CGMS Joint Working Group on Climate on the Climate WG webpage (e.g. link to report, etc.)

ITSC-22 Recommendations and Actions:

Gap analysis:

GCOS (Global Climate Observing System) and AOPC (Atmospheric Ocean Panel for Climate) are preparing gap analysis report. Gap analysis is a standing item for CGMS, they update every year and report. Links to the respective report will be added to the Climate WG webpage with the next update.

Action Climate-3 on Co-Chairs: Provide information on the GCOS and AOPC gap analysis report to the Climate WG webpage (e.g. link to report, etc.)

ITSC-22 Recommendations and Actions:

Data archiving:

The WG stresses that it is important, that satellite data providers archive the original raw data (level 0 data) with all accompanying metadata, sensor specification and laboratory measurements of antenna characteristics. This is especially important with respect to reprocessing of data for e.g. generation of FCDRs, correction of calibration issues also in more near-real-time applications, etc.

Recommendation Climate-1 to satellite agencies: Satellite data providers should allow access to level-0 data for all data after commissioning, and during the commissioning phase ensure some negotiated access regardless of the vendor.

ITSC-22 Recommendations and Actions:

Data continuity and consistency: upper stratosphere/lower mesosphere post SSMIS, inter-calibration requirements for climate data records, GSICS

DMSP F19 failed to transfer data to ground receiving stations in 2016. The U.S. Naval Research Laboratory (NRL) owns and still has the last SSMIS instrument in storage. NRL is currently looking for possible vehicles to launch this SSMIS instrument. If launched, this could be the last SSMIS flying on a satellite.

Recommendation Climate-2 on satellite agencies:

Upper stratosphere and lower mesosphere are an important component in the climate system. Satellite agencies should plan ahead in designing sounding instruments to cover atmospheric layers from 1hPa to 0.1hPa when SSMIS is no longer available

ITSC-22 Recommendations and Actions:

Metrological Traceability

As recognized by other groups (GSICS, CEOS-WGCV, ..) satellite agencies should ensure that accuracy specifications on new missions are underpinned by a requirement on instrument vendors and those responsible for pre-launch characterization to achieve metrological traceability for all measurements affecting level-1 products. A further aspiration, addressed by targeted missions such as CLARREO and TRUTHS, is to achieve metrological traceability for on-orbit measurements. These requirements complement existing recognized requirements for mission overlap and temporal stability.

Recommendation Climate-3 to satellite agencies:

When designing, characterizing and calibrating new sensors satellite agencies and instrument vendors should ensure that metrological traceability is achieved for all pre-flight measurements influencing the accuracy of level-1 products. This information should be comprehensively documented and be made available to end users.

Recommendation Climate-4 to GSICS: GSICS should ensure that traceability is part of their best-practices for calibration/inter-calibration

ITSC-22 Recommendations and Actions:

Requirements for new sensors for climate applications

The NWP community has been effective in shaping mission requirements for new meteorological satellite instruments, and many of the detailed NWP requirements are common to climate applications, however there are particular requirements related (for example) to stability, accuracy and traceability of the measurements that are unique to climate.

Recommendation Climate-4 to satellite agencies: The group recommends that satellite agencies support targeted studies aimed at translating GCOS ECV requirements into radiometric, spectral and sampling specifications for new sensors, particularly addressing requirements that are specific and additional beyond those generated from other applications such as NWP, etc.

ITSC-22 Recommendations and Actions:

Two-satellite constellation of same instrument in the same orbit

The value of having e.g. SNPP and NOAA-20 being separated by a half orbit in the 13:30 orbit has been shown during the conference. For climate monitoring, the difference between the two satellites (instruments, products) can be monitored on a 16 day or 32 day repeat cycle, because the global average should be identical since both satellites are observing at 13:30 and 1:30. This allows on the one hand to get better confidence in the retrieval of CDRs (e.g. seeing the same behavior of time series seen in product derived from both satellites) and also allows the monitoring of possible issues in one of the satellites. Two satellites half orbit apart also benefit nowcasting and severe weather monitoring.

