

A Summary of The Tenth International TOVS Study Conference (ITSC X)

Boulder, Colorado 27 January - 2 February 1999

1.1 INTRODUCTION

The Tenth International TOVS Study Conference - ITSC-X - was held in Boulder, Colorado, USA, from 27 January to 2 February 1999. One hundred and thirty-four participants attended the Conference and provided scientific contributions. Twenty-three countries, four international and many national organisations were represented: Australia, Austria, Brazil, Canada, China, the Czech Republic, Finland, France, Germany, Hungary, Italy, Japan, Republic of Korea, Mongolia, Netherlands, New Zealand, Norway, Russia, Spain, Sweden, Taiwan, the United Kingdom, the United States of America, ECMWF, EUMETSAT, WMO, the IRC, NASA and NESDIS.

The agenda for ITSC-X can be found in the 'Report on the Tenth International TOVS Study Conference, Boulder, Colorado, 27 January - 2 February 1999'. Most of the meeting was occupied with scientific presentations on a range of issues: TOVS and ATOVS data characteristics and processing; the application of TOVS and ATOVS data in numerical weather prediction (NWP) and climate studies; preparations for Advanced Sounders; and relevant plans of operational satellite agencies and international issues.

Section 4 of the Report records the abstracts of all scientific contributions. The corresponding papers are published separately as the Technical Proceedings of The Tenth International TOVS Study Conference, ITSC-X, available through the Co-chairs of the International TOVS Working Group (ITWG).

Working Groups were formed to consider five of the main issues/areas identified prior to the Conference: ATOVS data access, processing and validation; TOVS and ATOVS in numerical weather prediction; TOVS and ATOVS in climate studies; advanced infrared sounders; and international issues and future systems. The Working Groups reviewed recent progress in these areas, made recommendations on key areas of concern and identified items for action. Working Group reviews and recommendations comprise Section 2 of the Report.

During the Conference, a session on Status Reports considered summaries of allied meetings and activities that had taken place since ITSC-IX. It also reviewed progress on the Action Items identified by ITSC-IX Working Groups. Many of these items formed the basis for further discussion by Working Groups at ITSC-X.

Several technical sub-groups met during ITSC-X to discuss developments and plans concerning specific software packages shared and in common use in TOVS and ATOVS processing centres. Brief reports on these sub-group meetings are recorded in Section 3 of the Report.

Overall, the meeting documented significant gains in many areas and noted areas for further activity. In particular, it noted that:

- HIRS/3, AMSU-A and AMSU-B are now providing atmospheric monitoring, with great potential for NWP;
- Continuing excellent results are being demonstrated from advanced data assimilation techniques;
- There is still a need to pay attention to fundamentals; for example, accurate forward radiative transfer modelling, use of accurate spectral response functions and calibration;
- A survey of NWP users noted that the majority still use retrievals.
- Sufficient resources should be allocated in relation to future satellite programs to ensure proper use of the data at NWP and DA centres;
- There is a requirement to further emphasise climate activity and improve relations with the climate community;
- ITWG encourages the continuance of support for Pathfinder activities into the AMSU and HIRS/3 era and beyond, to establish the longest possible data record for climate research;
- The ITWG advocates a program to intercompare existing climate data sets (e.g. Pathfinder A, B, P; Spencer and Christy's MSU 2R, MSU 4; NCEP and ECMWF reanalyses);
- Encouragement should be given to national space agencies to implement advanced infrared sounding capabilities on future GEO satellites;
- CGMS should consider means to provide for well-resourced activities towards the protection of frequency allocations;
- There is a need to interface with the restructured World Meteorological Organization's Commission for Basic Systems (CBS);
- The development of community software for the processing of ATOVS data is proceeding well, with the AAPP preprocessing software already available to ITWG members and several other packages for further processing of ATOVS data nearing completion; and
- The ITWG expressed a strong requirement for (near) real-time access to AIRS and MODIS data via direct readout and through NOAA/NESDIS.

The conclusions and recommendations are summarised below.

1.2 CONCLUSIONS AND RECOMMENDATIONS

As a result of the activities of the Working Groups and their reports to the Conference, the following major conclusions and recommendations were adopted as a summary of the ITWG meeting at ITSC-X. More details and specific technical recommendations and actions are given in the Sub-Groups' full reports in Section 2 of the Report and the reports of the Technical Sub-Groups in Section 3 of the Report.

