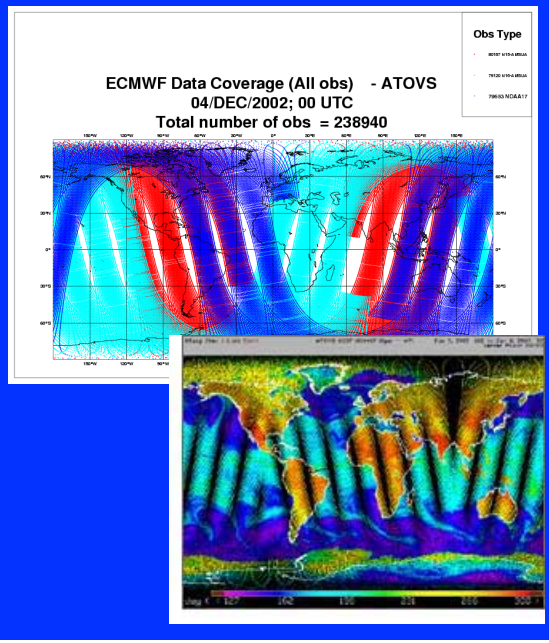
Status Report from the International (A)TOVS Working Group (ITWG)

Allen Huang & Steve English, *Co-chairs ITWG*
Allen Larar, *Member ITWG & IRC*

IRC Annual Business Meeting (6/30/11)
Melbourne, Australia

Sharing ideas, plans and techniques to study the Earth's weather and climate using space-based observations

- International Conferences
- Working Groups
- Technical Sub-groups



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

ITWG Status Report—Topics

- ITWG Objectives/Status/Activities
  - Mission, membership, structure, heritage
- ITSC-17 Summary
  - Tribute, presentations, actions, recommendations
- Way Forward
  - Activities since ITSC-17
  - Future plans
  - Summary and recommendations to IRC

ITWG Mission

The ITWG serves as a forum for operational and research users of TIROS Operational Vertical Sounder (TOVS), Advanced TOVS (ATOVS), and other advanced atmospheric sounding data to exchange ideas on methods for extracting information from these data to create atmospheric variables, and on usage / impact of these data and products in numerical weather prediction and in climate studies.

ITWG organizes the International TOVS Study Conferences (ITSCs), which have met every 18-24 months since 1983.

ITWG Mission - continued

The ITWG meetings result in recommendations and actions to guide the directions of future research and to influence relevant programs of the WMO and satellite provider agencies (e.g. NASA, NOAA, EUMETSAT, NSMC, JMA, ISRO, …).

An important part of the group's work has been to foster and participate in the generation of software to be shared throughout the community to enable use to be made of these data for operations and research.

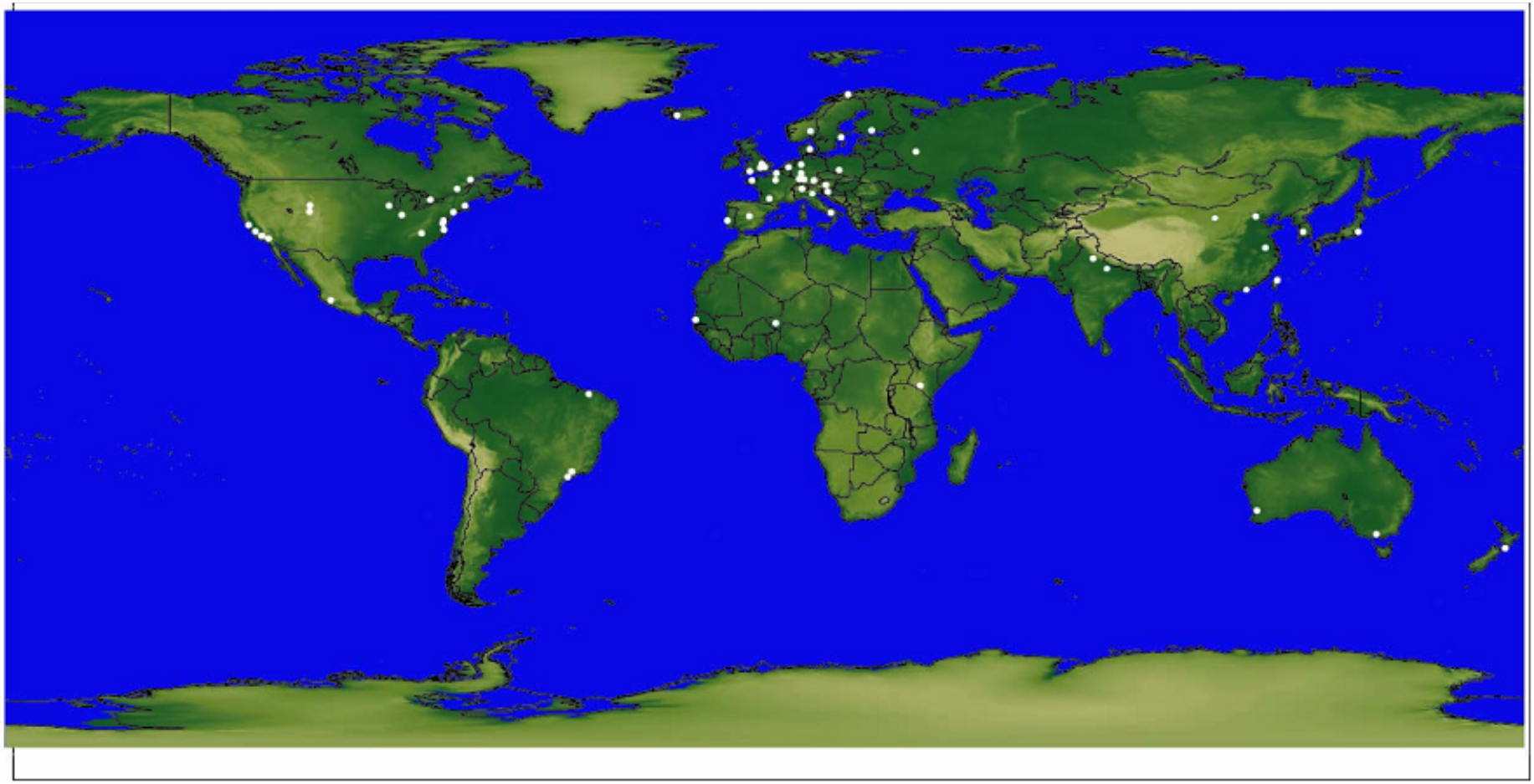
The group is also developing an important education and training role through the WMO and other collaborative and member actions.

