Suomi / NPP Mission Applications Workshop
Meeting Summary

Westin City Center, Washington, DC
June 21-22, 2012

Draft Report (updated March 12, 2013)

I. Background

The Suomi National Polar-orbiting Partnership (NPP) satellite mission is joint NOAA-NASA mission, and represents an important first step in building the next-generation satellite system that will continue the legacy of NASA's Earth Observing System (EOS). The Suomi National Polar-orbiting Partnership (NPP) spacecraft lifted off at 5:48 a.m. EDT on October 28, 2011, and acquired its first measurements on November 21, 2011. On February 22, 2013, the Suomi NPP spacecraft was transitioned to NOAA operational organization control.

The Suomi NPP spacecraft carries five key instruments: the Advanced Technology Microwave Sounder (ATMS), the Cross-track Infrared Sounder (CrIS), the Ozone Mapping and Profiler Suite (OMPS), the Visible Infrared Imaging Radiometer Suite (VIIRS), and Clouds and the Earth's Radiant Energy System (CERES). Data from these instruments will be used to produce sensor data records (SDRs), environmental data records (EDRs), and climate data records (CDRs). Many of the CDRs generated from the Suomi NPP mission are intended to provide long-term, continuous data records that are consistent with observations from instruments onboard EOS missions. These CDRs are critical scientific resources for long term studies to quantify rates and impacts of climate and land use change. In addition, many of the EDRs and CDRs derived from the VIIRS instrument are designed to provide data continuity with observations from the MODerate resolution Imaging Spectroradiometer (MODIS) onboard the Terra and Aqua spacecraft. MODIS observations have played a critical role in many successful efforts supported by the NASA Applied Science Program (ASP), and MODIS observations of land surface and vegetation conditions, fire activity and thermal anomalies, clouds and aerosols, sea ice, and ocean temperature and color are now essential components of many decision support systems operated by a diverse range of partners and stakeholders.

Under the Suomi NPP partnership, NOAA has the primary responsibility for satellite operations, and the ground and data systems for the mission, including the Suomi NPP Interface Data Processing Segment (IDPS). IDPS receives raw instrument data and telemetry from ground stations supporting the NPP mission, removes Raw Data Records (RDRs) from the data stream, and then processes RDRs into Sensor Data Records (SDRs) and ultimately Environmental Data Records (EDRs). The IDPS also supplies RDRs, SDRs and EDRs to two NOAA meteorological Centrals for evaluation or use in environmental applications. These two Centrals are National Environmental Satellite, Data, and Information Service (NESDIS) and the Air Force Weather Agency (AFWA). The IDPS also transmits RDRs, SDRs, and EDRs to

the Archive and Distribution Segment (ADS) for archiving and access/distribution to the broader user community and forwards RDRs to the Science Data Segment (SDS). The SDS interfaces with the IDPS installed in the NESDIS facility to support the necessary data flows. Data products from the NPP Mission are archived and currently available from NOAA's Comprehensive Large Array-data Stewardship System (CLASS; http://www.class.noaa.gov/*)*.

The NASA Suomi NPP Science Team is tasked with evaluating the NPP algorithms and providing guidance to NASA on the NPP data products, data processing, and instrument calibration/validation. In support of this activity, the NASA science team has organized five Product Evaluation & Analysis Tool Elements *(*PEATEs*):* Ocean, Land, Atmosphere, Ozone, and Sounder. The PEATEs also receive data from the Suomi NPP instruments via direct broadcast as well as from the NOAA IDPS and SDS. In support of their activities, the PEATEs also maintain data processing facilities for use in the evaluation of Suomi NPP algorithms, SDRs, EDRs, and CDRs.

More information about the Suomi NPP mission may be found at:
http://www.nasa.gov/mission_pages/NPP/main/index.html
http:// http://npp.gsfc.nasa.gov/
http://www.class.ngdc.noaa.gov/data_available/npp/index.htm

More information about the NASA Suomi NPP Science Team and PEATEs may be found at:
http://npp.gsfc.nasa.gov/science/teaminfo.html

II. Meeting Purpose and Objectives

The primary purpose of this meeting was to provide an update about the Suomi NPP Mission to the NASA ASP community, and to provide the community with an opportunity to comment on requirements for Suomi NPP data products and data systems. Specific meeting objectives included:

1. Update the Earth science and applications communities on the Suomi NPP mission, including, instrument performance, data characteristics, access to data and data products.