ATOVS data access, processing and validation

Issue	Recommendation or action	Person / group involved in recommendation or action
ATOVS data characteristics	Users should be informed of all significant changes to the ATOVS instrument by NESDIS via the ITWG list server	E. Brown
AMSU-B	A report on the AMSU-B problems should be compiled and distributed via the ITWG list server	M. Chalfant
	Software solutions to AMSU-B problems to be included in the AAPP	P. Dibben and D. Klaes
	A check should be performed on the consistency of the AAPP corrected radiances and the NESDIS global 1b dataset	P. Dibben and P. Brunel
AVHRR/3	Further test periods with channel 3a 'on' should be considered, to allow a full scientific evaluation of the channel 3a data in the morning orbit	NESDIS
Status of ATOVS processing software	A document should be made available to the ITWG describing the scientific aspects of the NESDIS ATOVS processing	A. Reale
	Feedback on AAPP problems should be posted on the AAPP web page	D. Klaes
	A requirements document to be written for visualisation tools for IAPP	ITWG members to submit requirements to CIMSS
Dissemination of ATOVS related information	In relation to instrument characteristics, a single web page should be provided at NESDIS to provide links to all relevant instrument data for ATOVS (including AMSU antenna patterns) and AVHRR	T. Kleespies
Ancillary data files	The new collocation dataset at NESDIS, the MDB, should be made available to the ITWG	E. Brown
ATOVS case studies	When requirements are confirmed and participant commitment affirmed, case study dates and areas should be defined and announced via the ITWG list server	ITWG Co-chairs

TOVS/ATOVS data in climate studies

Stratospheric retrievals	In support of Pathfinder activities, document the characteristics of current and past IR	Pathfinder Working Group Co-chairs
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	sounding channels and recommend necessary characteristics for future instruments.	
Pathfinder activities	Agencies encouraged to continue low-cost, efficient dissemination of data from future instruments, including METOP, NPOESS and ATOVS	NESDIS and EUMETSAT
	Continuance of support for Pathfinder activities into the AMSU and HIRS/3 era and beyond, to establish the longest possible data record for climate research	
ERA-15 and ERA-40	Radiance monitoring statistics should be retained in electronic form for the VTPR and TOVS radiances	R. Saunders and G. Kelly
	Reports to be provided on the characteristics of the filters flown on early satellites	R. Saunders
Pathfinder and reanalysis activities	Advocacy of a program to intercompare existing climate data sets (e.g. Pathfinder Path A, B, P; Spencer & Christy's MSU 2R, MSU 4; NCEP & ECMWF reanalyses) especially from the point of view of global and regional interannual variability and trends	ITWG
ATOVS - AMSR	Offer to AMSR team of ITWG expertise in calibration and validation of satellite-based sounders such as AMSU, as well as in the selection of additional sounding channels targeted towards climate monitoring	Co-chairs
Calibration, validation and continuity	Information on radiance bias corrections and forward model tuning should be documented and made available to the community. Specifically, information is needed on: radiance bias corrections; QC and rejection statistics; use of input data	J. Bates, J. Susskind, N. Scott and R. Saunders
	A standard climatological radiosonde data set should be assembled	
	Radiance biases from reanalysis and Pathfinder projects should be intercompared	ITWG
	Additional work on TOVS calibration should be undertaken to establish consensus and reconcile differences	
	Future infrared sounding instruments should observe radiances covering the same spectral	Satellite agencies

	bands as HIRS to ensure that its data record will be continued for as long as possible	
General action items	Provide input to the Intergovernmental Panel on Climate Change's Third Assessment Report	ITWG Co-Chairs/ Working Group Co-chairs

The use of TOVS/ATOVS in data assimilation /numerical weather prediction (DA/NWP)

Evaluation and use of TOVS/ATOVS in DA/NWP	Exchange of monitoring results should continue; also, each center to be encouraged to develop their own web page on which to post results. A master document to be developed on the ITWG site linking all web pages	C. Chouinard and B. Harris
	The so-called 'one observation experiment' should be posted on the web page of each center	C. Chouinard & E. Andersson to coordinate
Forward modelling	Strong support should be given to further improve the modelling of the radiative transfer problem. Specifically, close attention should be given to: surface emissivity modelling; improved LBL models; improved specification of instrument characteristics; improved fast RTM through larger dependent data bases and gradient comparisons of LBL and fast RTM models	ITWG
Future platforms and real-time access to data	WMO/NESDIS/EUMETSAT should develop a communication system with sufficient bandwidth to allow real-time data transfers from current and future platforms. Also, the development of a common format (e.g. BUFR) is strongly encouraged	WMO/NESDIS/ EUMETSAT
	NESDIS/EUMETSAT should further develop and publicise procedures for handling real-time data requests for external users	NESDIS/
	Sufficient resources should be allocated in relation to future satellite programs to ensure proper use of the data at NWP and DA centers	NWP and DA centers
	A web-based list of information and software available for exchange should be developed; the exchange of expertise should be encouraged through short-term visits	NWP and DA centers/ ITWG/ C. Chouinard

