

CGMS-XXVII  
Prepared by: USA  
Agenda Item: II/3

**REPORT ON THE TENTH INTERNATIONAL TOVS STUDY CONFERENCE (ITSC-X)**

A report on the findings and recommendations  
produced at the ITSC-X for CGMS consideration.

## **Report on the Tenth International TOVS Study Conference (ITSC-X)**

### **I. Introduction**

The tenth meeting of the International TOVS Working Group was held in Boulder, CO from 27 January through 2 February 1999. The co-chairs are Dr. Guy Rochard from CMS, Lannion, France and Dr. John LeMarshall from BMRC, Melbourne, Australia. About 120 scientists from 25 countries participated in presentations and working group deliberations. This was the largest ITSC ever, and quite possibly the most productive. The recent launch of NOAA-15 with the new instrument suite provoked a number of intriguing presentations and lively discussions.

### **II. Major Conclusions**

ITSC-X had several significant conclusions: (a) AMSU-A is proving to be a well characterized instrument that is providing valuable information for NWP and atmospheric understanding; (b) international collaboration within the ITWG has produced an AVHRR and ATOVS Processing Package (AAPP) that is freely available to all users to develop their ATOVS processing capabilities; (c) NWP assimilation of satellite data continues to advance (e.g., 4DVAR) and forecasts continue to show positive impact from utilization of NOAA data in both hemispheres; (d) a majority of NWP centers still rely on NESDIS retrievals; (e) transmittance model performances are improving, but spurious spectral response errors need further investigation (especially in the water vapor sensitive bands); (f) 20 years of TOVS pathfinder data is a good start and providing indications of interesting trends; (g) coordination with the reconfigured CBS is a high priority for the ITWG (and communications with GCOS and GOSSP); and (h) preparations for EOS must quicken to ensure timely readiness.

### **III. Items from CGMS**

CGMS XXVI requested that ITSC-X consider the following items for discussions.

- (a) The use of satellite radiances or retrievals over land needs further attention as there is a growing need for improved use of satellite data in some land areas of the globe; surface emissivity effects must be accommodated to achieve positive results. ITSC-X accepted this challenge; several members are already working on this problem and will report at the next study conference.
- (b) The am and pm polar satellites will likely have different sounding capabilities. ITSC-X agreed that members will study how to mitigate the effect of these differences in weather applications (including NWP) and report at future study conferences.
- (c) The importance of good characterization of total system spectral response functions has been stressed in past reports. ITSC-X agreed to investigate how good current estimates are and how good they need to be in various parts of the infrared spectrum. A report will be forthcoming.
- (d) Geostationary sounding is evolving toward greater capability with higher spectral resolution. What are the tradeoffs between spectral and spatial resolution and the information content of geostationary soundings in an era of polar orbiting satellites with high spectral resolution sounders on three platforms? ITSC-X noted that several operational satellite simulation experiments are underway to explore this issue and would hear progress reports at their next conference.

### **IV. Items for CGMS**

The ITSC-X reaffirmed its requirement for the provision of direct readout on operational meteorological satellites. It encouraged the CGMS to foster continued dissemination of data from future instruments, including METOP, NPOESS, and ATOVS. In addition, ITSC-X noted the important potential contribution of the AIRS instrument on the EOS PM satellite to WMO's World Weather Watch; AIRS would provide advanced sounder data to the meteorological community to speed preparations for the operational advanced sounders. Thus, the ITSC-X encouraged NASA to consider activities with the ITWG community towards

the establishment of a direct readout software package for AIRS (and MODIS) allowing timely use of the data for operations and research. In order to ensure the effective use of AIRS (and MODIS) data by the meteorological community, it is important for NASA and NESDIS to provide for the transfer of such data in near real-time. With regard to the need for radiances, the ITSC-X strongly endorsed the inclusion of radiance products in the environmental data records of the future.

**Recommendation: ITWG encourages CGMS to continue efficient dissemination of data from ATOVS as well as future instruments including METOP and NPOESS. Furthermore, ITWG encourages CGMS to endorse provision of near real-time data from AIRS (and MODIS). ITWG notes, in particular, the importance of the global provision of radiance and derived products in near real-time.**

When discussing the need for an overarching strategy to best address individual country needs as well as international requirements, ITSC-X felt that the long-range plans could benefit from better coordination especially with regard to gaps and overlaps in missions and instruments. In this regard, ITSC-X noted that WMO's CBS Working Group on Satellites had prepared a preliminary statement of guidance regarding how well satellite capabilities met WMO user requirements in several application areas. It felt that such guidance provided a valuable input to the satellite operators in developing long range plans and it was pleased to note that the CBS Open Programme Area Group for Integrated Observing Systems - OPAG IOS (the successor to the Working Group on Satellites) - would prepare a second iteration of the statement of guidance.

ITSC-X noted that some CGMS satellite operators (NOAA/NESDIS, EUMETSAT, China and the Russian Federation) have plans to launch polar-orbiting satellites and that coordination of their equator crossing times was very desirable. Additionally, it was suggested that CGMS take into consideration the plans of non-CGMS satellite operators who have plans to utilize the present frequency allocations for HRPT downlinks. Finally, the ITSC-X encouraged CGMS to consider contingency plans that would be comparable for all three polar orbits (early AM, AM and PM).