ITWG Co-Chairs

• ITSC 1-3	Bill Smith	Univ. Wisconsin
	Rolando Rizzi	Univ. Bologna
• ITSC 4-6	Alain Chedin	LMD
	Paul Menzel	NOAA
• ITSC 7-9	John Eyre	UK Met Office
	Mike Uddstrom	NIWA
• ITSC 10-12	Guy Rochard	Meteo-France
	John LeMarshall	ABoM
• ITSC 13-15	Roger Saunders	UK Met Office
	Tom Achtor	Univ. Wisconsin
• ITSC 16-18	Allen Huang*	Univ. Wisconsin
	Steve English*	UK Met Office

[* = Current]

ITWG Members are located worldwide



ITSC-16, Angra dos Reis, Brazil: 130 participants from 19 countries

WMO, NOAA, NASA, ECMWF EUMETSAT, CMA, JMA, ISRO CPTEC/INPE, ABOM, Meteo France, UK MetOff, LMD, CWB, NIWA, Universities ….

ITSC-17, Monterey, CA 146 participants from 18 countries (plus 36 family members)

ITWG *Working Groups & Technical Sub-Groups*

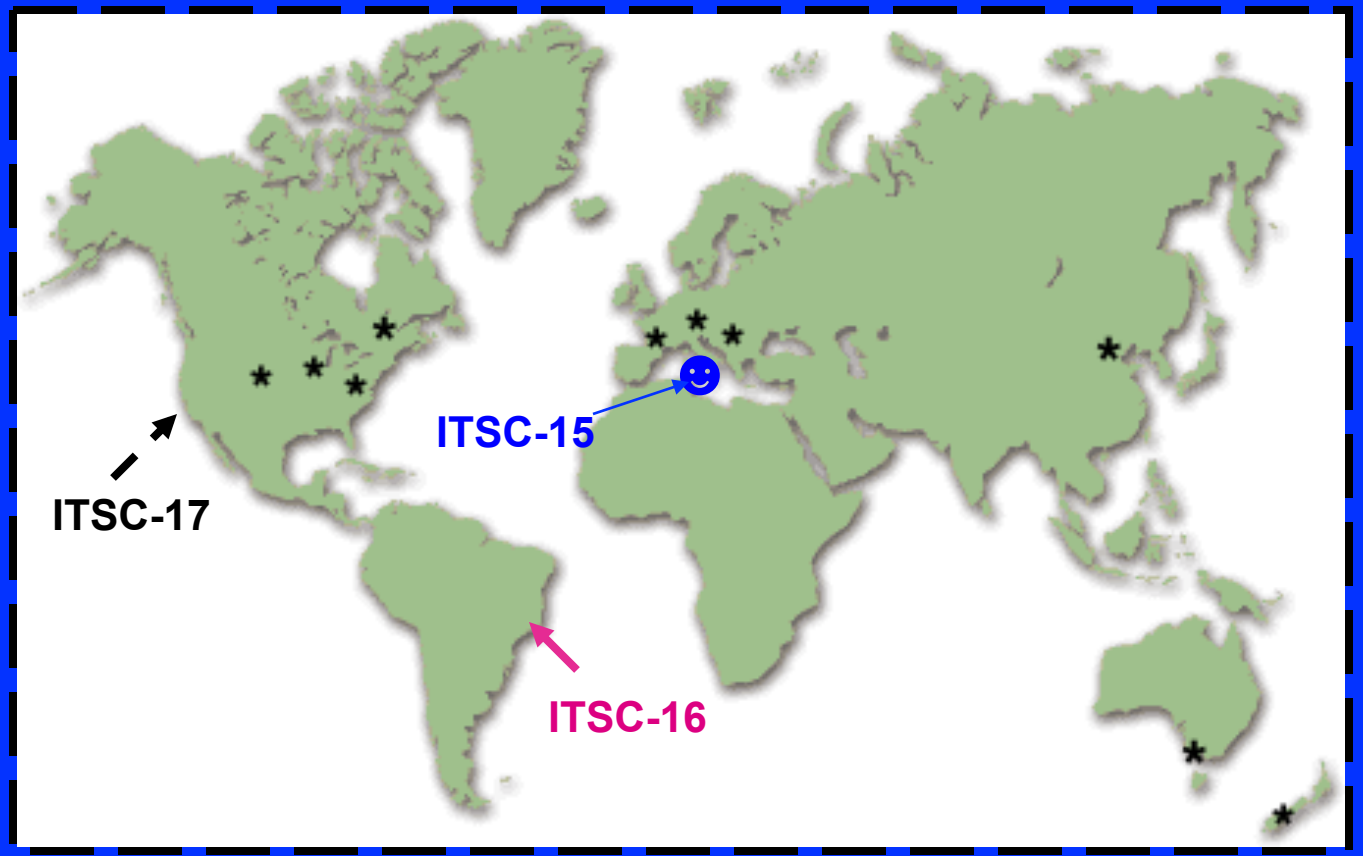
Working Groups:

