Precipitation Constellation Report, Discussion of Requests

Riko Oki
JAXA

Steven Neeck
NASA

April 23, 2008

Progress Since 21st Plenary

- ✓ **7th GPM International Planning Workshop, 5-7 December 2007**
  - JAXA hosted with 146 participants from 15 countries
  - Detailed review of GPM program/project, scientific, data working group, and data utilization status
- ✓ **U.S.–Japan PC Study Team Meeting, 7 December 2007**
  - Coordination meeting for 2008 PC activities
- ✓ **X-Calibration Working Group (WG) Meeting (in coordination with WMO CGMS/GSICS)**
  - January 15-16, 2008 - University of Central Florida, Orlando, FL, USA
  - NASA, JAXA, NOAA, NRL, and ISRO are supporting WG
  - WGCV/MWSS, Korea, and China invited
  - Report on workshop and next steps
- ✓ **CEOS SIT Chair Tag Up, 20 February 2008**
  - Provided PC status to SIT Chair
- ✓ **SIT CEOS-GEO Workshop, 20-22 February 2008**
  - Four Questionnaire Inputs submitted (18 total activities)
- ✓ **3rd GPM International Ground Validation (GV) Workshop**
  - March 4-6, 2008 – Buzios, Brazil
  - Hosted by AEB/INPE
  - 50 participants from 19 countries
  - Plans for 24 joint projects

Progress Since 21st Plenary (cont.)

- ✓ **Moving GPM from formulation to implementation phase at NASA and JAXA**
  - GPM DPR (JAXA) PDR (1Q2008)
  - PPS (NASA) assumes TRMM data processing including production merged product (2Q2008)
  - GPM Mission (NASA) PDR (4Q2008)
  - GPM Mission (NASA) KDP-C (1Q2009)

- ✓ **Future plans prepared**
  - CEOS PC Implementation Plan V0.4
  - CEOS PC 2008 Work Plan V2.4

- ✓ **Meetings/Workshops in planning**
  - Regional Workshop on Tropical Cyclone Research, May 26-30, La Reunion (CNES, CNRS, Meteo-France, Eumetsat, WMO)
  - 2nd GPM Asia Workshop, June 2-4, Tokyo, Japan (JAXA, NASA)
  - 2nd CEOS Precipitation Constellation Workshop, June 5-6, Tokyo, Japan (JAXA)
  - 3rd X-Cal Working Group, August 3, Colorado, USA (NASA, JAXA, ISRO, NOAA, NRL, etc.)
  - Precipitation Measuring Missions Science Team, August 4-5, Colorado, USA (NASA)

SIT-Related Activities

- ✓ **Requested SIT and CEOS Support status and next steps reviewed at CEOS SIT Chair Tag-Up**
  - Subsequent developments for 5 of 7 support items
- ✓ **Four Questionnaire Inputs submitted for CEOS SIT CEOS-GEO Task Workshop**
  - DA-07-03: Virtual Constellations
  - WA-08-01: Integration of In-situ and Satellite Data for Water Cycle Monitoring
  - CL-06-02: Key Climate Data from Satellite Systems
  - WE-06-02: Space-based Global Observing System for Weather
- ✓ **Four designated CEOS Category-1 Actions**
  - DA-07-03_2 (GEO Plenary Highlight), CL-06-02_2, DA-07-03_6, DA-07-03_1

GEO-Related Activities

Action: DA-07-03_2 Coordinate international GPM ground validation (GV) activities and establish the scope of joint GV projects during the year.

Status/Deliverables: Plans for 24 joint projects from 19 nations proposed. Of these one has been accepted by the PMM Program, one is in review, 11 are various stages of preparation, and 11 have been identified as potential opportunities. A report summarizing the workshop activities and describing the general framework for international collaboration on GPM GV is in preparation for release in the summer of 2008.

Action: CL-06-02_2 Make precipitation data available to a broad additional group of users who are more familiar with GIS than the satellite data formats. Allow easy integration of precipitation data into GIS analysis.

Status/Deliverables: GIS format real-time precipitation data operational on 20 March 2008.

Action: DA-07-03_6 Precipitation Processing System (PPS) assumes Tropical Rainfall Measuring Mission (TRMM) data processing effective 1 June 2008.

Status/Deliverables: System testing completed. In Operational Acceptance Testing.

