# Advanced Sounder WG

**Co-Chairs:**

**Dorothee Coppens (EUMETSAT) and David Tobin (Univ. of Wisconsin)**

**Thursday morning, 16 March 2023**

# Working group goal

**The advanced Sounder Working Group (ASWG) focuses on scientific issues affecting the optimal performance of advanced sounder systems.**

**The working group reviews the status of the development of advanced sounder systems and recommends changes pertaining to instrument specification, performance , data processing and utilisation.**

**For the purpose of this group, "Advanced Sounders" are defined as instruments that present significant new scientific and technological challenges and which require new methods for data processing and utilisation.**

**➔ Advanced Sounders currently include high spectral/spatial resolution passive infrared and microwave sounders and active sensors.**

# Planned sensors and data

**Review of progress of action items and recommendations from the last meeting.**

**Discussion on having IR+MW on the same platform like it was recommended at the last ITSC, instead of having IR+imager to get the cloud information. Cloud information are used by NWP centres among other methodologies, as well as other users like atmospheric composition community.**

**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.**

**Recommendation ITSC23-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 ITSC23-AS-2 to Mitch Goldberg (?):**

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

**Recommendation ITSC23-AS-2 to Space Agencies (CMA):**

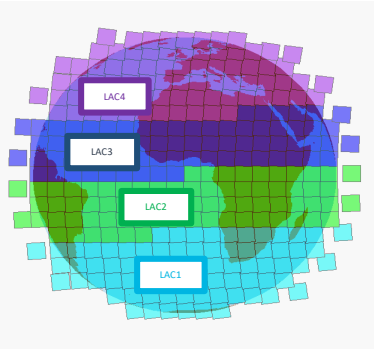
To get the MERSI cloud amount and MERSI radiances. They can provide those products

# Planned sensors and data

***From Recommendation ITSC22-AS-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 ITSC22-AS-8*** *EUMETSAT hybrid method should be taken as the best practice to establish PC for IRS on MTG*
***Action ITSC22-AS-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.*

**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.**

**PC hybrid will be operational end of March**



# Planned sensors and data

***From ITSC22-AS-2 to Space Agencies (CMA)*** *to 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.*

***From Recommendation ITSC22-AS-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 ITSC22-AS-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.*

**Updated presentation from CMA of 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 recomm of the ITSC-22:**

- **HIRAS/FY-3E spectra will be available at full spectral resolution for all bands**
- **HIRAS/FY-3E will be 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**
- **LWIR of FY4B/GIIRS is 680-1130 $cm^{-1}$**

**FY-4B and FY-3E are in operation!**

# Next generation sensors and data

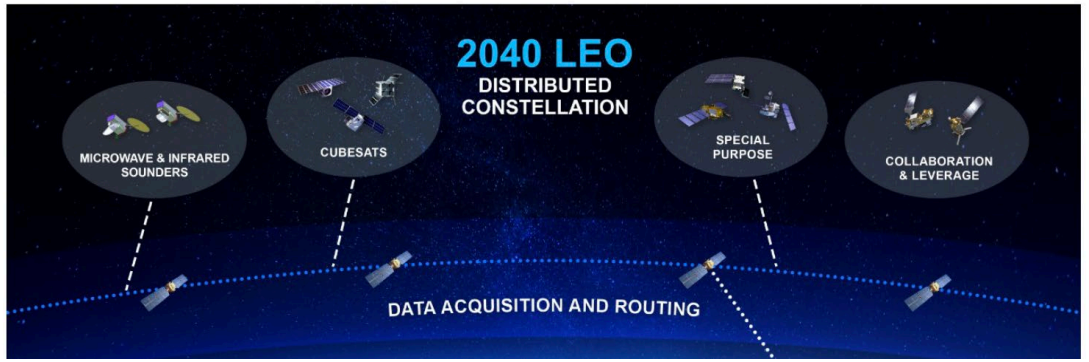
***From Action ITSC22-AS-5 to Karen St Germain*** *to provide information on the new NOAA trade study mission*

**Presentation from Mitch Goldberg on the new NOAA Next-Gen systems:**

- **GEO:**


**Geo-XO recently passed "milestone 2" with payloads and schedule in place**

- **LEO: Next-Gen plan to be in place in a couple years from now.** Continuing the backbone observations in the 13:30 orbit and other application driven assets for higher temporal coverage, etc.