2. Identify and review potential applications of data from all Suomi NPP instruments, with emphasis on VIIRS, in four elements of the Applied Science Program:
   - Disaster response and management
   - Ecological forecasting
   - Public health (air quality)
   - Water resources

3. Provide an opportunity for identification of requirements and community feedback to NASA on data products, data access and other user needs.

III. Meeting Participants

The intended audience for the Suomi NPP Mission Applications workshop included Earth observation data users and stakeholders in the science and applied science communities across all sectors – government, commercial, non-government organizations and academia. The meeting was advertised widely within the NASA ASP community, and invitations were sent to all projects currently supported by NASA ASP.

More than 140 members of the NASA ASP community registered to attend (see http://earthscience.arc.nasa.gov/npp/npp_conf_attendees.html for the full list of participants). The majority of meeting participants were from U.S. federal agencies and universities, though the attendee list also includes a number of participants from the private sector.

IV. Meeting Organization

The first day of the meeting was allocated primarily to presentations on the status of the Suomi NPP mission, instruments, data systems, and data products. The first day concluded with four breakout groups, organized by NASA ASP program elements: Disaster response and management; Ecological forecasting; Health and Air Quality; Water resources. Each breakout group was asked to consider the eight questions listed below, and breakout groups reported back to the full group during the morning of the second day. The breakout group reports were followed by approximately one hour of discussion of the findings from the breakout group reports. A full meeting agenda is included in Appendix I and available at http://earthscience.arc.nasa.gov/npp/npp_conf_agenda.html.

Breakout group questions:

1. What NASA Terra/Aqua satellite data sets, or products derived from NASA satellite observations, are you currently using?
2. What are the current applications and / or science questions that you are addressing with NASA Terra / Aqua satellite data?
3. What data sets from the Suomi-NPP suite of instruments have potential value in your science or applications tasks?
4. What higher level data products from Suomi-NPP data sets would be helpful in your science or applications tasks? (Include the characteristics of the product and other requirements, e.g. resolution, accuracy, data latency, data format.) What are the three most important data products?
5. Who are your key partners or end user organizations on tasks, projects, or processes that use NASA satellite data?
6. On a scale of 1-10 (10 being most important): How important is data continuity from Terra/Aqua data products to their counterparts on Suomi-NPP? Is data continuity a concern to your partners?
7. Data access: a) How do you currently access NASA satellite-based data sets and data products? b) How would you like to access data and data products from Suomi-NPP observations?

8. What are the biggest impediments limiting your use of NASA satellite data and data products? (Consider the data and the ground system)

V. Meeting Summary

NASA Applied Science Community Requirements and Breakout Group Findings

The primary result of the breakout groups was the identification of five key requirements from the NASA ASP Community for the Suomi NPP Mission data products and data systems:

1) **Data consistency:** *To facilitate a smooth transition from EDRs and CDRs from EOS instruments to Suomi NPP EDRs and CDRs, the data products must be consistent across the data records from different instruments.* In particular, participants stated that it is important that algorithms used to produce the EDRs and CDRs, including details such as handling of QA flags, are consistent. In cases where there are necessary differences as a result of algorithm advances or operational needs of the NOAA community, these differences should be clearly documented and described, and strategies should be developed to facilitate a smooth transition to the Suomi NPP EDR/CDR from the corresponding EOS data products. Suomi NPP ATBDs should be easily accessible, and the NASA ASP community also requested development of a clear process for reviewing and commenting on Suomi NPP ATBDs.

2) **Data formats:** *Suomi NPP data products must be available as gridded Level 3 products, and in data formats that are consistent with corresponding EOS data products*. Many NASA ASP supported efforts currently rely on gridded Level 3 data products available from the NASA DAACs (http://earthdata.nasa.gov/) or the NASA LANCE system (http://earthdata.nasa.gov/data/near-real-time-data/about-lance), and gridded products are not currently available from the NOAA IDPS or CLASS systems. Lack of gridded data products will limit the utility of Suomi NPP EDRs and CDRs for the ASP community unless granule/swath to grid tools for Suomi NPP data products are widely available and easy to implement and use. Many decision support systems operated by NASA stakeholders and partners are also designed to ingested EOS HDF-5 formats, and additional software development would be required to modify these systems to ingest Suomi NPP data formats.

3) **Data latency:** *To support the full range of NASA ASP efforts, Suomi NPP products must be available in near real-time.* Many meeting participants expressed a need for a data latency of <12 hours, and expressed concern about data access via the NOAA CLASS system and the current inability to obtain near real-time products from the CLASS system.