Action: DA-07-03_1 Complete the initial phase of the first intercomparison study undertaken by the Precipitation Measurement Missions (PMM) Science Team intercalibration working group in coordination with the CGMS/GSICS. Consists of (a) Investigating algorithms for intercalibrating the brightness temperatures measured by similar, but not identical, spaceborne microwave radiometers, and (b) Comparing these algorithms using a common test data set.

Status/Deliverables: Working group met on 15-16 January 2008 at the University of Central Florida in Orlando, FL to discuss the preliminary study results. Two categories of cross-calibration algorithms - “brightness temperature mapping algorithms” and “limiting value algorithms” - were identified. Comparison of radiative transfer codes is necessary precursor to algorithm comparison. A number of sun angle effects must be addressed. Working group will next meet on 3 August 2008 in Ft. Collins, CO to discuss initial phase study results and decide on the next steps. Will review radiative transfer code comparisons, BESS/CSU and UCF/JAXA inter-calibration algorithm pair-wise comparisons, and improved sun angle correction techniques. A summary report will be completed by 31 August 2008.

2008 Success

- From the ***2008 Precipitation Constellation Work Plan***:
  - Execute and complete the identified joint activities
  - Produce the identified deliverables from individual Precipitation Constellation members

- Joint Activities are in the following areas:
  - Mission Operation and Development - 10
  - Linkages to User Communities - 7
  - PC Framework - 3
  - Data exchange - 3
  - Cal/Val - 5
  - Algorithm and Products - 4
  - Meetings and Workshops - 6

- Individual Precipitation Constellation Deliverables fall under the following categories:
  - Hardware; Satellite, sensor, data-distribution systems - 6
  - Software; Algorithm development/improvement, data-processing, products - 7
  - Applications - 5

- Results will be reported in ***2008 Precipitation Constellation Final Report***

Backup

Goal of the PC

To establish an international framework to guide, facilitate, and coordinate the continued advancements of multi-satellite global precipitation missions

1) To provide a framework for implementation and monitoring of GEO task AR-06-10

Advocate and facilitate the timely implementation of the Global Precipitation Measurement (GPM) mission and encourage more nations to contribute to the GPM constellation

2) To sustain and enhance an accurate and timely global precipitation data record including a Fundamental Climate Data Record essential for understanding the integrated weather/climate/ecological system, managing freshwater resources, and monitoring and predicting high-impact natural hazard events.

This data record should be fit for the purpose specified by GCOS for the monitoring of Precipitation as an essential climate variable (ECV) (as defined in the recent GCOS document 'Systematic Observation Requirements for Satellite-based Products for Climate')

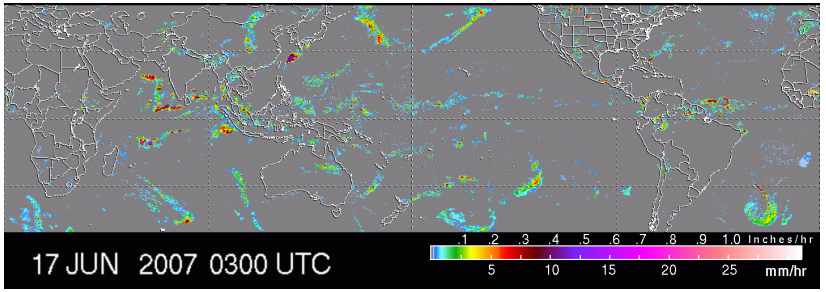
Implementation

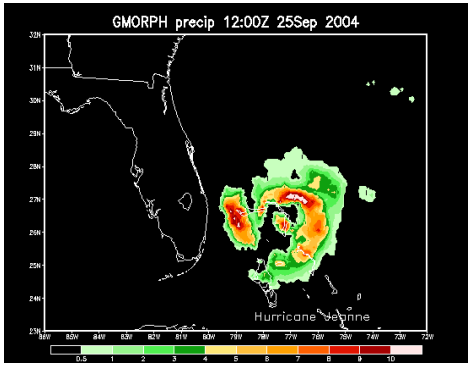
- The implementation of CEOS PC is in four phases

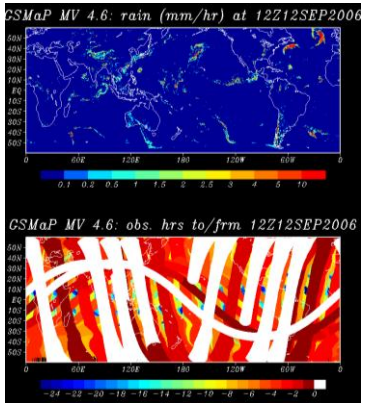
year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
phase	study phase	GPM preparatory phase					GPM phase					post -GPM phase	
							GPM						

