

The IPWG Newsletter

November 2007



Recent activities of the International Precipitation Working Group

<http://www.isac.cnr.it/~ipwg>

1. Introduction

- **Message from the IPWG Co-Chairs**

It's been a very exciting year for IPWG. It is hard to believe that our third workshop in Melbourne, Australia was over one year ago! We are pleased to report that as of this writing, the number of nations participating (or expressing interest) in IPWG has expanded from 18 countries in 2002 to 27 in 2007. Recent countries that have been in contact with us include: India, Mozambique, Nepal, and Turkey. Remember, being part of IPWG provides international organizations with the opportunity to be at the cutting edge of satellite precipitation estimation – new algorithm development, utilization of the latest sensor technology, devising new validation strategies, and providing direction for future work. If you or your organization can benefit from the IPWG activities, or you are interested in becoming more involved, please contact the IPWG co-chairpersons. Also, if there are any relevant activities that you would like posted in this newsletter, please let us know. Finally, we encourage you to forward this to your colleagues or others who may be interested in the IPWG.

- **3rd IPWG Workshop, Melbourne, Australia** (*J. Turk and P. Arkin; Joe.Turk@nrlmry.navy.mil*)

The "Third Workshop of the International Precipitation Working Group" took place during 23-27 October 2006, and was hosted by the Australian Bureau of Meteorology Research Centre (BMRC) in Melbourne, Australia. The workshop was held in parallel with the 2006 Asia Pacific Satellite Application Training Seminar (APSATS), hosted by the Bureau of Meteorology Training Centre, with one joint session to enable sharing of information among IPWG and APSATS participants. Thanks to our host Beth Ebert of BMRC, the workshop was a tremendous success, with record attendance. The excellent workshop presentations are online under the "Meetings" link under the main IPWG website.

- **Pilot Evaluation of High-Resolution Precipitation Products(PEHRPP)** (*Joe.Turk@nrlmry.navy.mil*)

The IPWG Program to Evaluate High Resolution Precipitation Products (PEHRPP) will be holding a workshop at the World Meteorological Organization (WMO) headquarters in Geneva, Switzerland from December 3-5, 2007. PEHRPP was initiated by the IPWG in late 2004 to characterize as clearly as possible the errors in various high resolution precipitation products on a wide range of spatial and temporal scales over varying surfaces and climatic regimes. Preliminary results have been presented at several conferences since that time, and this workshop will summarize the current status of the PEHRPP effort and discuss plans for a future phase. Please check the IPWG website in early 2008 for the presentations given at this meeting.



- **Special Journal Issue on Data Assimilation** (*G. Ohring; George.Ohring@noaa.gov*)

As an outcome of the Joint Center for Satellite Data Assimilation's International Workshop on the Assimilation of Cloud and Precipitation Observations in NWP Models (May 2-4, 2005, Leesburg, VA, USA), 13 papers were recently published in the *Journal of Atmospheric Sciences* (Volume 64, No. 11, November 2007).

2. IPWG Validation Activities (C. Kidd; C.Kidd@bham.ac.uk)

The importance of rainfall studies was not lost on many people in the UK over this summer with many areas having some of the worst flooding in recent history. Many 24-hour rainfall totals in excess of 100mm (4") were recorded from what were essentially frontal-stratiform weather systems. Many of the satellite products coped admirably with this wet weather, producing both the right areas and intensities of rainfall experienced. However, the ability of these algorithms to perform well during the upcoming winter season will be severely tested. Building upon the base-line validation sites (see list below) we have a number of new areas being developed. A Baltic-region inter-comparison site, based upon the highly-successful Baltex data sets (thanks to A. Thoss, D. Michelson and others), is being developed and hosted alongside the current European inter-comparison site, broadening the validation of precipitation products over NW Europe. This region will be particularly challenging on two accounts: first, the dominance of frozen precipitation during the wintertime, and second, the scarcity of satellite precipitation products at these latitudes. This will (hopefully) help encourage new techniques for higher latitudes/cold season retrieval of precipitation.

We are pleased to report that the intercomparison work has expanded to new regions due to recent interest in IPWG by other nations. A. Emre (Turkey) is looking at validation of satellite products through synoptic station and AWOS data. In India, R. Harikumar is looking at calibration and validation for the Megha-Tropiques mission. In South Africa, M. Nekvalivhe is developing a validation site using rain gauge data. Finally, S. Bajracharya (Nepal) is looking at satellite rainfall estimation in the Hindu Kush Himalayan region, a region severely affected by orographic precipitation.

