

The International TOVS Working Group (ITWG)

Presented to ICWG
October 29, 2018

Liam Gumley (CIMSS/SSEC/UW-Madison)

ITWG Co-Chair (along with Vincent Guidard, Meteo France)



International TOVS Working Group (ITWG)

- Established in 1983 as a working group of the International Radiation Commission (IRC) of the International Association of Meteorology and Atmospheric Physics (IAMAP).
- Formally adopted as sub-group of Coordination Group for Meteorological Satellites (CGMS) in 2012.
- Provides a forum where operational and research users of atmospheric infrared and microwave sounders exchange information on:
 - Sensor status
 - Processing methods and derived products
 - Data use in Numerical Weather Prediction
 - Radiative transfer developments
 - Climate studies
 - Real time sounder data processing and products

<http://cimss.ssec.wisc.edu/itwg/>

International TOVS Study Conferences

- ITSC is held every 18-24 months; 21 conferences so far since 1983.
- ITSC-21 was held in December 2017 in Darmstadt, Germany (hosted by EUMETSAT).
- Conference spans 7 days:
 - 5 days are plenary session talks and posters (single track)
 - 1 day is for working group meetings
 - 1 day free
- Working groups meet for 2-4 hours to discuss progress on action items, new topics, and assign new actions and recommendations.
- Working group co-chairs present and write up a working group report
- ITWG co-chairs write a conference report and present it to CGMS and IRC (contains ITWG recommendations).

ITWG Working Groups

Six Working Groups

- Radiative Transfer and Surface Property Modeling
- Climate
- Numerical Weather Prediction
- Advanced Sounders
- International Issues and Future Systems
- Sounder Products and Software

3 Technical Sub-Groups

- RTTOV
- CRTM
- RARS/DBNET and direct broadcast packages

ITWG Leadership

ITWG Co-Chairs (2018-):

Vincent Guidard, CNRM Meteo France, and Liam Gumley, CIMSS/SSEC/UW-Madison

Radiative Transfer and Surface Property Modeling:

Marco Matricardi, ECMWF and Benjamin Johnson, JCSDA/NCEP)

Climate:

Nathalie Selbach, DWD/Climate SAF and Cheng-Zhi Zou, NOAA

Numerical Weather Prediction:

Andrew Collard, NCEP and Fiona Smith, BoM/Met Office

Advanced Sounders:

Dieter Klaes, EUMETSAT and Bill Smith, UW-Madison/Hampton Univ.

International Issues and Future Systems:

Stephen English, ECMWF and Peng Zhang, CMA

Sounder Products and Software:

Nigel Atkinson, Met Office and Liam Gumley, UW-Madison

ITSC-21

ITSC-21 was hosted by EUMETSAT in Darmstadt, Germany

29 November - 5 December 2017

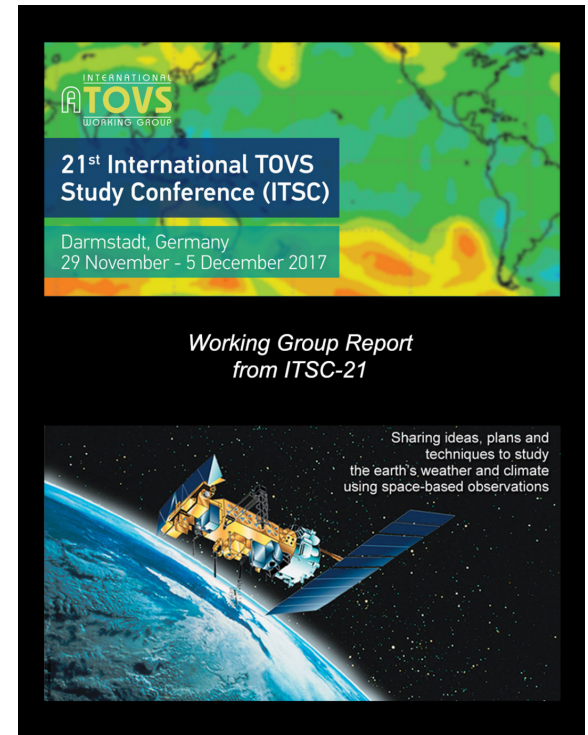
- 180 participants

- 63 oral, 132 poster presentations

<http://cimss.ssec.wisc.edu/itwg/itsc/itsc21>

Topics Covered:

- Current, new and future observing systems
- Reports from space agencies and NWP Centres
- Data assimilation applications
- Climate applications
- Sounder processing software and products
- Advanced sounder science
- Radiative transfer models
- Cloud and precipitation applications
- Retrieval Science

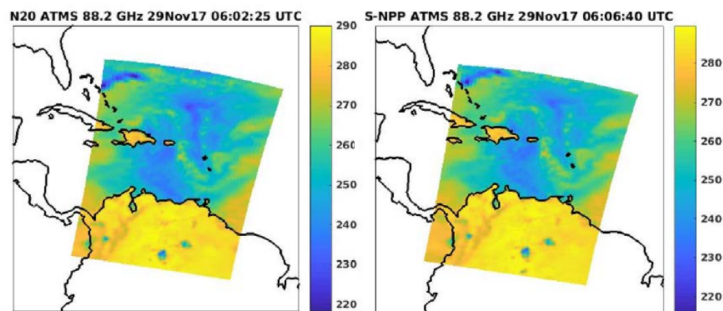


ITSC-21 Group Photo



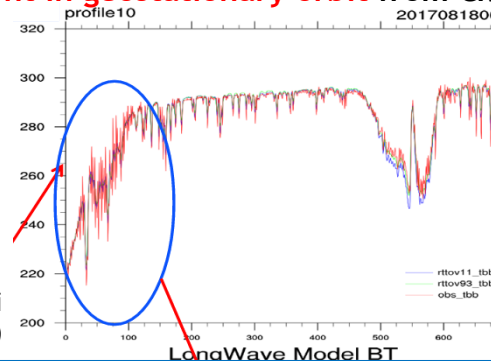
ITSC-21 Highlights

- First results from **NOAA-20 ATMS** (almost live)



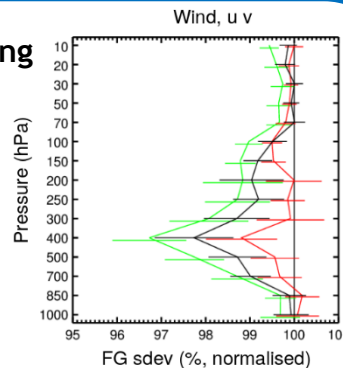
(courtesy Mitch Goldberg et al)

- Initial results from **GIIRS** - the **first hyperspectral IR instrument in geostationary orbit** from **CMA**



(courtesy Wei Han et al)

- **Good NWP impact** of sounding instruments confirmed, including on wind in 4d-Var



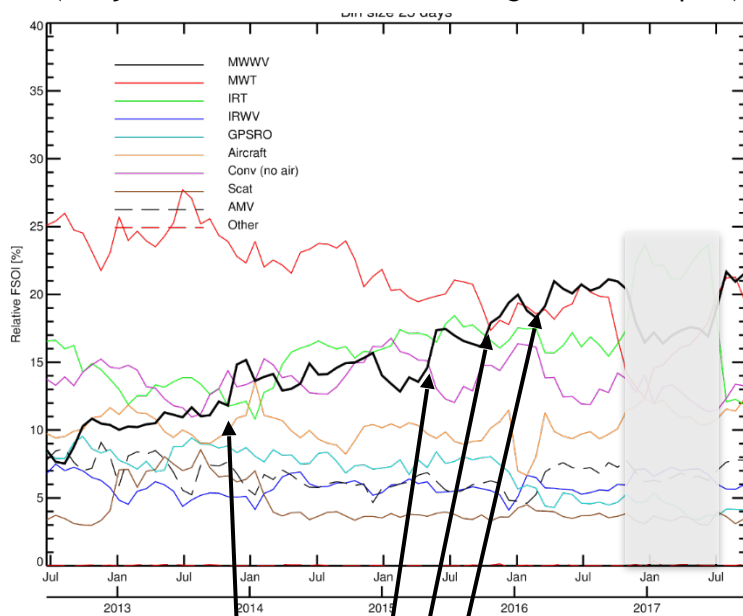
All HyIR data 12 h DA window
HyIR 3 h in the end of DA window
HyIR 3 h in the beginning of the DA window

(courtesy Kirsti Salonen)

ITSC-21 Highlights

- Significant progress in **all-sky assimilation of radiances**

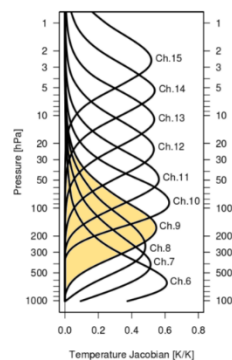
Relative FSOI in ECMWF system
 (= adjoint-based measure of short-range forecast impact)