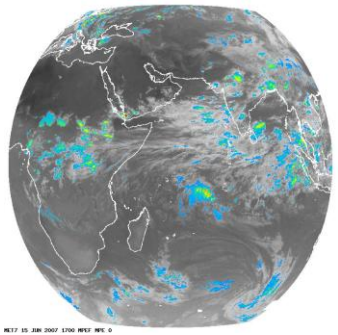
Phase Descriptions

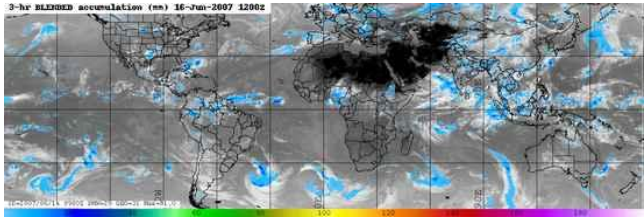
- Objectives are articulated for four phases
  - Study Phase (2007)
    - Study key items which should be achieved to formulate the CEOS PC, and produce the initial Implementation Plan
    - Identify the key points of agreement for space agency co-operation in order to meet the needs of both the data producer and user communities
    - Study the existing multi-sensor activities undertaken by PC team members
      - NASA TRMM 3B42 standard product
      - JAXA GSMaP prototype product
      - NOAA CMORPH/QMORPH products
      - NRL products
      - EUMETSAT MPE product (TBC)







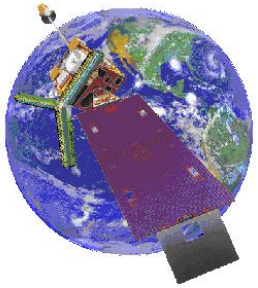
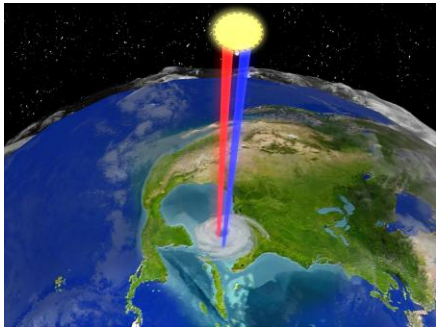




Phase Descriptions (cont.)

- GPM preparatory phase (2008-2012)
  - Comparison of different methods of inter-calibration for generating uniform precipitation estimates from diverse types of precipitation sensors
  - Evaluation of different multi-sensor precipitation products
  - The prototyping of uses of merged data products from multiple sensors as well as evaluation of tools to support such use
  - Establishing the standard merged precipitation products desired
- GPM phase (2013-2017)
  - Launch and operation of GPM, the first constellation-focused mission that will improve precipitation estimates through extensive intercalibration and the use of a reference standard
- Post-GPM phase (after 2017)
  - Beyond timeframe of GEOSS 10-Year Implementation Plan
  - Activities during this phase will not be specified clearly in an early stage
  - Lessons learned from GPM and other PC activities will serve to guide the planning and further evolution of CEOS PC



Participation

- **CEOS SIT Liaison:**
  - USA - NOAA: Mary Kicza, Mary.Kicza@noaa.gov
- **Study Lead Agencies:**
  - Japan – JAXA: Riko Oki, oki.riko@jaxa.jp & USA – NASA: Steven Neeck, steven.neeck@nasa.gov
- **Space Agency Participants:**
  - France - CNES: Didier Renaut, didier.renaut@cnes.fr
  - India - ISRO: contacted
  - Brazil - INPE: Carlos Frederico Angelis, angelis@cptec.inpe.br
  - Europe - ESA: Einar-Arland Herland, einar-arland.herland@esa.int
  - China - CAST/NRSCC: contacted
  - USA - NOAA: Ralph Ferraro, ralph.r.ferraro@noaa.gov
  - USA - Naval Research Laboratory: Joe Turk, turk@nrlmry.navy.mil
  - Europe - EUMETSAT: Johannes Schmetz, Johannes.Schmetz@eumetsat.int
  - Germany - DLR: Martin Hagen, martin.hagen@dlr.de
  - Canada - Canadian Space Agency: David Kendall, Dave.Kendall@space.gc.ca

Participation (cont.)

