

## 2.4 ADVANCED SOUNDERS

Web site: <http://cimss.ssec.wisc.edu/itwg/aswg/>

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### 2.4.1 Working Group meeting agenda: 16 June 2021

The ASWG held its working group meeting on 16 June 2021. The meeting agenda is shown below, and each of the presentations are available online at:

[http://cimss.ssec.wisc.edu/itwg/itsc/itsc23/working\\_groups.html](http://cimss.ssec.wisc.edu/itwg/itsc/itsc23/working_groups.html)

<b>ITSC-23 ASWG Meeting Agenda</b>		
<b>ASWG Introduction / Goals / Review of the Agenda</b>	5 min	Co-chairs
<b>Review of progress of action items and recommendations from the last meeting</b>	20 min	Co-chairs/all
<b>WMO Coordination Group for Meteorological Satellites (CGMS) High Level Priority Plan Items</b>	5 min	Co-chairs/all
<b>Hybrid PC approach for the hyperspectral sounder radiances</b> Current status at EUMETSAT (dissemination and ongoing studies) Current status for CrIS	20 min	Tim Hultberg D.Tobin
<b>Latest status of FY-3D/3E and FY-4A/4B</b>	20 min	Chengli Qi
<b>Presentation of the FORUM mission</b>	20 min	Luca Palchetti
<b>User readiness for ICI</b>	15 min	Alan Geer
<b>Information on NOAA future missions</b>	30 min	Mitch Goldberg
<b>Coming End Of Life activities</b> IASI EOL AIRS EOL	20 min (if time permits)	Dorothee Coppens D.Tobin for S.Broberg
<b>Open discussion, Candidate recommendations/actions</b>	20-30 min	All
<b>ASWG Website</b>	5 min	
<b>AOB</b>		

The ASWG email list has been updated, and all ASWG participants may be reached via email with the following address: [itwg\\_aswg@g-groups.wisc.edu](mailto:itwg_aswg@g-groups.wisc.edu)

## 2.4.2 Planned Sensors and Data

### **Cloud and Sub-Pixel Information within Sounder Footprints**

The meeting included a review of progress of action items and recommendations from the last meeting and discussion of needs regarding planned sensors and related data. This included a discussion on having IR+MW sensors on the same platform like it was recommended at the last ITSC, instead of having IR+imager to get the cloud information. Cloud information from collocated imager/sounder data are used by NWP centres among other methodologies, as well as other users like atmospheric composition community.

The meeting included discussion on the methodology to include cluster information from the imager in the IR FOV. The methodology of the Nuees dynamiques for the AVHRR/IASI could be used by other instruments. EUMETSAT NWP/SAF has applied that methodology to VIIRS/CrIS. The following recommendations and action were made:

### **Recommendation AS-1 to Space Agencies**

**To develop a methodology to include the imager clusters in the hyperspectral IR sounders field of view and to study different clustering technics and compare them.**

### **Action AS-1 to Mitch Goldberg**

**To investigate why the VIIRS/CrIS software developed by EUMETSAT Via NWP/SAF is not used.**

### **Recommendation AS-2 to Space Agencies (CMA)**

**To analyse the need of having the MERSI cloud amount and MERSI radiances coregistered with HIRAS pixels and possibly to develop the new products accordingly.**

### **PC Reconstructed Radiances**

The meeting also included a review of Recommendations and Actions regarding the availability and use of PC reconstructed radiances. Those included:

- **Recommendation AS22-10 to NWP centers**  
To investigate the use of theoretical PC reconstructed radiances, for a representative set of spectral channels, to be used in the radiance assimilation process.
- **Recommendation AS22-8**  
EUMETSAT hybrid method should be taken as the best practice to establish PC for IRS on MTG.
- **Action AS22-4 to ASWG co-chairs**  
To circulate to ASWG the information to the bandwidth for the MTG IRS L1 PC dissemination as soon as it is available.
- **From CGMS**  
To establish together with the user community a commonly agreed approach for retrieval of Principal Component scores and associated parameters from hyperspectral infrared data, minimizing information loss including the mutually acceptable update strategy for the principal component basis and to implement such an approach in a coordinated manner.

At the Working Group meeting, EUMETSAT presented the status of the hybrid approach development and the activities related to the use of reconstructed radiances in NWP and Atmospheric Composition (AC) user communities. The hybrid methodology is being refined at the very moment to capture all atmospheric signal to answer the AC user needs. CIMSS/SSEC reported that the hybrid approach is currently being implemented by NOAA for the CrIS products.

The action AS22-4 has been closed during the meeting.

No new actions nor recommendations have been identified. The recommendation AS22-10 should be re-conducted and becomes:

#### **Action AS-2 to NWP centers**

**To investigate the use of theoretical PC reconstructed radiances, for a representative set of spectral channels, to be used in the radiance assimilation process.**

### **Updates on Chinese Satellites**

Relevant recommendations from ITSC-22 included:

- **Recommendation AS22-1 to Space Agencies (CMA)**  
Disseminate the HIRAS and GIIRS data 6 months after launch if possible, and not only via EUMETCAST but also to the Global User Community.
- **Recommendation AS22-2 to Space Agencies (CMA)**  
Consider to make available as soon as possible the HIRAS spectra at full spectral resolution for all bands. This also applies to all future hyperspectral sounders.

- **Recommendation AS22-3 to Space Agencies (CMA)**

FY-4B GIIRS data has good noise performance below the current longwave cutoff of 700 1/cm; CMA to investigate and consider extending the output range of FY-4B GIIRS spectra to ~680 1/cm.