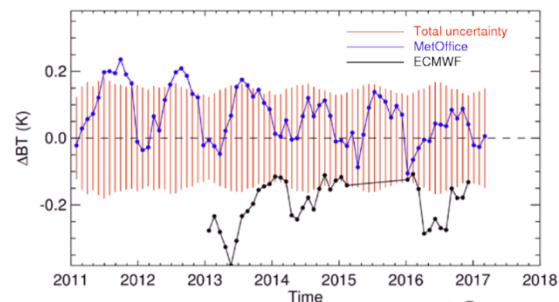
Addition of more all-sky data
 (courtesy Alan Geer et al)

- Significant progress in **uncertainty characterization/ cal-val for climate applications and NWP**

NWP – GRUAN, Lindenberg, monthly mean
 ATMS channel 9 (55GHz)



(courtesy Fabien Carminati et al)



Fiduceo



Examples of ITSC-21 Recommendations

1. **To CGMS and other 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.
2. **To CGMS and other satellite agencies:** Noting the growing evidence of likely benefits from hyperspectral geostationary soundings, ITWG recommends where possible to work towards the provision of such instruments in plans for future geostationary systems.
3. **To CGMS, other satellite agencies, and users:** ITWG recognises the opportunities arising from the provision of sounder data from small satellites as supplements to the global observing system, particularly for better temporal sampling. ITWG recommends the evaluation of such missions by appropriate agencies, including already planned missions (e.g., TROPICS).
4. **To CGMS and other satellite agencies:** Instrumentation to allow continued sounding of the temperature of the upper stratosphere and mesosphere (as for the SSMIS UAS channels) should be explored, in support of maintaining a robust global satellite observing system.
5. **To CGMS and other satellite agencies:** ITWG recommends to develop, test, and implement an SI-traceable radiometric standard in space as soon as feasible.
6. **To satellite agencies:** Consider implementing high spatial resolution and contiguous sampling detector arrays in future hyperspectral infrared sounding instruments.
7. **To CGMS and other satellite agencies:** Climate applications should be appropriately represented during the planning for new meteorological satellite missions.
8. **To space agencies and all agencies involved in GRUAN/ARM:** ITWG recommends to expand the provision of GRUAN and ARM sites, noting the continued need for and scarcity of ground-based reference measurements.

Background for Recommendation 19

- Rec. #19 >> CGMS radiance processing change notification procedure proposal
- The guiding principle is that users are, in general, sensitive to changes smaller than the specification of the instrument accuracy. So, for example, the specification of the absolute calibration of a radiance dataset may be 1K. Users expect to have to make corrections (e.g. bias correction) of up to 1K prior to operational use of the data. However once operational an unexpected change of, say, 0.1K may cause detrimental impact.
- An example of this was the recent changes introduced by EUMETSAT for IASI, where advance warning was given to users only a short time before the change, because the expected change of 0.1K was well below specification. However it caused severe problems to operational users of IASI, who had to either accept a degraded system or blacklist the data and quickly revise operational bias corrections to allow for the change
- Therefore the guiding principle proposed by the ITWG is if the expected maximum change (temporally, geographically) in the observed brightness temperature of any channel of the instrument exceeds 0.1K or 20% of NEdT (whichever is smaller) this should be made clear in notifications to users. Users need these notifications to be made no later than 8 weeks before the change and with test data (at least a few orbits, ideally more) provided if possible.

ITWG / ICWG Cooperation

- ITWG cares about what happens inside the hyperspectral infrared sounder field of view (e.g., IASI, CrIS, IASI-NG) as those sounders still have a "large" pixel size (12-14 km at nadir).
- Cloud identification/characterization from imager pixels colocated within sounder FOVs can be very helpful (e.g., AVHRR for IASI, VIIRS for CrIS, MetImage for IASI-NG). Sub-pixel information from the imager can be used to investigate scene homogeneity, for instance.
- If the ICWG can help to provide the best information about cloud fraction, effective emissivity, height, etc. within the sounder FOV then the ITWG has the connections to the NWP community that allow the impact of the cloud information on NWP assimilation to be assessed.
- Perhaps we can suggest a dataset for joint ITWG/ICWG analysis?

ITSC-22

Any suggestions from the ICWG are welcomed by the ITWG co-chairs.

ITSC-22 will be held in late October / early November 2019.
Location to be announced very soon...

Vincent.Guidard@meteo.fr
Liam.Gumley@ssec.wisc.edu