The current precipitation inter-comparison analysis can be found at:

- Australia:** http://www.bom.gov.au/bmrc/SatRainVal/sat_val_austr.html
- USA:** http://www.cpc.ncep.noaa.gov/products/janowiak/us_web.shtml
- Europe:** <http://kermit.bham.ac.uk/~ipwgeu/>
- S.America:** <http://cics.umd.edu/~dvila/web/SatRainVal/dailyval.html>
- Japan:** http://www.radar.aero.osakafu-u.ac.jp/~gsmmap/IPWG/sat_val_Japan.html

3. Progress in Rain Assimilation at ECMWF

(P. Bauer, A. Geer, P. Lopez, C. Cardinali, G. Kelly) (Contact: peter.bauer@ecmwf.int)

Following the operational implementation in June 2005, extensive studies have been performed on quantifying the impact of global assimilation of rain-affected SSM/I observations in the ECMWF 4D-Var system. These make use of Observing System Experiments (OSEs) where individual observation types are withdrawn from the full system to evaluate their respective contribution. At ECMWF, the full system currently uses about 3 million observations from 35 satellite instruments twice a day. Figure 1a shows the beneficial impact of the rain assimilation that is mainly found in the lower troposphere in the Tropics at day-2. The OSEs were performed for 2 months in 2006 and employ SSM/I radiances from the DMSP F-13 and F-14 satellites. The system is currently prepared to also use F-16 SSMIS, Aqua AMSR-E and TRMM TMI data. The beneficial impact of these observations can also be quantified from adjoint sensitivity techniques recently developed at various centers. Figure 1b shows the geographical distribution of a 5-week average of forecast sensitivity to the SSM/I rain observations and can be compared to the mean short-range rain accumulation forecast over the same period (Figure 1c). Again, the impact is particularly positive in the tropical Pacific (ITCZ and SPCZ) and the Western Indian Ocean.