- Advanced Sounders
- ATOVS/TOVS data in NWP
- ATOVS/TOVS in climate studies
- International Issues and Future Systems
- Radiative transfer and surface property modeling
- Satellite Sounder Science and Products

Technical Sub-Groups (consolidated):

- ATOVS and AVHRR Processing Package
- International ATOVS Processing Package
- International MODIS/AIRS Processing Package
- Fast Radiative Transfer Model, **RTTOV**
- Community Radiative Transfer Model, **CRTM**
- Frequency Management
- Direct Broadcast

ITSC 1-17 Locations



1st Meeting in Igls, Austria – August 1983

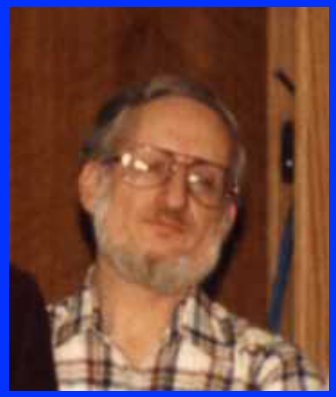
Europe (8), NAM (5), Asia/Oceania (3), SAM (1)

ITSC-17:

101—oral research presentations
96—oral poster introductions
> 100—poster presentations
17—working group & technical sub-group presentations

Tribute to *Hal Woolf* held during ITSC-17

The conference paid tribute to Hal woolf, an active member of the group, who died in December 2009. During the conference special evening session on Asilomar conference ground, Monterey, CA., Bill Smith, Paul Menzel, John Eyre, Roger Saunders and Tom Achtor recalled Hal's life and his contribution to NESDIS/NOAA, ITWG and to the development and use of direct broadcast processing packages and radiative transfer models. He will be sadly missed by the ITWG.