**Recommendation: ITWG encourages CGMS to consider coordination of polar-orbiting equator crossing times to optimize satellite utilization while minimizing potential conflicts in data reception, to consider non-CGMS satellite operator plans to utilize the present downlink frequency allocations, and to consider comparable contingency plans for all polar orbits.**

With regard to promoting well-resourced national activities towards protection of frequency allocations, ITSC-X also suggested that CGMS consider means to provide for such dedicated resources. The ITSC-X also agreed that the new ITU/WMO Handbook on the use of frequency for meteorological applications would be a most valuable reference for use by National Meteorological and Hydrological Services (NMHS). ITSC-X reiterated the need for instrument designers to utilize only those frequencies for which approved allocations existed. The use of non-approved allocations would be detrimental to the sounding community for several reasons.

**Recommendation: ITWG encourages CGMS to consider means to provide for well-resourced activities towards protection of frequency allocations.**

With regard to education and training and the use of small workstations, the ITSC-X was pleased to learn of recent decisions to make the AAPP software widely available and hoped that such decisions could be extended for wider use on workstations by the meteorological community in general. The ITSC-X also noted the work program for the OPAG IOS that included an expert team dedicated to improve satellite system utilization. Expected improvements were through the use of improved education and training techniques, in particular the use of a virtual laboratory, and through the provision of guidance to manufacturers of satellite ground receiving equipment. A standard portfolio of applications as well as specific methods for presentation as defined by WMO would form the basis for the design of satellite ground receiving equipment.

Similarly, coordination of activities toward a widely available processing package for MODIS and AIRS data should be fostered.

**Recommendation: ITSC-X encourages establishment of a direct readout software package for AIRS (and MODIS) allowing timely use of the data for validation activities, research, and operations.**

The ITSC-X recalled that concern had been expressed for the capacity of WMO's present Global Telecommunication System to handle large volumes of satellite data. The ITSC-X was informed of WMO's initiatives in upgrading the present GTS from a store and forward system to one of a distributed database, similar in operation to the Internet. It noted that WMO Members had already agreed upon TCP/IP specifications to enable Internet-like communications. It also was informed that many European meteorological services were starting to use a new satellite based GTS. The ITSC-X commended these developments and requested the WMO to keep the ITWG informed of further developments at future ITSCs. It also suggested that WMO undertake an activity to make its Members aware of the availability of existing satellite products through use of the WWW Operational Newsletter and the WMO Satellite Activities Home Pages.

With regard to instrument advances, ITSC-X noted that advanced infrared sounders are needed in geostationary earth orbit (GEO) satellites to meet the WMO hourly sounding requirement and to observe transport of water vapor, especially in the tropics. These measurements are needed with high spatial and temporal resolution, particularly in the highly convective tropics, the source of heat and moisture of both tropical and extratropical storms. The flexible, repeat sampling possible from GEO enables detailed capture of the 4-dimensional behavior of temperature, moisture and clouds on time scales as short as minutes. GEO advanced infrared sounders are required to support improvements in nowcasting by capturing the wide temporal and spatial characteristics of atmospheric and surface phenomena that is unavailable from current and planned polar orbiting systems. In addition, GEO advanced infrared sounders can provide cloud-free views of atmospheric and surface conditions at different times of day, thereby improving the probability of clear soundings to more locations.

**Recommendation: ITSC-X strongly recommends that national space agencies be encouraged to implement advanced infrared sounding capability on their future GEO satellites.**

Further, ITSC-X noted that the information content of the far infrared spectrum beyond 15 microns was very promising. It encouraged space agencies to foster investigations of this part of the spectrum for future advanced infrared sounders.

With regard to direct assimilation of radiances or the retrieval of atmospheric parameters, ITSC-X reiterated that rapid transmittance models are used in retrievals and radiance analysis to define the relationship between atmospheric state and measured radiance. Currently, adjustments are necessary to remove systematic differences between calculated and measured values. Before measured radiances can achieve their full impact on forecast models, a detailed understanding of the causes of these biases must be developed and the size of the adjustments needs to be reduced. These biases have several potential causes, including errors in (a) atmospheric parameters used to calculate radiances, (b) knowledge of instrument spectral response, (c) line-by-line models used to generate rapid models, (d) rapid models themselves, and (e) instrument calibration.

**Recommendation: To increase the impact of fast models, ITSC-X recommended that efforts begin to (a) establish and quantify the potential sources of error, (b) improve review of ground calibration procedures, (c) improve use of essential spacecraft information, (d) support efforts to validate available rapid algorithm performance, and (e) standardize the vertical spacing of line-by-line calculations.**

Finally, the continued need for airborne measurement campaigns was noted. These offer the primary source of validation for operational and research remote sensing instruments.

**Recommendation: ITSC-X recommends airborne measurement campaigns in concert with well calibrated in situ sensors, covering a wide range of climatological and meteorological conditions, should be supported.**

**V. ITSC-XI**

The next meeting will occur in Budapest, Hungary 27 September through 3 October 2000.