T+48h RAIN – NORAIN impact on relative humidity

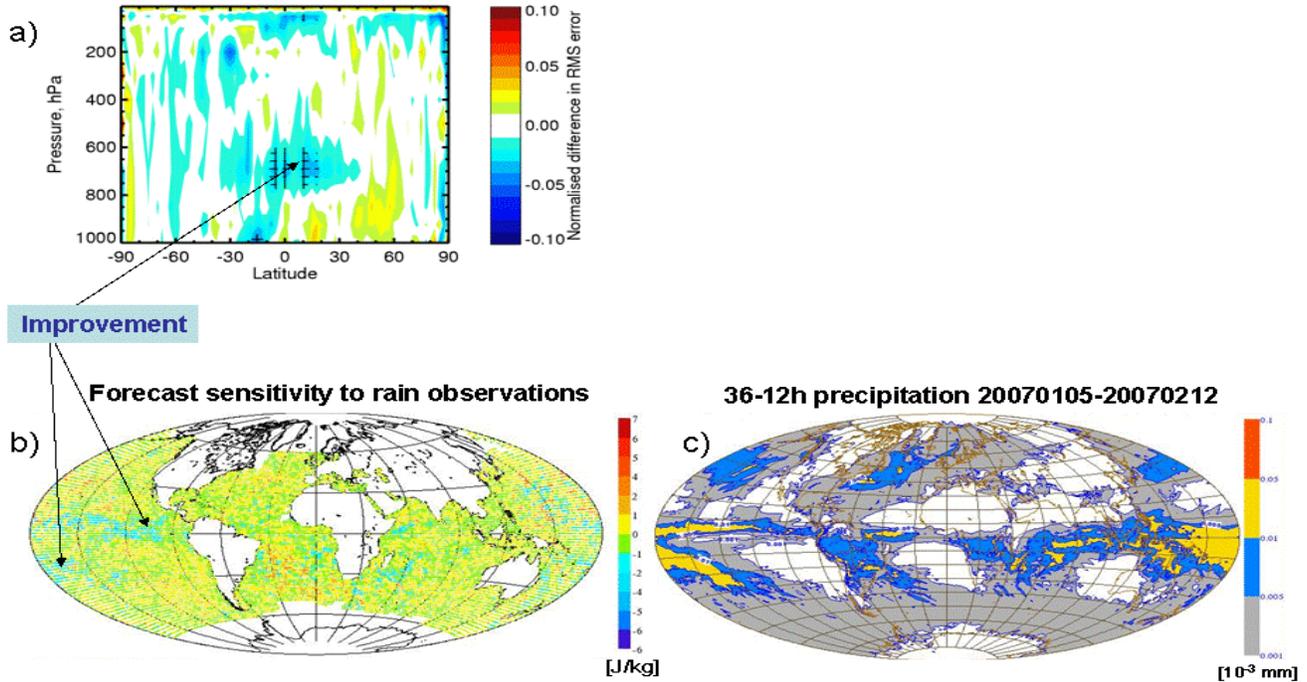


Figure 1: a) Normalized root-mean-square forecast error difference for relative humidity at day-2 between systems including (RAIN) and excluding (NORAIN) SSM/I rain assimilation. Blue areas denote positive contribution and hatching indicates areas where differences are statistically significant. b) 5-week mean adjoint day-2 forecast sensitivity (as dry energy norm, units are J/kg) to SSM/I rain assimilation. Blue areas denoted improvement. c) Mean 36 minus 12-hour rain accumulation forecast (in 10^{-3} mm).

4. The Global Precipitation Measurement (GPM) Mission

(A. Hou; Arthur.Y.Hou@nasa.gov)

The Global Precipitation Measurement (GPM) Mission initiated by NASA and JAXA is an international satellite mission specifically designed to unify and advance global precipitation measurements from a consortium of research and operational microwave sensors. The GPM concept centers on making combined use of active and passive microwave sensors to provide a reference standard for developing the next-generation global precipitation products. GPM is identified in the U.S. as a high-priority mission in the 2007 Earth Science Decadal Survey conducted by the National Research Council and is serving as the scientific cornerstone for the development of an international satellite constellation for monitoring global precipitation by the Committee on Earth Observation Satellites (CEOS) under the auspices of the Global Earth Observation System of Systems (GEOSS). During its mission life, GPM is envisioned to be a mature realization of the CEOS Precipitation Constellation.



The GPM Core Observatory will carry a dual-frequency (Ku/Ka-band) precipitation radar (DPR) and a broad-band (10-183 GHz) conical-scanning GPM microwave imager (GMI). The Core Observatory is scheduled to be launched in the summer of 2013, followed by the launch of the GPM Low-Inclination Observatory (LIO) with a second GMI in 2014 for improved monitoring of hurricanes. The GPM Core will fly in an inclined orbit at 65° to function as a “physics observatory” and a “calibration reference” to unify and improve precipitation estimates from a constellation of passive microwave radiometers. In

addition to the GPM Core and LIO, the GPM constellation was originally conceived to comprise additional conical-scanning microwave radiometers on the DMSP F-Series satellites, JAXA's GCOM-W satellite series, and the Indo-French Megha-Tropiques satellite. In view of the recent advance in AMSU-B rain retrievals over land, which have been shown to be comparable in accuracy to those derived from conical-scanning imagers, the baseline GPM constellation was reconfigured in 2006 to include cross-track-scanning microwave sounders (i.e., MHS on MetOp series and NOAA-N', and ATMS on NPP and NPOESS-C1) to achieve 1-2 hour sampling frequency over land. The overall sampling capability of GPM may be further enhanced with additional partner satellites such as the GPM constellation satellite under planning at the Brazilian Space Agency (AEB).

The GPM Core sensor and spacecraft development is on track to meet the 2013 launch date. The Ball Aerospace Corporation, which is under contract with NASA to design and build the GMI, has successfully completed the instrument preliminary design review. JAXA has received governmental approval to proceed to the Phase C/D development of the DPR, and the NASA Goddard Space Flight Center has been directed to develop the GPM Core Spacecraft.

The GPM Mission is supported by science teams in the U.S. and Japan. Currently, the NASA Precipitation Measurement Missions (PMM) Science Team has over 70 principal investigators from universities, industries, sister agencies, and international institutions. NASA continues to invite no-cost research proposals from international investigators to complement existing science team activities and to facilitate international collaboration on precipitation algorithm development, ground validation, scientific research, and societal applications. For more information, please contact Dr. Arthur Hou (Arthur.Y.Hou@nasa.gov).

