American Meteorological Society

96th Annual Meeting

NOAA’s Joint Polar Satellite System’s

Proving Ground and Risk Reduction Program

Initiatives Making the Difference in NOAA Operations!

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13 Jan 2016
Outline

Introduction

PGRR Background

PGRR Proving Ground Initiatives

Additional JPSS PGRR Project Images

Summary
JPSS PGRR Background Definitions

• **Proving Ground**
  - Demonstration and utilization of data products by the end-user operational unit, such as a NWS Weather Forecast Office or Modeling Center.
  - Promote outreach and coordination of new products with the end users, incorporating their feedback for product improvements.

• **Risk Reduction**
  - Development of new research and applications to maximize the benefits of JPSS satellite data.
    - Example - use of Day Night Band for improved fog and low visibility products at night, benefiting transportation industry.
  - Encourages fusion of data/information from multiple satellite, models and in-situ data.
  - Primary work is done at the algorithm and application developer’s institution.
  - Address potential risk in algorithms and data products by testing alternative algorithms.
Application Areas

- **Weather Forecasting** - Improving Global, Regional forecasts
  - Tropical Cyclones
  - Severe Weather (Nowcasting)
- **Ocean/Coastal** - Coral Bleaching, Harmful Algal Bloom alerts
- **Land** - Droughts, Agriculture
- **Hazards** - Smoke, Fire, Volcanic Ash, Air Quality
- **Hydrological** - Precipitation, Floods, Soil Moisture, Snow/Ice, River Ice
- **Climate** - Integrated products, real-time anomaly products
- **Education and Training**
- **Infrastructure** - Direct Readout + Software (CSPP), Airborne campaigns
The PGRR Program was established in early 2012, following the launch of the Suomi National Polar Partnership (SNPP) satellite.

The initial Call-for-Proposals in Jan 2012 resulted in nearly 100 teams providing Letters-of-Intent (LOIs). These LOIs were evaluated and teams were selected to provide full proposals.

These proposals went through a rigorous user-led selection – nearly 40 projects selected for funding.

Project leads work with the users to determine how best to use new JPSS data, and to quickly transition these capabilities to operations.

The JPSS Program worked with projects to ensure their user community played a major role in actions taken by each PGRR Project.

As these researcher-user teams kept the projects moving forward a new way of interacting was proposed. Today the JPSS Program calls it PGRRR Initiatives
PGRR Proving Ground Initiatives Responding to User Feedback

- The River Ice and Flooding Initiative was the first attempt at this new partnership and it was established in response to Galena AK flooding in May 2013.

- The Initiative included River Ice and River Flooding Project teams, direct broadcast SMEs, and National Weather Service River Forecast Center forecasters.

- The success of River Ice and Flooding Initiative led to creation of Fire and Smoke Initiative and NUCAPS Initiative.

- The continued success of the multi-agency initiative teams further solidified with FY15-16 JPSS PGG Call for Proposals establishing 13 Initiatives.

- Initiatives will seek to leverage NOAA Testbed capabilities to maximum extent possible.
The success of the JPSS PGRR Program led to a second PGRR Program Call-for-Proposals in Dec 2014. Over 130 LOIs were received.

These LOIs went through a similar selection process to request formal proposals and final funding decisions.

The funding decisions caused some projects to end after their initial work, other projects had new work, and additional projects were new starts.

Nearly all of the PGRR Projects are now part of one of the Initiative’s Working Group. These groups work to combine individual project objectives to focus on specific operational capabilities that support key user needs.

The initiatives have monthly telecons to evaluate progress, establish priorities, identify milestones and dates for future actions.

More details are provided on three of the most “senior” initiatives.
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<th>Initiative</th>
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<td>Fire and Smoke</td>
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<td>Sounding Applications including NOAA Unique CrIS/ATMS Processing System</td>
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<td>(NUCAPS)</td>
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<td>OCONUS and NCEP Service Centers AWIPS Initiative</td>
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<td>Innovation</td>
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River Ice and Flooding Initiative

• Initiative began in Nov 2013

• Initiative Objectives
  • Test new River Ice and Flooding Products in operational River Forecast Center (RFC) environments
  • Determine the value of these products in their use in response to real-world ice jam and flooding events
  • Implement procedures to transition these research capabilities to operations

• Initiative has high interest in NWS River Forecast Centers (RFCs)
  • Alaska-Pacific and North Central RFCs partners in initial actions
  • Northeast, West Gulf, and Missouri Basin RFCs became partners in 2014

• Products available from Direct Broadcast data through The Community Satellite Processing Package (CSPP) to RFC Systems

• Products evaluated during Winter 2013-14 and Winter 2014-2015. Changes made to River Ice Product and Flooding Product algorithms based on forecaster feedback

• Flooding Product has been applied year-round to US and international river basins
River Ice and Flooding Initiative

NWS RFC Partners
River Ice and Flooding Initiative

Ted Shanks Wildlife Management Area (Missouri)
Road marker 4 to 5 ft tall...
The background image is experimental satellite imagery collected by NOAA’s Suomi NPP, using the Visible Infrared Imaging Radiometer Suite (VIIRS). It shows the extent of surface water as of 01 JAN 2016. It has been downscaled to 30 meter resolution and packaged into KML files by NOAA. MVR extracted the KML images for import into GIS on 02 JAN 2016.