4) **Data reprocessing:** *To ensure consistency across the Suomi NPP data record, support for data reprocessing of the full Suomi NPP data record is required following changes in algorithms, similar to reprocessing that NASA provides for each MODIS collection.* Many ASP supported efforts rely on derived indicators that relate current conditions to various statistical summaries

of long-term historic ranges. If algorithm changes are made without reprocessing of the archive, this can results in additional uncertainty in these DSSs that would reduce the utility of the satellite data for these partners and stakeholders.

5) **Data access:** *There must a reliable, consistent, easy to use source of data from the Suomi NPP mission for the NASA ASP community.* At present, the user community expressed uncertainty about how to access Suomi NPP data, and whether to obtain data from CLASS or the NASA PEATEs. Multiple participants also expressed strong concern about the potential for distribution of different versions of the same product (generated from the same sensor but using different algorithms) from different data distribution systems (i.e., CLASS versus the PEATEs).

Other Comments and Requests

The NASA ASP community also made the following requests and suggestions for the next Suomi NPP Applications workshop:

- **i.** To increase interaction with the NASA and NOAA Suomi NPP / Science Teams, consider a joint meeting with the NASA and NOAA Suomi NPP Science Teams.
- **ii.** Additional information and training on use of CLASS and PEATEs to access Suomi NPP data, including demos and trainings on data processing, and use and interpretation of QA flags (this could also be offered as an on-line short course). Nearly 40% of respondents indicated they would be interested in attending a training or webinar series on these subjects.
- **iii.** To increase participation and representation from other agencies, and recognizing current limitations on travel, participants recommended distribution of breakout questions and materials in advance, to allow agency representatives to collect and collate relevant input and materials from colleagues / contacts that were not able to attend.
- **iv.** Recognizing travel limitations, consider a virtual workshop via webinar.

Status of the Suomi NPP Satellite and Instruments

The presentations from June 21, 2012 are posted online at http://earthscience.arc.nasa.gov/npp/npp_conf_agenda.html. Current information on the status of Suomi NPP can be found online at http://npp.gsfc.nasa.gov/.

Appendix I: Meeting Agenda

Thursday, June 21

8:15 - 8:45	Greetings and workshop purpose	L. Friedl (NASA/HQ)
8:45 - 9:30	Update on status of NPP Mission and instruments. NPP Science Team meeting summary.	D. Wickland (NASA/HQ)
9:30 - 10:00	JPSS – Current status and future	M. Goldberg (NOAA)
10:00	Break	
10:15	NPP instruments - performace characteristics	
10:15 - 10:40	VIIRS	C. Hsu (NASA/GSFC)
10:40 - 11:00	ATMS	W. Blackwell (MIT)
11:00 - 11:20	CrIS	J. Susskind (NASA/GSFC)
11:20 - 11:40	OMPS	N. Krotkov (NASA/GSFC)
11:40 - Noon	CERES	P. Stackhouse (NASA/LaRC)
Noon	Lunch	
1:30 - 2:15	NPP ground system: Data retrieval, processing, archival, and distribution	A. Grauman (NOAA) M. Goldberg (NOAA)
2:15 - 2:45	Overview of LANCE	K. Murphy (NASA/GSFC)
2:45 - 3:00	NASA product development	M. Maiden (NASA/HQ)
3:00	Break	
3:30 - 3:50	NPP direct broadcast	P. Coronado (NASA/GSFC)

3:50 - 4:15	Direct broadcast science algorithms and products	L. Gumley (GST/GSFC)
4:15 - 4:30	Breakout sessions: review and instructions	J. Haynes (NASA/HQ)
4:30 - 5:30	Breakouts:	
	Water resources	B. Doorn
	Eco Forecasting	W. Turner
	Disasters	F. Lindsay
	Public Health/AQ	J. Haynes
5:30	Adjourn for the day	

Friday, June 22

8:15 - 8:30	Review previous day	J. Haynes (NASA/HQ)
8:30 - 9:00	Mapping urban development and gas flaring activity with nighttime VIIRS data	C. Elvidge NOAA/NESDIS
9:00 - 10:30	Breakouts continue	Breakout chairs
10:30	Break	
10:45 - 12:00	Reports from the breakouts and discussion of recommendations	Breakout chairs
Noon	Lunch	
1:30 - 2:15	Summary: Potential/anticipated applications from VIIRS: making the MODIS to VIIRS transition.	J. Haynes (NASA/HQ)
2:15 - 3:00	Summary: Science and applications from ATMS, CrIS, OMPS and CERES.	C. Hsu (NASA/GSFC)
3:00	Wrap-up: Actions, future workshops, etc.	J. Haynes (NASA/HQ)

3:30 Adjourn