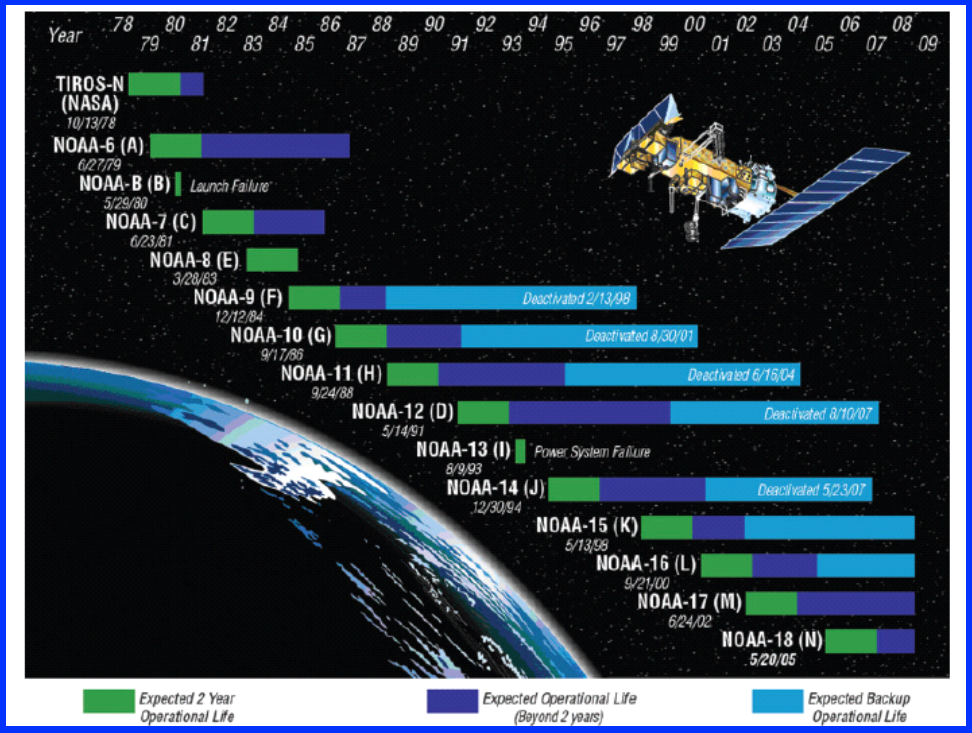
Hal Woolf
1940-2009

A Tribute to *Hal Woolf* in ITSC-17 From Paul Menzel

1940-2009

ITPP transitioned to IAPP

* **Hal was the software guru**
* **ITSC could not meet without Hal**



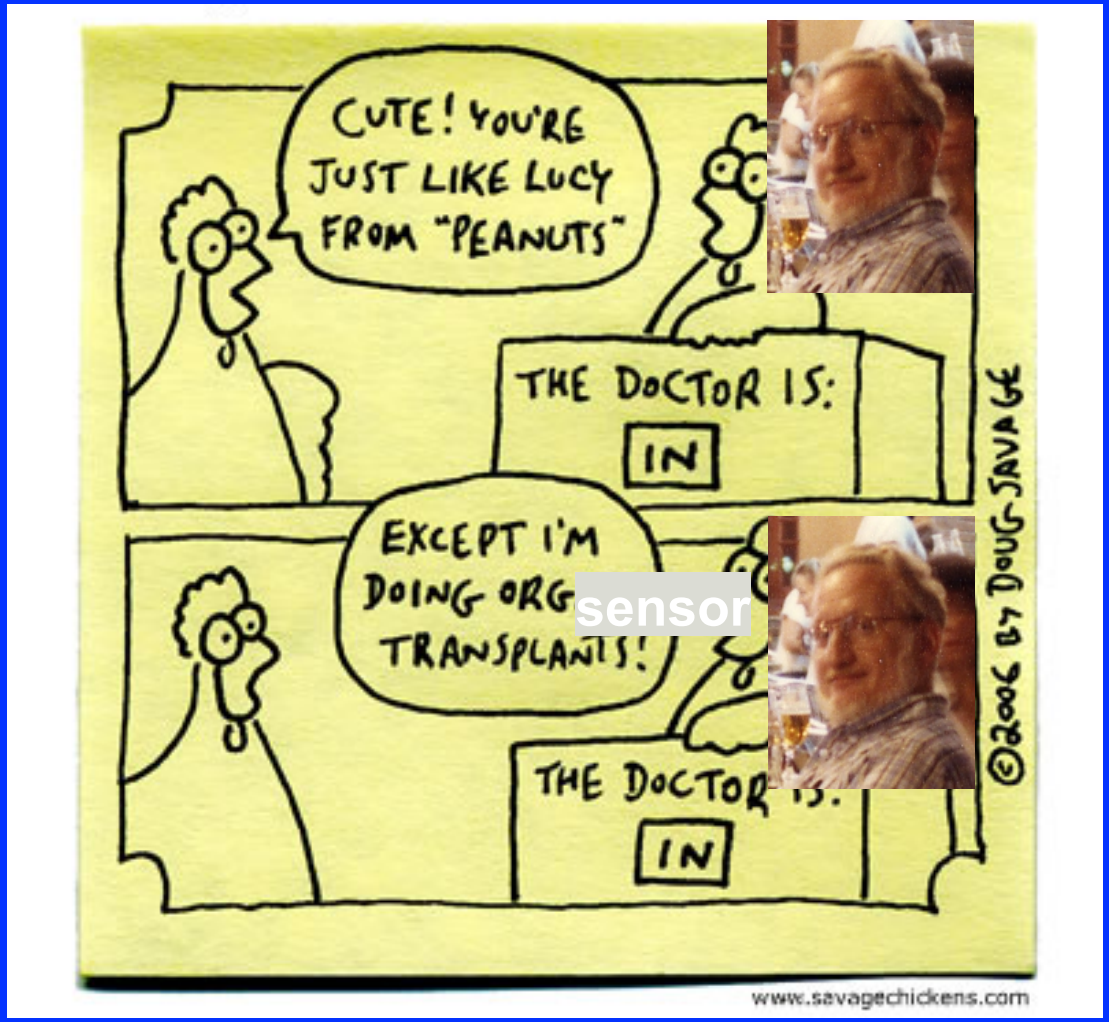
Hal provided the coefficients for RT calculations for each new sensor

$$B(vm,T) =$$

$$FK1/[\exp(FK2/(tc1+tc2*T)-1]$$

A Tribute to *Hal Woolf* in ITSC-17 From Paul Menzel

The ITPP Doctor is in



A Tribute to *Hal Woolf in* ITSC-17 From Paul Menzel

1940-2009

At ITSC, Hal continued his leadership role in introducing new satellite systems into operations and assisting the international user community in achieving regional applications. He is remembered globally for the timely update of his data processing packages with each new sensor system.

