ITWG key recommendations to CGMS plenary

Presented to CGMS-53 Plenary, agenda item 5

Coordination Group for Meteorological Satellites

INTERNATIONAL ATOVS WORKING GROUP CGMS

Executive summary of the WP

Around 115 participants representing 23 countries attended ITSC-25, held 8-14 May 2025 in Goa, India. A full report including recommendations and actions will be available on our website https://itwg.ssec.wisc.edu/conferences/past-itsc-meetings/ from the end of July.

There was strong engagement from industry, including private companies developing microwave sounders. ITWG highlights the need for stability and adequate calibration and recommends space agencies to act as a link.

ITWG continues to recommend completion of the baseline observing network with a complete GEO ring of hyperspectral IR, the use of the 05:30 orbit and the inclusion of 6 SSO and low inclination orbits with microwave sounders.

There is a need to review the resilience of climate datasets.

AI/ML has the potential to disrupt the weather industry, with rapid changes in a short period of time and the development of direct from observations predictions. Observations will remain critically important, and should be made ML-ready.

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ITSC-25

- We have just returned from ITSC-25, held 8-14 May 2025 in Goa, India
- Around 115 Participants representing 23 countries
  - 96 Scientists attended in person
  - No representation in person from NOAA and NASA core staff, nor from CMA
    - Around 10 of these listened in online, mostly from CMA
  - 17 people recorded a presentation that was shown at the conference to share information from these organisations (including 2 from NRL, 1 from ECMWF)

- Presentations will be made available by the end of June and linked from our website https://itwg.ssec.wisc.edu/conferences/past-itsc-meetings/
- The conference report will be finalised by the end of July

- Working groups met during the conference
  - Advanced Sounders, Climate, DA/NWP, International, Products and Software, Radiative transfer
  - Fast RT models technical subgroup also met
  - Technical subgroup on RFI met 2 weeks before the conference

HLPP items relevant to ITWG (1)

4.2.6 *Establish… a commonly agreed approach for retrieval of PC scores and associated parameters from hyperspectral infrared data, minimizing information loss… Consider dropping this item from HLPP*

- Most centres confirm they will likely assimilate reconstructed radiances rather than PC scores
- NASA following a similar approach to EUMETSAT (hybrid global/local) and JMA are open to exploring this also.
- More important than a common approach is detailed technical documentation
- Note arrival of hyperspectral microwave data
- Considerations for PC compression in direct broadcast products (consistency with global)

4.3.2 *Conduct an intercomparison study between… level 2 data from IR hyperspectral sounders*

- NCMRWF have volunteered to compare EUMETSAT and NOAA products over India vs RAOBS.

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HLPP items relevant to ITWG (2)

4.4.1 *Establish common vocabulary and methodology with appropriate error propagation to include the errors associated with validation data…*

- Members of Climate working group will report in 2028 on validation of ERA-6 vs CrIS which will include this. The insights will contribute to the evidence base and definitions.
- Error statistics to be included with IRS L2 products

4.6.3 *Through coordination between IPWG, ITWG and ICWG continue to improve microwave RT models to include complex surfaces… and scattering atmospheres…*

- A paper at this conference (Niels Bormann, 7p.01) presented a machine learning approach
  - Explore further use of AI/ML to adapt to e.g. flooding
- Need for the following to support this effort
  - Creation of full-spectrum aerosol and cloud datasets
  - Treatment of full polarization

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HLPP items relevant to ITWG (3)

4.7.2 Conduct trade-off studies regarding the benefits of spectral, radiometric and spatial resolution of infrared sounders… Consider dropping this item from HLPP

- This was addressed by ITWG in 2016-17 (e.g. https://doi.org/10.1364/AO.55.007113) and no further work has been done.
- Forthcoming and planned GEO Hy IR sounders all share similar resolution characteristics and this is felt to be beneficial for fast user uptake for NWP.
- However, ITWG is generally supportive of smaller footprints for all applications and encourages CGMS members to reduce footprint size.

4.9 Identify AI/ML tehcnologies for… product processing and data management infrastructure and develop best practices

- Field is changing rapidly, wide range of active developments. No clear preferred methodology or area of focus
- Use of Reanalyses (e.g. ERA-5) for training of ML – need for continued investment
- Data curation in ML-ready formats
  - Reanalysis
  - Satellite obs to include e.g. geolocation, orbital position etc
  - Hyperspectral IR to include all channels

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Other key recommendations (1)

- Complete the GEO ring with hyperspectral IR sounders
- Implement microwave sounding capability in low-inclination orbits

- Continue to populate the early morning orbit in LEO
- Extend the baseline 3-SSO configuration to include another 3 SSO with microwave sounding capability (e.g. EPS-Sterna)
- Extend the AWS mission lifetime beyond August 2026

- Concern remains for loss of high-altitude sounding such as MLS and UAS channels of SSMI/S

Other key recommendations (2)

- Commercial providers of microwave data have arrived
  - Need to consider mission continuity – space agencies must balance risks
  - Need for calibration and stability of performance – space agencies must act as link

- Review the resilience of climate dataset holdings across agencies and work towards achieving multiple geo-redundancy for prioritized datasets

- AI/ML models
  - Direct from observations prediction has the potential to disrupt the weather industry
  - Rapidly changing environment with developments in many areas