- **User Community Representatives:**
  - CGMS-IPWG: Ralph Ferraro, ralph.r.ferraro@noaa.gov
  - GEWEX: Chris Kummerow, kummerow@atmos.colostate.edu
  - WCRP/IGWCO: Rick Lawford, lawford@umbc.edu
  - GCOS: Paul Mason, p.j.mason@reading.ac.uk
  - Peter Bauer, Peter.Bauer@ecmwf.int
  - Phil Arkin, parkin@essic.umd.edu

U.S. Study Team

- Steven Neeck/NASA HQ
- Ramesh Kakar/NASA HQ
- Arthur Hou/NASA GSFC
- Bob Adler/ NASA GSFC
- Erich Stocker/NASA GSFC (SEO POC)
- Scott Braun/NASA GSFC (Visualization POC)
- Ralph Ferraro/NOAA
- Joe Turk/NRL
- Chris Kummerow/Colorado State University

Japan Study Team

- Riko Oki, JAXA
- Masahiro Kojima, JAXA
- Kinji Furukawa, JAXA (SEO POC)
- Keizo Nakagawa, JAXA
- Chu Ishida, JAXA
- Misako Kachi, JAXA (Visualization POC)
- Toshiaki Takeshima, JAXA
- Kengo Aizawa, JAXA
- Keiji Imaoka, JAXA
- Kazuo Umezawa, JAXA
- Kenji Nakamura, Nagoya University
- Toshio Iguchi, NICT
- Ken'ichi Okamoto, Osaka Prefecture University
- Toshio Koike, University of Tokyo
- Jun Matsumoto, Tokyo Metropolitan University
- Kazuhiko Fukami Public Works Research Institute
- Yoshiaki Takeuichi, Japan Meteorological Agency
- Yoshiyuki Chihara, Ministry of Education, Culture, Sports, Science and Technology

Requested SIT and CEOS Support

1. To urge ISRO/CNES to acquire the capability to make Megha Tropiques data available in real-time, which is important for the CEOS constellation to meet the needs of the application communities such as NWP and hydrological prediction. The SIT should assist in locating a ground station in the Southern Hemisphere to enable ISRO/CNES to collect data more than three times a day.

2. To urge Russia to make available to the PC the radiometric measurements from the ROSHYDROMET MTVZA sounder/imagers.

3. To urge China to make available to the PC the radiometer measurements from the FY-3 MWRI and MWHS imager and sounders.

4. To urge ESA and JAXA to implement a high-sensitivity light and solid precipitation measurement capability in EarthCARE.

5. To urge NASA and JAXA to commit resources for the timely implementation of the Global Precipitation Measurement (GPM) mission and encourage more space agencies to contribute to the GPM constellation.

6. To take the lead to convince all PC contributors to adopt an open data sharing philosophy through an explicit agreement that all data should be freely and openly available to all requestors.

7. To adopt policies and approaches that recognize the unique status of the individual prototype constellations in different stages of development and their needs to be engineered differently.

Status of Requested Support

1. South American ground station discussed in CNES-INPE meeting in context of Megha-Tropiques and GPM-Br collaboration.

2. Stephen Ward/CEOS Secretariat discussed MTVZA with ROSHYDROMET (Alexander Uspensky). ROSHYDROMET invited to upcoming 2nd Precipitation Constellation Workshop.

3. NRSCC and NSMC/CMA invited to upcoming 2nd Precipitation Constellation Workshop.

4. Chu Ishida discussed with JAXA EarthCare Project.

5. NASA FY2008 enacted budget and FY2009 proposed budget fully funds GPM. JAXA GPM/DPR Project entered Phase C on 1 April 2008.

6. No change in status.

7. No change in status.

Responses to CEOS-GEO Questionnaire

Please answer each question for each GEO Task in which your SBA Team, Constellation, or Working Group is involved and provide the completed sheet to the SIT Chair and the CEOS Executive Officer by 31 January 2008.

GEO Task #DA-07-03: Virtual Constellations

CEOS Agency: NASA, JAXA

CEOS Virtual Constellation: Precipitation Constellation (PC)

Point of Contact: Steven Neeck, steven.neeck@nasa, Riko Oki, oki.riko@jaxa.jp

1. Identify current activities contributing to this task, and the significance.

Current PC activities contributing to this task fall within the Global Precipitation Measurement (GPM) preparatory phase. All work elements for 2008 will build upon international science activities on radiometer intercalibration, satellite algorithm development, ground validation, and data processing already underway in support of the GPM Mission. In 2008 the PC continues to encourage the development and evaluation of precipitation products from the existing constellation of satellites including the Tropical Rainfall Measurement Mission (TRMM). These activities include inter-comparison and validation of satellite data products against high quality ground data.