Hal set a high standard for scientific competence and professionalism. We, his colleagues, knew we could rely on him and often did. His contributions to environmental remote sensing have played a significant part in advancing weather monitoring and forecasting in the past decades.

ITWG Special Focus Working Groups - Reports provided by each group

1. Use of TOVS/ATOVS in Data Assimilation and Numerical Weather Prediction
2. Satellite Sounder Science and Products (including Direct Broadcast issues & processing packages)
3. Radiative Transfer and Surface Property Modeling
4. Use of TOVS/ATOVS Data in Climate Studies
5. Advanced Sounders
6. International Issues and Future Systems (including frequency management issues)

ITSC-17 Actions & Recommendations (1/3)

RADIATIVE TRANSFER AND SURFACE PROPERTY MODELLING

12 Actions

5 Recommendations

TOVS/ATOVS IN CLIMATE

18 Actions

20 Recommendations

THE USE OF TOVS/ATOVS IN DATA ASSIMILATION/ NUMERICAL WEATHER PREDICTION

16 Actions

17 Recommendations

ITSC-17 Actions & Recommendations (2/3)

ADVANCED SOUNDER
6 Actions
5 Recommendations

INTERNATIONAL ISSUES AND FUTURE SYSTEMS
1 Action
8 Recommendations

SATELLITE SOUNDER SCIENCE AND PRODUCTS
12 Actions
15 Recommendation

ITSC-17 Actions & Recommendations (3/3)

Total of
65 Actions
and
70 Recommendations

The final report and details of the recommendations are published at:

http://cimss.ssec.wisc.edu/itwg/itsc/itsc17/

Key ITSC-17 Recommendations (1/6)

- **Recommendation to space agencies and NWP centres:**
  Support the use of GIFTS/STORM data for research and development of hyperspectral infrared geostationary sounder products in advance of operational instruments (e.g., MTG-IRS).

- **Recommendation to space agencies:**
  To ensure the continuation of capability for conically scanning sounders in the post DMSP era.

- **Recommendation to the Russian Federation:**
  To make the Meteor-M mission a fully contributing component of the GOS by providing the global data sets from this mission in a timely manner with all necessary ancillary information.

Key ITSC-17 Recommendations (2/6)

- **Recommendation to Space Agencies:**
  Satellite agencies operating environmental polar satellites to provide or continue to provide a Direct Broadcast capability on their polar environmental satellite systems, and to make available in a timely manner the Direct Broadcast data processing (L0 to L1, and/or L1 to L2) software, documentation, and related training.

- **Recommendation to Space Agencies:**
  Satellite agencies operating environmental polar satellites to provide expected formats of level 1b and level 2 datasets at least one year prior to launch, and to establish web sites to provide detailed information on instruments, schedule, products and formats.

- **Recommendation to Space Agencies:**
  NOAA and DOD to consider the use of the SafetyNet as a joint ground system ensuring timely availability of data from the JPSS and DMSP-Follow-on missions.

Key ITSC-17 Recommendations (3/6)

- **Recommendation to NOAA and DOD:**

To consider the use of the SafetyNet as a joint ground system ensuring timely availability of data from the JPSS and DMSP-Follow-on missions.

- **Recommendation to US Department of Defense:**

Noting that the NPOESS program is being restructured into two separate programs, one being run by DoD and the other by NOAA/NASA known as JPSS, the WG recommends that imaging and sounding capabilities should be included on the DoD satellite, ideally including MW and IR. Furthermore, data should be free and readily accessible to the general international user community.

- **Recommendation to all relevant space agencies:**

The WG recommends that the constellation of at least three orbits (early morning, morning, and afternoon), each with full sounding capabilities (IR and MW), is maintained. The WG recommends coordination between agencies of the overpass times of operational satellites with sounding capability (IR and MW) to maximize coverage (including, e.g., China, India).

Key ITSC-17 Recommendations (4/6)

- **Recommendation to DoD of US and other space agencies:**

The NWP WG recommends that future microwave sensors maintain sounding capabilities of the upper stratosphere and mesosphere, in addition to tropospheric and stratospheric sounding capabilities, as is the case for SSMIS.