At the Working Group meeting an updated presentation from CMA was given on the status of upcoming FY-3D/FY-3E and F-4A/FY-4B. Lots of new information given, including the following points to answer the recommendations of the ITSC-22:

- HIRAS/FY-3E spectra will be available at full spectral resolution for all bands;
- HIRAS/FY-3E will continuous like the IASI spectra;
- Data of FY3E/HIRAS and FY4B/GIIRS will be disseminated 6 months after launch: in December 2021 for FY4B/GIIRS and January 2022 for FY3E/HIRAS; and
- LWIR of FY4B/GIIRS is 680-1130  $\text{cm}^{-1}$ .

### **Updates on Russian Satellites**

EUMETSAT provided an update that MTVZA-GY (Conical scanning imaging/sounding microwave radiometer with 21 frequencies and 29 channels) data from Roshydromet Meteor-M N2-2 satellite will be available on EUMETCast from 6 May 2021.

No information on IKFS-2 was available at the meeting.

The Action from ITSC-22 is retained:

#### **Action AS-3 to ITWG Co-chairs**

**To follow the data release date, 2 or 3 months after the launch of Meteor-M N2-2 (January 2020?) and circulate the information at ASWG.**

### **2.4.3 Next Generation Sensors and Data**

#### **NOAA Next-Generation Systems**

An action from ITSC-22 was for NOAA to update the ASWG on efforts to define their Next-Gen systems, to be in place following JPSS and the GOES-R series:

- **Action AS22- 5 to Karen St Germain**  
To provide information on the new NOAA trade study mission.

At the WG meeting, NOAA provided a detailed presentation on this status of this effort. For GEO, the preliminary recommended GEO-XO Architecture is:



And for the LEO plans, the presentation material indicates that the plan for the Next-Gen LEO system should be in place in a couple of years from now. Emphasis is on continuing the backbone observations in the 13:30 orbit and other application driven assets for higher temporal coverage.



Regarding these next-gen systems, the WG created the following new recommendations:

**Recommendation AS-3 to space agencies**

To consider LEO constellations of small satellites to improve the temporal refresh. However, the backbone of high quality stable measurements of visible, infrared, microwave, UV, established by NASA (AQUA), NOAA (JPSS), and EUMETSAT (Metop) measurements are still needed. With an observatory of at least microwave, infrared, imagery and ozone to allow continuation of climate data records in fixed stable orbits with two satellites in each orbit for intercalibration enabling continuation of climate data records, and for intercalibration of smallsats in extended orbits, as well as stable long-term observations for NWP.

**Recommendation AS-4 to Space Agencies**

To continue to employ the traditional longwave infrared spectral radiance measurement band on all future hyperspectral IR satellite sensors.

**Recommendation AS-5 to NOAA**

To more quickly develop the plan for its Next-Gen LEO mission/payloads.

### **Recommendation AS-6 to NOAA**

**To expedite the implementation of an advanced IR imaging infrared sounder for GEO-XO to assure on-orbit operations by 2030 with a goal of the mid-2020s for better coordination with other international efforts to achieve a more effective global ring**

#### ***The Ice Cloud Imager (ICI) Mission***

The WG meeting included an overview of the upcoming ICI mission with the following summary points and recommendation.

- ICI –to be launched 2024
  - Operational radiance measurements at 183 GHz –664 GHz on Metop-SG
  - Co-flown with Microwave Imager (MWI) and scatterometer on B-satellite
- Test data in NetCDF available now
  - **BUFR format still in preparation** (aim: this year)
- Radiative transfer modelling (e.g. RTTOV-SCATT, CRTM?):
  - Sub-mm spectroscopy, error characterisation (**ongoing EUMETSAT / Met Office study**)
  - Ice hydrometeors (**shape, orientation, polarisation, PSD**)
  - Surface emissivity (ocean, **sea-ice, snow, land**)
- Data processing:
  - Possible ECMWF approach: **Assimilate L1B radiances with superobbing (e.g. 40 by 40 km) and combine into one super-sensor with MWI**
  - Alternative possibility: **Optimal convolution onto a single FOV**; to be part of L2 processing

### **Recommendation AS-7 to Space Agencies**

**To ensure the ICI readiness.**

#### **2.4.4 Re-iterating previous high priority ASWG recommendations:**

The WG also re-iterates several previous high priority recommendations:

- **Recommendation to Satellite Agencies (NOAA, JAXA)**

Consistent with numerous previous ITWG and ASWG recommendations, and consistent with the WMO Integrated Global Observing System (WIGOS) Vision for the Global Observing System in 2025 and 2040, the ASWG strongly recommends that space agencies develop and implement plans to fill the gaps in IR hyper-spectral sounding within the Geostationary constellation.
- **Recommendation to Satellite Agencies**

The constellation of at least three polar orbits (early morning, morning, and afternoon), each with full sounding capabilities (IR and MW), should be maintained. The overpass times of operational satellites with sounding capability (IR and MW) should be coordinated between agencies to maximize their value.
- **Recommendation to Satellite Agencies**

Implement high spatial resolution and contiguous sampling detector arrays in future hyperspectral infrared sounding instruments.

- **Recommendation to Satellite Agencies**  
To develop, test, and implement an Infrared SI-traceable radiometric standard in space as soon as feasible.
- **Action to ITWG Co-chairs**  
To re-iterate these recommendations to Space Agencies via CGMS.