Recommendation Climate-6 to satellite agencies: The group recommends satellite agencies to keep and/or establish a 2-satellite configuration for the same sensor in the same orbit (same equator crossing time) to improve the confidence in derived CDRs and also provide a measure to assess the stability/health of the instruments on the two satellites.

ITSC-22 Recommendations and Actions:

Reanalysis, Data Rescue and Data Quality Assessment

Several activities are ongoing to rescue and assess the quality of early (pre-1979) satellite level-1 datasets to support climate reanalysis and other climate studies. Information on the outputs from these types of activity (data and documentation) should be collected in a central portal, to help coordinate future reprocessing efforts and to provide a single authoritative catalogue of status on these activities. Although the main focus of GSICS is the intercalibration of modern-era satellite data records the expertise, interests and communication channels of the group are most closely matched to the early rescue and assessment activities and therefore is the most obvious group to host such a portal.

Action Climate-4 on WG Co-chairs: Co-chairs to ask GSICS for guidance on stewardship of data, documentation and metadata related to the recovery and assessment of early satellite data sets

ITSC-22 Recommendations and Actions:

Hyperspectral IR sounder uncertainties

An ongoing assessment of the consistency the bias corrections applied to the advanced IR sounder data assimilated in ERA5 (AIRS, IASI and CrIS) is providing useful insights into the performance of the reanalysis. For example, the bias corrections applied to (NPP and NOAA-20) CrIS for most of the 15 μm temperature sounding channels are smaller than the radiometric uncertainties (at 3σ). This represents a good consistency check on the mean state of the reanalysis in the recent era, and may provide an important tool in the development of a 'benchmark' reanalysis. Such an analysis requires that the radiometric uncertainties for these sensors are documented and made available to users.

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

Action Climate-6 on Climate WG co-chairs: To ask GSICS to forward the request to the instrument teams at agencies to provide the uncertainty information from all operational hyperspectral IR instruments.

ITSC-22 Recommendations and Actions:

Efficient dissemination of hyperspectral IR data: Channel subsets vs. all channels; PC scores vs. radiances

Recommendation Climate-7 to satellite providers: Satellite data providers should distribute a set of selected channels and PC scores for (upcoming) hyperspectral sensors. This way, users could reconstruct the radiances and compare the reconstructed channels with the distributed channels and check if PCs are done correctly and get a feeling about the potential information loss. The archiving and open availability of full L1C data for climate studies should be preserved and re-processed data should be publicized whenever available.

ITSC-22 Recommendations and Actions:

Validation:

The WG encourages community to do mutual validation for satellite pairs on the same orbit for similar instruments. This mutual validation provided better confidence in terms of CDR traceability and stability. In addition, the GCOS Reference Upper-Air Network (GRUAN), an international reference observing-network of sites measuring essential climate variables including temperature, water vapor, wind and pressure, provides long-term, high-quality climate data records to validate satellite sounding observations for traceability and stability. Finally, *Network for the Detection of Atmospheric Composition Change (NDACC)* has long-term observations of other trace gases for validating satellite observations of greenhouse observations.

Recommendation Climate-8 to GRUAN: *GRUAN should be encouraged and supported to provide subsets of satellite targeted observations (NOAA and MetOp satellites) and EUMETSAT encouraged to support MetOp targeted radiosondes at selected GRUAN sites similar to ongoing JPSS targeted radiosonde programs with NOAA satellites. These are most valuable in the context of climate (and weather) oriented validation. GRUAN should use existing balloon-borne sensors and/or developing new ones to make profile measurements of the greenhouse gases such as CO₂, ozone, CH₄, etc. to provide a in situ source for validating satellite greenhouse gas observations.*

ITSC-22 Recommendations and Actions:

Training

Training of users in the usage of different CDRs (from FCDRs to TCDRs) is an important issue to support climatologists in applying the products in climate monitoring, climate analysis, and climate modelling. One example are the training activities of the different EUMETSAT Satellite Application Facilities together with the EUMETSAT training and outreach group. Training courses at different knowledge levels are given regularly together with the provision of documented software tools. Currently CM SAF is e.g. supporting the development of a training module that will become available in [COMET](#).