- **Recommendation all relevant space agencies and WMO:**

The WG recommends that all relevant space agencies (i.e. ESA, NASA, NOAA, JMA, EUMETSAT, CMA, KMA, etc…) send information to users, including the NWP WG mailing list, about planned changes in data processing, formats, and other issues related to data as early as possible.

- **Recommendation to WMO:**

The NWP WG continues to support fast delivery initiatives (RARS) with extensions wherever possible, however the WG believes that the system should continue to be low cost. At ITSC-17, it was reported that the RARS coverage is now 78%. Further extension towards global coverage is encouraged until the point is reached where further improvements are no longer cost effective.

Key ITSC-17 Recommendations (5/6)

- **Recommendation to space** agencies:

If they are considering changing the frequency or viewing geometry / resolution of heritage measurements, need to consider the impact on climate monitoring and particularly trend characterization.

- **Recommendation to CGMS**:

Recognizing that climate change may have a diurnal cycle component we recommend to CGMS to explicitly consider the coordinated international phasing of satellites to ensure adequate sampling of diurnal cycle.

- **Recommendation to NASA**:

Absolute calibration missions (such as CLARREO) should be planned to continue after CLARREO's expected lifetime and include other spectral regions including microwave radiances which are recognized to be hugely challenging.

Recommendation to Space and Weather agencies:

Recommend agencies to provide and sustain high quality in-situ observations through programs such as GRUAN to improve radiative transfer models co-located in space and time. Furthermore, to advertise the existence of such data to their users.

Key ITSC-17 Recommendations (6/6)

➢**Recommendation to** ESA:
To strongly consider clear and unambiguous guidance on data openness and transparency from the outset to the CCI initiative to ensure that datasets created are verifiable and exhibit best practices.

➢**Recommendation to CGMS**:
To consider the potential benefits of the NWP and climate requirements approach adopted by EUMETSAT as part of the post-EPS mission planning.

➢**Recommendation to EUMETSAT and NOAA/JPSS:**
A Level-2 retrieval package for IASI/AMSU should be provided and made available for international DB users.

ITWG activities since ITSC-17 (1/2)

1) ITSC-17 Proceedings (working group reports, Program, Papers, and Abstracts) are available on-line at:
http://cimss.ssec.wisc.edu/itwg/itsc/itsc17/index.html

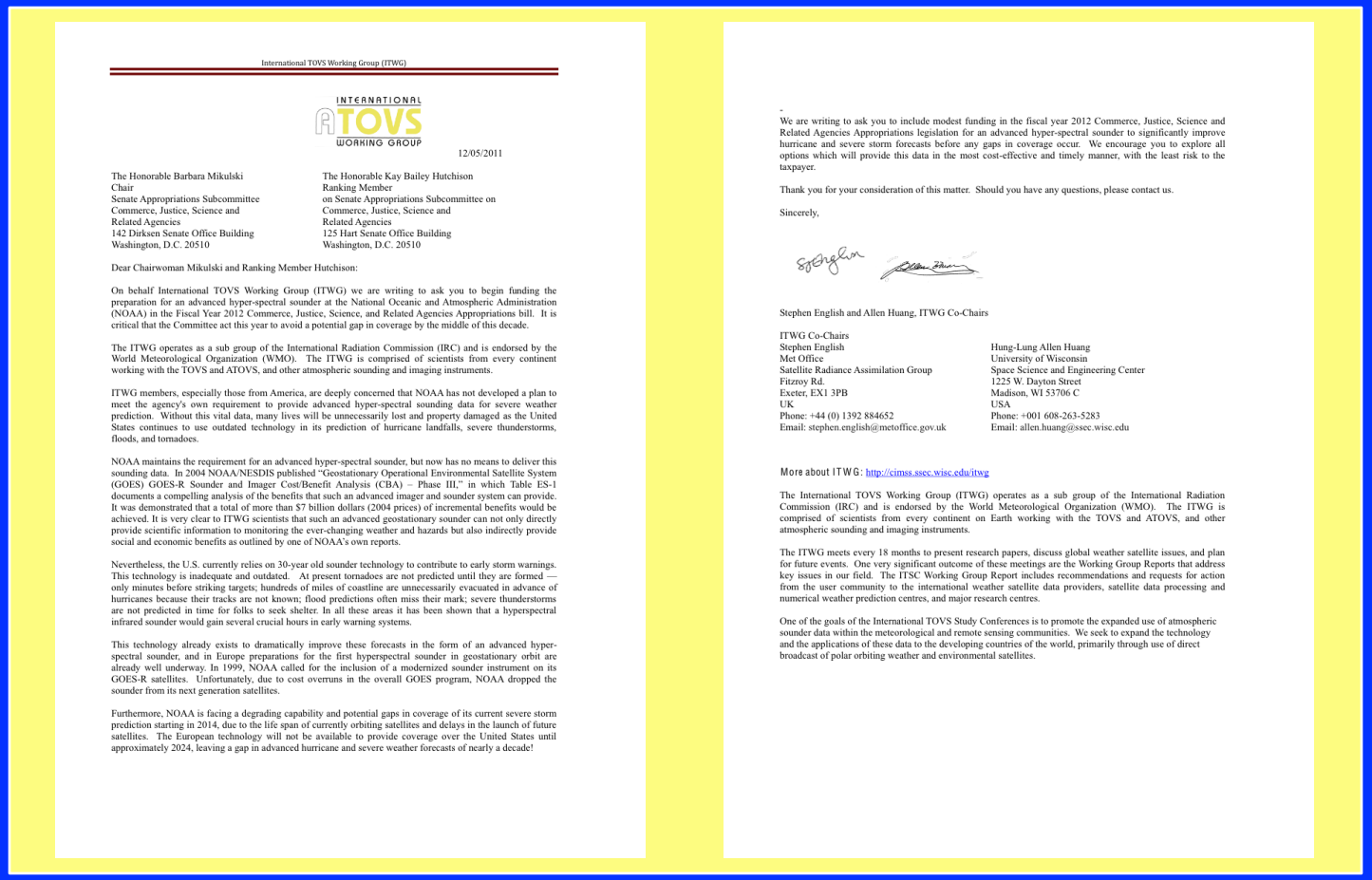
2) Next ITWG meeting will be at ITSC-18, to be held in Toulouse, France, 21-27 March 2012; 1st Circular has been distributed to ITWG mailing list; details available at:
http://cimss.ssec.wisc.edu/itwg/itsc/itsc18/