Among the major PMM science team activities in 2007 are:

(1) Formation of an international GPM working group on radiometer calibration to develop - in coordination with CGMS/GSICS - consensus reference standards for cross-calibrations of microwave radiometers and global precipitation products. This activity is being organized as an open-access community effort. For more information, please contact Prof. Tom Wilhelm (wilheit@tamu.edu).

(2) PMM/GPM participation in the Canadian-CloudSat-CALISPO Validation Program (C3VP) field campaign (winter of 2006-2007) to collect *in situ* aircraft and ground-based measurements for developing algorithms to retrieve falling snow.

(3) Development of focused joint research projects with international partners (e.g., Finland, Canada, Australia, France, and Brazil) to support GPM Ground Validation (GV). Progress in this area and opportunities to form additional international GV collaborations will be the highlight of the 3rd GPM International GPM GV Planning Workshop to be hosted by INEP/AEB in Buzios, Brazil, 4-6 March 2008. For more information, please contact Dr. Paul Hwang (Paul.H.Hwang@nasa.gov).

5. CEOS Precipitation Constellation

(R. Ferraro; Ralph.R.Ferraro@noaa.gov)



As an outcome of the 19th CEOS Plenary Meeting held in November 2005, the CEOS Implementation Plan for Space-Based Observations for the Global Earth Observation System of Systems (GEOSS) is to identify the space-based observations as required by the 10-year implementation plan for GEOSS and propose a process for coordinating different types of Earth observing programs funded by CEOS Member agencies to provide the required observations. The CEOS Constellations is the title given to this

new process. Four pilot constellation studies, including precipitation, have been initiated in order to pioneer and test the concept. JAXA and NASA have been identified as the lead agencies in the study of the development of a CEOS Precipitation Constellation (PC) and charged with drafting a scoping paper to provide a common vision of the scope and objectives of the PC. The goal of the CEOS PC is to establish an international framework to guide, facilitate, and coordinate the continued advancements of multi-satellite global precipitation products. An international workshop to better define this scoping paper was held in Washington, DC USA on June 14 and 15, 2007.

The development of the CEOS PC is unique in having:

(1) An existing constellation of precipitation sensors providing multiple merged multi-satellite global precipitation products for research and applications, and

(2) A planned international constellation satellite mission, the Global Precipitation Measurement (GPM) mission, which is in an advanced stage of planning and whose objectives coincide with what the CEOS PC aims to accomplish. The CEOS PC development is in an excellent position to leverage and build upon the extensive community inputs already collected in preparation of the GPM mission to be launched by NASA and JAXA in 2013.

More details can be found at the CEOP PC web site (<http://ceospc.gsfc.nasa.gov/>).

6. Recent Meetings with IPWG Representation

- 6-8 November 2006 – 6th International Planning Workshop on GPM (Annapolis, MD USA)
- 20 March 2007 – GPM Cal/Val Workshop (Greenbelt, MD USA)
- 12-13 April 2007 – IGeoLab (Beijing, China)
- 7-10 May 2007 – PMM Science Team Meeting (Atlanta, GA USA)
- 14-15 June 2007 – CEOS Precipitation Constellation Meeting (Washington, DC USA)
- 26-28 June 2007 – Towards a Polar Snowfall Hydrology Mission: The Science and the Gaps (Montreal, Canada)
- 5-7 September 2007 – GEWEX Radiation Panel/Working Group on Data Management and Analysis (New York City, NY USA)
- 24-28 September 2007 – AMS/EUMETSAT Joint Conference on Satellite Meteorology (Amsterdam, The Netherlands)
- 16 October 2007 – EUMETSAT Hydrology Satellite Applications Facility (Rome, Italy)

7. Upcoming IPWG Sponsored Meetings

There are three important IPWG sponsored meetings that are planned over the next year. Be sure to visit the IPWG web site (<http://www.isac.cnr.it/~ipwg>) for further details!

3-5 December 2007 - First PEHRPP Workshop, Geneva, Switzerland



1-3 April 2008: Second IPWG Snowfall Workshop, Steamboat Springs, CO USA



13-17 October 2008: Fourth IPWG Workshop, Beijing, China



For further information, contact the current IPWG co-chairpersons:

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