2. Identify actions and/or deliverables related to the activities described above (these actions will be reported to CEOS). What is the identifiable result of the action?

a. TRMM data processing will be assumed by the Precipitation Processing System (PPS) effective 1 June 2008. This action allows an early build of the data processing system that will be used for GPM processing to be used to establish key aspects of a system required for multiple satellite data merging: flexibility, extensibility, and maintainability. In addition the action improves the access to the user community of all TRMM based data including the production merged satellite product.
b. Coordinate international ground validation (GV) activities and establish the scope of joint GV projects during the year. An international GV meeting will be held in Brazil during March 2008. Action ensures coordinated activities to support GPM pre-launch algorithm development at the national and international levels. Action is also part of the effort for determining error characteristics of satellite precipitation products.
c. Complete the first intercomparison study undertaken by the Precipitation Measurement Missions (PMM) Science Team intercalibration working group in coordination with the CGMS/GSICS. This action is to completed by August 2008. This action is an important step in establishing how PC data should be intercalibrated at antenna and brightness temperature stage. It also examines the issues involved in using a reference satellite as part of the intercalibation.
d. Continue PMM science team working group activities that improve precipitation science algorithms (e.g. drop size distribution issues, etc.). This is an ongoing GPM activity, with the first working group report due in August 2008. This action ensures that precipitation algorithms will be greatly improved using microphysical measurements provided by the GPM dual-frequency radar.
e. Continued progress on moving GPM from formulation to implementation phase at NASA and JAXA. Major near-term milestones are: GPM DPR (JAXA) PDR (1Q2008), GPM DPR (JAXA) Delta PDR (3Q2008), GPM Core Spacecraft/Mission (NASA) PDR (4Q2008), GPM Mission (NASA) Confirmation (1Q2009). Action is necessary to realize GPM Phase of PC.
f. Continue TRMM operations (NASA) through 2008. Action is necessary to support GPM Preparatory Phase of PC.

3. Identify any issues (current/potential data gaps, data sharing problems, funding, etc)

Key Challenges and Requested SIT and CEOS Support were provided by the PC at the 21st CEOS Plenary. The PC encourages the assistance of the SIT and CEOS in resolving them.

4. Identify actions and/or deliverables needed to address the issues described above (these actions will be reported to CEOS). Specify when action needs to be completed. What is the identifiable result of the action?

See 3. above

5 Identify key international organization(s) already assigned to work on this task from the satellite perspective. Are there any outstanding issues CEOS can help address in coordination with these organization(s).

NASA and JAXA are co-leads on the PC. Additional space agencies that have confirmed participation in the PC or have been invited are: CNES, ISRO, INPE, ESA, CAST/NRSCC, NOAA, Naval Research Laboratory, EUMETSAT, DLR, and Canadian Space Agency. See 4. for outstanding issues and actions.

Responses to CEOS-GEO Questionnaire (cont.)

Please answer each question for each GEO Task in which your SBA Team, Constellation, or Working Group is involved and provide the completed sheet to the SIT Chair and the CEOS Executive Officer by 31 January 2008.

GEO Task #WA-08-01: Integration of In-situ and Satellite Data for Water Cycle Monitoring

CEOS Agency: NASA, JAXA

CEOS Virtual Constellation: Precipitation Constellation (PC)

Point of Contact: Steven Neeck, steven.neeck@nasa, Riko Oki, oki.riko@jaxa.jp

1. **Identify current activities contributing to this task, and the significance.**

The PC is contributing data for this task from multiple satellites systems including TRMM and GPM via the Data Management Task DA-07-03 (Virtual Constellations).

2. **Identify actions and/or deliverables related to the activities described above (these actions will be reported to CEOS). What is the identifiable result of the action?**

   a. The conversion of HDF formatted 3hr global rainrate products to GIS formatted rain accumulation products. To become fully operationally and available to all users in April 2008. This activity puts precipitation data in a format easily used by users combining satellite and ground data via GIS packages.
   b. The GPM ground validation (GV) working group is using satellite and ground data to investigate key issues of combination over co-located sites. Such issues include but are not limited to scan differences, representational differences, grid-size differences, etc. Initial steps will be completed by November 2008. This activity will facilitate integration of in-situ and satellite data for users.
   c. PPS will enable users to create dynamic geographical subsets of TRMM rain products. This will become available April 2008. This feature will allow users to retrieve precipitation data only over the area for which they wish to integrate or study in-situ data.