3) During ITSC-18, ITWG will be soliciting candidates for the election of two new co-chairs.

4) ITWG has submitted a report entitled "The International TOVS Working Group (ITWG) International TOVS Study Conference (ITSC) XVII Summary Report" to CGMS. CGMS NOAA representative Dr. Mitch Goldberg presented this report at the CGMS-38 meeting (8-12 November 2010, New Delhi, India).

ITWG activities since ITSC-17 (2/2)

5) ITWG Co-chairs have submitted a letter to the US Congress recommending the inclusion of modest funding in the fiscal year 2012 Commerce, Justice, Science and Related Agencies appropriations legislation for an advanced hyper-spectral sounder.



International TOVS Working Group (ITWG)

INTERNATIONAL ATOVS WORKING GROUP

12/05/2011

The Honorable Barbara Mikulski
Chair
Senate Appropriations Subcommittee
Commerce, Justice, Science and
Related Agencies
142 Dirksen Senate Office Building
Washington, D.C. 20510

The Honorable Kay Bailey Hutchison
Ranking Member
on Senate Appropriations Subcommittee on
Commerce, Justice, Science and
Related Agencies
125 Hart Senate Office Building
Washington, D.C. 20510

Dear Chairwoman Mikulski and Ranking Member Hutchison:

On behalf International TOVS Working Group (ITWG) we are writing to ask you to begin funding the preparation for an advanced hyper-spectral sounder at the National Oceanic and Atmospheric Administration (NOAA) in the Fiscal Year 2012 Commerce, Justice, Science, and Related Agencies Appropriations bill. It is critical that the Committee act this year to avoid a potential gap in coverage by the middle of this decade.

The ITWG operates as a sub group of the International Radiation Commission (IRC) and is endorsed by the World Meteorological Organization (WMO). The ITWG is comprised of scientists from every continent working with the TOVS and ATOVS, and other atmospheric sounding and imaging instruments.

ITWG members, especially those from America, are deeply concerned that NOAA has not developed a plan to meet the agency's own requirement to provide advanced hyper-spectral sounding data for severe weather prediction. Without this vital data, many lives will be unnecessarily lost and property damaged as the United States continues to use outdated technology in its prediction of hurricane landfalls, severe thunderstorms, floods, and tornadoes.

NOAA maintains the requirement for an advanced hyper-spectral sounder, but now has no means to deliver this sounding data. In 2004 NOAA/NESDIS published "Geostationary Operational Environmental Satellite System (GOES) GOES-R Sounder and Imager Cost/Benefit Analysis (CBA) – Phase III," in which Table ES-1 documents a compelling analysis of the benefits that such an advanced imager and sounder system can provide. It was demonstrated that a total of more than $7 billion dollars (2004 prices) of incremental benefits would be achieved. It is very clear to ITWG scientists that such an advanced geostationary sounder can not only directly provide scientific information to monitoring the ever-changing weather and hazards but also indirectly provide social and economic benefits as outlined by one of NOAA's own reports.

Nevertheless, the U.S. currently relies on 30-year old sounder technology to contribute to early storm warnings. This technology is inadequate and outdated. At present tornadoes are not predicted until they are formed — only minutes before striking targets; hundreds of miles of coastline are unnecessarily evacuated in advance of hurricanes because their tracks are not known; flood predictions often miss their mark; severe thunderstorms are not predicted in time for folks to seek shelter. In all these areas it has been shown that a hyperspectral infrared sounder would gain several crucial hours in early warning systems.