Advanced IR sounder Working Group

Importance of GEO satellite advanced	Encouragement should be given to national space agencies to implement advanced infrared sounding capabilities on future GEO satellites	WMO
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infrared sounders	A detailed study of regional user requirements for advanced infrared sounder data should be undertaken	Geostationary satellite data providers
	A program should be established to train regional users on the use of GEO wind and sounder data in nowcasting	
Use of new technology for improving spatial resolution of soundings>	National space agencies should investigate the use of large focal plane array technology for enhancing the spatial resolution and clear air sampling capabilities of advanced infrared sounders	Space Agencies
	Cloud scene airborne measurement data sets and analysis methods should be established to provide a common basis for assessing sounder performance	
	An immediate study of the installation of HIRS/4 aboard NOAA/M should be undertaken, to provide an earlier opportunity to evaluate and benefit from the effects of reduced IFOV size	NOAA
New spectral regions	Investigations should be undertaken into including far infrared wavelengths (15 - 1000 μ m) in future advanced infrared sounders	
Use of advanced infrared sounder data in NWP	Further work be undertaken to establish the best method(s) for extracting information from advanced infrared sounder data for NWP	Space agencies
	Additional research should be undertaken to improve the efficiency of ground processing systems in using advanced infrared data for operational soundings	
	The facility should be created to make global AIRS data available in near-real-time to the international operational weather forecasting community	NOAA/ NASA
Fast model considerations	Recommended steps to increase the impact of fast models: establish & quantify potential error sources; review and improve ground calibration procedures; improve use of essential spacecraft information; support programs to define and correct errors in spectral parameters; support efforts to validate rapid algorithm performance; standardise vertical spacing of LBL calculations	NOAA/NASA/ EUMETSAT/ ESA
Data compression studies	Detailed study of lossy data compression techniques for advanced infrared sounders should be undertaken. Performance of lossy compressions should be evaluated and largest errors documented and transmitted to users	Space agencies
Airborne and ground truth validation studies	Airborne measurement campaigns, covering a wide range of climatological and meteorological conditions, should be conducted and should employ well calibrated in situ and ground-based sensors	

Radiance assimilation and retrieval assimilation	Data producers should provide the NWP community with error covariance matrices of both radiances and retrievals	NOAA, EUMETSAT and JMA
Climate applications of Advanced Infrared Sounders	Detailed studies of advanced infrared sounders should be carried out to document and assess the utility of these instruments for providing accurate data products for climate studies	Space agencies
Other uses of Advanced Infrared Sounders in NWP	Detailed study should be undertaken of the performance and assimilation of Advanced Infrared Soundings over land. In addition, development and distribution of an accurate, high resolution surface characterisation should take place	NOAA and EUMETSAT
Other uses of Advanced Infrared Sounders in atmospheric chemistry	Detailed study should be undertaken of the uses of advanced infrared sounders in atmospheric chemistry	ITWG

International issues and future systems

Polar-orbiting satellite coordination	CGMS should consider coordination of polar-orbiting equator crossing times to optimise satellite utilisation	CGMS
Advanced sounder deployment	NASA should consider placing the NPP sounder in a PM orbit	NASA
Relations with SOAT	The USA Integrated Programme Office should be informed that ITWG is ready to participate on the Sounder Operational Algorithm Team when requested	ITWG Co-chairs
Frequency protection	>CGMS should consider means to provide for well-resourced activities towards the protection of frequency allocations	CGMS
Relations with CBS	OPAG IOS should consider a mechanism, similar to that between ITWG and CBS WGSAT, for providing guidance and assistance between ITWG and OPAG IOS	OPAG IOS
Communication with OPAG-IOS	Co-chairs of ITWG should develop an ITWG process to provide guidance and assistance to the OPAG IOS	ITWG Co-chairs

Communication with GOSSP	The Chairman of the GOSSP should be informed of ITWG's willingness to provide guidance, assistance and expertise with the expectation that a mechanism, similar to that between WMO and ITWG be developed	
Status of the GTS	WMO should inform meetings of the ITWG of the latest status and plans for improvements to the GTS	WMO/ D. Hinsman
NPOESS Environmental Data Records	The NPOESS IPO should include radiance products as part of the suite of NPOESS EDRs, as a matter of urgency	NPOESS IPO
Direct readout of AIRS and MODIS	NASA should consider support for activities with the ITWG community towards the establishment of direct readout software packages for AIRS (and MODIS) allowing timely use of the data for operations and research	NASA
Real-time AIRS and MODIS data	ITWG encourages provision, by NASA and NESDIS, of near real-time data from AIRS (and MODIS).	NASA and NESDIS