3. **Identify any issues (current/potential data gaps, data sharing problems, funding, etc)**

Key PC Challenges and Requested SIT and CEOS Support were provided at the 21st CEOS Plenary. The PC encourages the assistance of the SIT and CEOS in resolving them.

4. **Identify actions and/or deliverables needed to address the issues described above (these actions will be reported to CEOS). Specify when action needs to be completed. What is the identifiable result of the action?**

See 3. above

5 **Identify key international organization(s) already assigned to work on this task from the satellite perspective. Are there any outstanding issues CEOS can help address in coordination with these organization(s).**

NASA and JAXA are co-leads on the PC. Additional space agencies that have confirmed participation in the PC or have been invited are: CNES, ISRO, INPE, ESA, CAST/NRSCC, NOAA, Naval Research Laboratory, EUMETSAT, DLR, and Canadian Space Agency. See 4. for outstanding issues and actions.

Responses to CEOS-GEO Questionnaire (cont.)

Please answer each question for each GEO Task in which your SBA Team, Constellation, or Working Group is involved and provide the completed sheet to the SIT Chair and the CEOS Executive Officer by 31 January 2008.

GEO Task #CL-06-02: Key Climate Data from Satellite Systems

CEOS Agency: NASA, JAXA

CEOS Virtual Constellation: Precipitation Constellation (PC)

Point of Contact: Steven Neeck, steven.neeck@nasa, Riko Oki, oki.riko@jaxa.jp

1. Identify current activities contributing to this task, and the significance.

The PC is contributing data to this task through multiple satellites missions including TRMM and GPM via the Data Management Task DA-07-03 (Virtual Constellations). A key PC goal is *"To sustain and enhance an accurate and timely global precipitation data record including a Fundamental Climate Data Record essential for understanding the integrated weather/climate/ecological system, managing freshwater resources, and monitoring and predicting high-impact natural hazard events. This data record should be fit for the purpose specified by GCOS for the monitoring of Precipitation as an essential climate variable (ECV) (as defined in the recent GCOS document 'Systematic Observation Requirements for Satellite-based Products for Climate')".*

2. Identify actions and/or deliverables related to the activities described above (these actions will be reported to CEOS). What is the identifiable result of the action?

a. Test updated merged realtime algorithm that includes NOAA-N AMSU data into the 3hr merged product. Test completion 31 Mar 2008. This action improves the accuracy of the rain retrievals and the coverage by including an additional radiometer. It also provides valuable information for the use of sounders in the GPM system.
b. Make the Version 6 merged realtime algorithm which includes NOAA-N AMSU data the production version. Completion 1 April 2008. Action result is same as for 2a.
c. Develop the TMI Metop-A AMSU calibration approach: June 2008. By using TMI to calibrate rain from METOP-A AMSU the consistency of the rain retrievals are greatly improved. This action also provides one approach to intercalibration at the level 2 data product for GPM.
d. Include Metop-A AMSU data into realtime merged stream if calibration warrants. Target date December 2008. Action result same as that described in 2a.
e. GIS format: TIFF with World File totally operational. 1 April 2008. This action allows access to precipitation data to operational and research users who use GIS extensively and for whom HDF formats are not easily accessible.
f. Completion of 11 years of TRMM 3-hr, multi-satellite standard product (TRMM Multi-satellite Precipitation Analysis, product number 3B42). To be completed by January 2009. This product provides 3-hour global rainfall and accumulation maps and is being used extensively for hydrological and other studies. Action will further extend the data set.

3. Identify any issues (current/potential data gaps, data sharing problems, funding, etc)

Key PC Challenges and Requested SIT and CEOS Support were provided at the 21st CEOS Plenary. The PC encourages the assistance of the SIT and CEOS in resolving them.

4. Identify actions and/or deliverables needed to address the issues described above (these actions will be reported to CEOS). Specify when action needs to be completed. What is the identifiable result of the action?

See 3. above

5 Identify key international organization(s) already assigned to work on this task from the satellite perspective. Are there any outstanding issues CEOS can help address in coordination with these organization(s).

NASA and JAXA are co-leads on the PC. Additional space agencies that have confirmed participation in the PC or have been invited are: CNES, ISRO, INPE, ESA, CAST/NRSCC, NOAA, Naval Research Laboratory, EUMETSAT, DLR, and Canadian Space Agency. See 4. for outstanding issues and actions.

Responses to CEOS-GEO Questionnaire (cont.)