This technology already exists to dramatically improve these forecasts in the form of an advanced hyper-spectral sounder, and in Europe preparations for the first hyperspectral sounder in geostationary orbit are already well underway. In 1999, NOAA called for the inclusion of a modernized sounder instrument on its GOES-R satellites. Unfortunately, due to cost overruns in the overall GOES program, NOAA dropped the sounder from its next generation satellites.

Furthermore, NOAA is facing a degrading capability and potential gaps in coverage of its current severe storm prediction starting in 2014, due to the life span of currently orbiting satellites and delays in the launch of future satellites. The European technology will not be available to provide coverage over the United States until approximately 2024, leaving a gap in advanced hurricane and severe weather forecasts of nearly a decade!

We are writing to ask you to include modest funding in the fiscal year 2012 Commerce, Justice, Science and Related Agencies Appropriations legislation for an advanced hyper-spectral sounder to significantly improve hurricane and severe storm forecasts before any gaps in coverage occur. We encourage you to explore all options which will provide this data in the most cost-effective and timely manner, with the least risk to the taxpayer.

Thank you for your consideration of this matter. Should you have any questions, please contact us.

Sincerely,

Stephen English and Allen Huang, ITWG Co-Chairs

ITWG Co-Chairs

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More about ITWG: http://cimss.ssec.wisc.edu/itwg

The International TOVS Working Group (ITWG) operates as a sub group of the International Radiation Commission (IRC) and is endorsed by the World Meteorological Organization (WMO). The ITWG is comprised of scientists from every continent on Earth working with the TOVS and ATOVS, and other atmospheric sounding and imaging instruments.

The ITWG meets every 18 months to present research papers, discuss global weather satellite issues, and plan for future events. One very significant outcome of these meetings are the Working Group Reports that address key issues in our field. The ITSC Working Group Report includes recommendations and requests for action from the user community to the international weather satellite data providers, satellite data processing and numerical weather prediction centres, and major research centres.

One of the goals of the International TOVS Study Conferences is to promote the expanded use of atmospheric sounder data within the meteorological and remote sensing communities. We seek to expand the technology and the applications of these data to the developing countries of the world, primarily through use of direct broadcast of polar orbiting weather and environmental satellites.

ITWG Future Plans (1/2)

1. The ITWG will continue to meet and inform the ATOVS and advanced sounder community of the latest news and developments through its Web site currently maintained by the University of Wisconsin CIMSS and the email list also maintained by CIMSS.
2. The website will continue to evolve to become an important tool for ITSC, with many new ideas proposed and endorsed at ITSC-16 and ITSC-17. This could include some interactive elements to the website (e.g., wiki).

ITWG Future Plans (2/2)

3. ITSC Format:

- The format of ITSC-17 was changed to a longer oral presentation but still relatively short for comprehensive discussion of scientific results and findings. Although ITSC-17 was successful in keeping the schedule we would likely to refine it with longer oral and improve the poster presentation layout to allow more space between neighboring posters so that the interference can be minimized during viewing .
- One minute oral presentation for each poster paper was implemented in ITSC-17. This format will likely be preserved for future ITSC meetings.
- Some technical sub-groups were absorbed into working groups. Direct broadcast tech. sub-group now is integrated into sounding science WG and Frequency management tech. sub-group is now part of International and future system WG.

Summary of ITWG report and Recommendations to IRC (1/2)

The International TOVS Working Group (ITWG) is convened as a sub group of the International Radiation Commission (IRC) of the International Association of Meteorology and Atmospheric Sciences (IAMAS).

ITWG is actively carrying out its mission goals by:

- Organizing working group conferences. Since 1983 seventeen (17) International TOVS Study Conferences (ITSCs) have been held in ten (10) countries; **ITSC-18 will be held in Toulouse, France, 21-27 March 2012**
- Two elected co-chairs and more than 250 participants from 26 countries are actively participating in organized study activities and making recommendations and actions to relevant international agencies to promote and advocate optimization of utilities for and usage of satellite assets.
- A dedicated working group working together with passion to advance space technology, remote sensing theory, climate monitoring, weather prediction, and environmental applications through coordinated efforts.

Summary of ITWG report and Recommendations to IRC (2/2)

Top-3 ITWG Recommendations to IRC:

- Advocate **free and openly available data,** processing s/w, documentation, and status updates in a timely manner from global environmental satellite programs to maximize international research and operational community benefits; directed toward international space agencies
- Advocate evolution of Advanced Infrared Sounders to **hyperspectral / ultraspectral systems**: directed toward international user communities and space agencies
- Advocate planning and implementation of **absolute calibration missions** (such as the recently scaled back CLARREO program) aimed at improving remote sensing accuracy, including broader spectral coverage (e.g. microwave); directed toward NASA and other international space agencies