# Next generation sensors and data.
# Draft recommendations from the WG meeting:

**Recommendation ITSC23-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 a stable long-term observations for NWP.

**Recommendation ITSC22-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 ITSC22-AS-5 to NOAA** to more quickly develop the plan for its Next-Gen LEO mission/payloads.

**More discussion to come on Saturday**

# Re-iterating previous high priority ASWG 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 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.

**Was communicated to CGMS**

# ASWG current topics to be discussed on Saturday:

**Saturday morning 9am to noon, concurrent with Climate WG and RT WG**

- ✓ **CGMS/High Level Priority Plan – discuss items relevant to the ASWG**
- ✓ **Discussion on the decision to switch SNPP CrIS from LW+SW to SW+MW (NOAA)**
- ✓ **Impact of having a hyperspectral IR sounder in the 5.30 AM orbit (NOAA)**
- ✓ **How future GEO IR sounders and LEO sounders complement each other (NOAA)**
- ✓ **Discussion of future/advanced sounders from the MW included in the ASWG. These could include:**
  - ✓ **The use of sub-mm, from Metop-SG ICI and others in the pipeline;**
  - ✓ **The hyperspectral MW concepts being pushed in various places;**
  - ✓ **Improved sensor technology that could provide extremely low noise MW sounders in the future**
- ✓ **Technical discussion on Straylight management in future FTS programs**

➔ **Any other topic you would like to discuss on Saturday ???**

**Dorothee.Coppens@eumetsat.int** **Dave.tobin@ssec.wisc.edu**

**itwg_aswg@g-groups.wisc.edu**

# Participants of the last ITSC-23

| | | | | | |
|---|---|---|---|---|---|
| Aya Kasai (JMA) | Dieter Klaes | Indira Rani S (NCMRWF, MoES) | Liam Gumley | Peter Beierle | Vinia Mattioli - EUMETSAT |
| Alain Beaulne | Nico Cimini | Ishida Haruma | Luca Palchetti | Chengli Qi - CMA | Wei Han |
| Alan Geer ECMWF | Dorothee Coppens - EUMETSAT | Jianjun Jin | MasamiMoriya | Reima Eresmaa | William Mccarty |
| Agnes Lim | Emily Liu | James Jung | Mitch Goldberg | Rich Kelley | Bill Smith |
| Awdhesh Sharma | Eric Fetzer | Joe Predina | Miguel-Angel Martinez | Robert (Bob) Tubbs | Xavier Calbet |
| Benjamin Johnson | Erin Lynch | Jeon-Ho Kang_(KIAPS) | Hidehiko Murata (JMA) | Robert Knuteson | Zhenglong Li |
| Lei Bi | Evan Fishbein | Katie Lean - ECMWF | Nick Nalli | Hiroyuki Shimizu (JMA) | Zhipeng Ben Wang |
| William Campbell | Fabien Carminati | Masahiro Kazumori | Niels Bormann | Silke May | Zhiyu Yang |
| Bill Smith | Filomena Romano | Keiichi Kondo | Nigel Atkinson | Scott Mindock | |
| Chawn Harlow | Fiona Smith | Kirsti Salonen | Ninghai Sun | Stegmann | |
| Chenke | Flavio Iturbide | Toshiyuki Kitajima (JMA) | Noelle Scott | Stephen English ECMWF | |
| Chris Burrows | Graeme Martin | Kozo Okamoto (JMA/MRI) | Olaf Stiller | Sylvain Heilliette | |
| Christina Köpken-Watts (DWD) | Haixia Liu (Ext) | Kristen Bathman | Olivier Coopmann | Tim Hultberg | |
| Cristina Lupu | Hank Revercomb | Naoto Kusano, JMA | Norio Kamekawa | Tom Atkins | |
| David Tobin | Hejun Xie | Lambrigtsen, Bjorn | Yoshifumi Ota (JMA) | Yong Chen | |
| David Duncan | Heikki Pohjola WMO | Leanne Avila | Paul Menzel | Vincent Guidard | |