Please answer each question for each GEO Task in which your SBA Team, Constellation, or Working Group is involved and provide the completed sheet to the SIT Chair and the CEOS Executive Officer by 31 January 2008.

GEO Task #WE-06-02: Space-based Global Observing System for Weather

CEOS Agency: NASA, JAXA

CEOS Virtual Constellation: Precipitation Constellation (PC)

Point of Contact: Steven Neeck, steven.neeck@nasa, Riko Oki, oki.riko@jaxa.jp

1. Identify current activities contributing to this task, and the significance.

The PC is contributing to this task through multiple satellites missions including TRMM and GPM via the Data Management Task DA-07-03 (Virtual Constellations). A key PC goal is "*To sustain and enhance an accurate and timely global precipitation data record including a Fundamental Climate Data Record essential for understanding the integrated weather/climate/ecological system, managing freshwater resources, and monitoring and predicting high-impact natural hazard events. This data record should be fit for the purpose specified by GCOS for the monitoring of Precipitation as an essential climate variable (ECV) (as defined in the recent GCOS document 'Systematic Observation Requirements for Satellite-based Products for Climate')*".

2. Identify actions and/or deliverables related to the activities described above (these actions will be reported to CEOS). What is the identifiable result of the action?

a. NASA/JAXA have provided continued funding for the TRMM satellite including the production of merged precipitation products. This stage of the process will be completed Dec 2008. Continued TRMM funding allows the expansion of a consistent 10 year record of precipitation already provided by this mission. TRMM data is currently used operationally (e.g. for the monitoring of hurricanes and flooding).
b. TRMM merged product data has been converted into a GIS format with 3hr, 3 day and 7 day accumulations. Currently in operational prototype. April 2008 is the move to final production. This is currently used by operational agencies (e.g. Pacific Disaster Monitoring Group) for integration into their GIS based disaster monitoring systems.
c. TRMM data currently used in prototype flood monitoring and landslide warning prototypes. This system will be improved and put into operational prototype mode by December 2008. This action maximizes the use of merged precipitation data in the natural hazards monitoring arena. It also provides insights that are important for extending such services during the GPM constellation era.

3. Identify any issues (current/potential data gaps, data sharing problems, funding, etc)

Key PC Challenges and Requested SIT and CEOS Support were provided at the 21st CEOS Plenary. The PC encourages the assistance of the SIT and CEOS in resolving them.

4. Identify actions and/or deliverables needed to address the issues described above (these actions will be reported to CEOS). Specify when action needs to be completed. What is the identifiable result of the action?

See 3. above

5 Identify key international organization(s) already assigned to work on this task from the satellite perspective. Are there any outstanding issues CEOS can help address in coordination with these organization(s).

NASA and JAXA are co-lends on the PC. Additional space agencies that have confirmed participation in the PC or have been invited are: CNES, ISRO, INPE, ESA, CAST/NRSCC, NOAA, Naval Research Laboratory, EUMETSAT, DLR, and Canadian Space Agency. See 4. for outstanding issues and actions.

Action: DA-07-03_2 Description

Action: DA-07-03_2

Primary SBA Area: Transverse

NASA Point of Contact: Steven Neeck

Due Date: 3/31/2008

Participating Organizations: NASA, JAXA, NOAA, AEB, INPE, ISRO, EC, FMI, KNMI, JMA, KMA, CNR, BMRC, LMD, ISAC, OPERA, SIMEPAR, CEDEX, UCLM, ETP-CNRS-UVSQ, German Weather Service, Cyprus Weather Service, Universities from U.S., Asia, and Europe

Participating CEOS groups: PC

Action Description

- Coordinate international GPM ground validation (GV) activities and establish the scope of joint GV projects during the year.
  - The objective of this action is to establish collaborative GV measurement and research activities between the GPM Mission and international partners to support pre-launch satellite algorithm development and post-launch product evaluation.
  - Action is important for coordinating GV assets and facilities around the world within a consistent framework to contribute to the refinement of satellite simulators and retrieval algorithms for GPM.
  - Action is also part of the effort for determining error characteristics of satellite precipitation products for the development and production of the next-generation multi-satellite global precipitation data products and for improved applications in weather forecasting and hydrological prediction.

Action: DA-07-03_2 Status

- The 3rd International GPM GV Planning Workshop hosted by AEB/INPE was held in Buzios, Brazil, 4-6 March 2008, to develop joint research projects for investigators from the international community to collaborate with the U.S. Precipitation Measurement Mission (PMM) Science Team on GPM GV. The workshop concluded with plans for 24 joint projects from 19 nations. Of these 24 proposed activities, one has already been accepted by the PMM Program, one is in review, 11 are various stages of preparation, and 11 have been identified as potential opportunities.
- The workshop presentations are available online at http://pindara.cptec.inpe.br/gpm/workshop/index.html.
- A report summarizing the workshop activities and describing the general framework for international collaboration on GPM GV is in preparation for release in the summer of 2008.

Action: CL-06-02_2 Description

Action: CL-06-02_2

Primary SBA Area: Transverse

NASA Point of Contact: Steven Neeck

Due Date: 4/30/2008

Participating Organizations: NASA

Participating CEOS groups: PC

Action Description

- Make precipitation data available to a broad additional group of users who are more familiar with GIS than the satellite data formats. Allow easy integration of precipitation data into GIS analysis.
  - The task is to make the prototype GIS format using TIFF with world files available to the general community in full operational mode. This action allows access to precipitation data to operational and research users who use GIS extensively and for whom HDF formats are not easily accessible.

Action: CL-06-02_2 Status

- The GIS format real-time precipitation data was put into regular operational status on 20 March 2008.
- Data are available on an anonymous ftp server for regular pickup
  - 3hr, daily and 7 day rain accumulation products
  - trmmopen.gsfc.nasa.gov
  - pub/gis directory
  - Accessed by disaster monitoring organization (Pacific Disaster Warning group on Maui, Hi)
- Historical merged data product also available but not yet on anonymous server
  - Used by researchers at University of Georgia
  - Used by U.N. World Food Programme researcher
  - Will be soon moved to anonymous server

Action: DA-07-03_6 Description

Action: DA-07-03_6

Primary SBA Area: Transverse

NASA Point of Contact: Steven Neeck

Due Date: 6/1/2008

Participating Organizations: NASA

Participating CEOS groups: PC

Action Description

- The Precipitation Processing System (PPS) will assume Tropical Rainfall Measuring Mission (TRMM) data processing effective 1 June 2008. This action allows an early build of and risk reduction for the data processing system to be used for the successor Global Precipitation Measurement (GPM) mission. This system will allow testing the architectural characteristics of multi-satellite data merging: flexibility, extensibility, and maintainability. In addition, the action improves the access to the user community of all TRMM-based data including the production merged satellite products.

Action: DA-07-03_6 Status

- System testing ended on 31 March 2008
- Operational Acceptance Testing (OAT) began on 1 April 2008 and will continue through 31 May 2008
- System testing very successful and early OAT indicates the same
- Currently on schedule for 1 June 2008 changeover of TRMM processing

Action: DA-07-03_1 Description

Action: DA-07-03_1

Primary SBA Area: Transverse

NASA Point of Contact: Steven Neeck

Due Date: 8/31/2008

Participating Organizations: NASA, JAXA, CNES, ISRO, INPE, ESA, CAST/NRSCC, NOAA, NRL, EUMETSAT, DLR, CSA, Universities from the U.S. and Asia (Korea)

Participating CEOS groups: PC, WGCV (invited)

Action Description

- Complete the initial phase of the first intercomparison study undertaken by the Precipitation Measurement Missions (PMM) Science Team intercalibration working group in coordination with the CGMS/GSICS.
  - Consists of
    - Investigating algorithms for intercalibrating the brightness temperatures measured by similar, but not identical, spaceborne microwave radiometers, and
    - Comparing these algorithms using a common test data set.
  - This action is an important step in establishing how PC data should be intercalibrated at antenna and brightness temperature stage. It also examines the issues involved in using a reference satellite as part of the intercalibration.

Action: DA-07-03_1 Status

- The working group met on 15-16 January 2008 at the University of Central Florida in Orlando, FL to discuss the preliminary study results.
  - Two categories of cross-calibration algorithms - "brightness temperature mapping algorithms" and "limiting value algorithms" - were identified. The two methods can be used to check against each other.
  - Comparison of radiative transfer codes is necessary precursor to algorithm comparison.
  - A number of sun angle effects must be addressed.
  - Wind azimuth effects were not significant.
- The working group will next meet on 3 August 2008 in Ft. Collins, CO to discuss initial phase study results and decide on the next steps.
  - Review radiative transfer code comparisons.
  - Review BESS/CSU and UCF/JAXA inter-calibration algorithm pair-wise comparisons.
  - Review improved sun angle correction techniques.
  - Produce a summary report to be made available by 31 August 2008.