NOTE: Surface water behind a levee should not be categorically interpreted as an overtopping. The surface water detected could be due to many situations including, but not limited to, levee seepage.boils, pre-existing surface water, or ponding due to precipitation.
Fire and Smoke Initiative

- Initiative began in May 2014
- Initiative Objectives were established
  - Evaluate the current use of geostationary and polar orbiting satellite capabilities in support of Fire and Smoke mission
  - Identify current SNPP/JPSS and new GOES-R data and capabilities with the potential to improve support to this mission
  - Establish methodologies and procedures for the operational demonstrations of these capabilities
  - Identify the satellite capabilities whose operational impacts are sufficient to warrant transition from research to operations
- Initiative has been working NWS and Air Quality personnel responding to Alaska and Western US Fires in 2014 and 2015
- Alaska had 4.7 million acres burned as of late July 2015… second-highest seasonal total on record
- US HRRR Model know has smoke window for NWS Western Region
- Work has begun on a Blended Fire and Smoke Product development and demonstration at National Interagency Fire Center (NIFC) in Mar 2016
Pacific Northwest Fires
Why Should People in the Midwest Care?

26 Aug 2015
Smoke from Canada Wildfires Settles over the Salish Sea

Smoke from fires burning on Vancouver Island consolidated over the Salish Sea region Sunday, July 6, 2015, bringing thick haze to Port Angeles and south to Seattle. This image from the Suomi NPP satellite's VIIRS instrument taken on consecutive days.
Fire and Smoke Initiative
Satellite Visualization and Aerosol Products

VIIRS RGB and smoke/dust mask 20150901
Weak east-west frontal boundary from northern UT to northern CA -- smoke from fires get caught up along front -- verified pretty well.
NUCAPS Initiative

• Initiative began in Jul 2014

• NUCAPS Program Objectives.
  • Generate spectrally and spatially thinned radiances
  • Provide retrieved products such as profiles of temperature, moisture, trace gases and cloud-cleared radiances to users
  • Provide global validation products such as radiosonde matchups and gridded radiances and profiles

• Initiative Objective: to improve the operational use of SNPP for those NWS offices with AWIPS II and assist those offices that will be getting AWIPS II with NUCAPS.

• The initiative will address:
  • NUCAPS algorithm work (STAR)
  • Operational application and validation of NUCAPS (Omaha/Boulder WFO)
  • NUCAPS training (NWS)
Preliminary NUCAPS Feedback from 2015 Spring Experiment

- All participants answered that they understand the differences between space-based soundings and RAOBs
- Only 1 NWS participant already uses NUCAPS at home office (Alaska)
  - 20/23 say they will
3 July 0000 UTC Hurricane
- Moved north-northeastward between the ridge over the W Atlantic and an approaching mid- to upper-level trough over the eastern US.

4 July 0315 UTC Landfall on Shackleford Banks, NC
- Became increasingly embedded in the mid-latitude flow

4 July 0800 UTC Landfall Oregon Inlet, NC
- Located off the coast of Cape Cod, MA

5 July 0600 UTC tropical storm
- Strong-upper level winds and closer sea surface temperatures cause Arthur to lose strength
- Located off the coast of Cape Cod, MA

5 July 1200 UTC extratropical
- Transitioned to an extratropical cyclone in 6 hours and located over the Bay of Fundy, west of Nova Scotia
- Gale-force winds and heavy rain over portions of eastern Canada

1613 UTC MODIS 3 July 2014 Air Mass RGB
1800-1815 UTC 3 July 2014 NUCAPS O3

Mid-Level dry air
- Upper-Level moisture
- Gradual change in ozone profile
- Profile exceeds TCO climatology of 44.0 DU at 160 mb
NUCAPS Initiative

NOAA Products Validation System (NPROVS)

Temperature (deg K)

Pressure (hPa)

Radiosonde
NOAA IASI MetOp-A
NOAA IASI MetOp-B
NUCAPS NPP

Temperature
Dewpoint Temp

<table>
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<tr>
<th>Radiosonde 72558 (182)</th>
<th>11/18/2015 23:24</th>
<th>41.32 N / 96.36 W</th>
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<tr>
<td>NOAA IASI MetOp-A</td>
<td>11/19/2015 03:50:33 (4.4 hours)</td>
<td>41.38 N / 96.07 W (25.7 km)</td>
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<tr>
<td>NOAA IASI MetOp-B</td>
<td>11/19/2015 03:05:15 (3.7 hours)</td>
<td>41.20 N / 95.91 W (40.1 km)</td>
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<tr>
<td>NUCAPS NPP</td>
<td>11/18/2015 19:14:11 (-4.2 hours)</td>
<td>41.39 N / 96.47 W (12 km)</td>
</tr>
</tbody>
</table>
Hydrology Initiative

- Initiative began in Jul 2015

- Hydrology Program Objectives.
  - Exploit S-NPP ATMS, VIIRS and GCOM-AMSR (as well as DMSP SSMIS, MetOp MHS, GPM GMI) derived precipitation, water vapor, soil moisture and snow cover to improve
    - Short term weather and hydrological forecasts
    - Global climate monitoring and prediction, including extension of climate data records

- Initiative Objective: to coordinate activities amongst the various projects (i.e., commonality of data sets, software, user interactions) and link together the various products, particularly in “news worthy” events (e.g., storms associated with on-going El Nino, etc.)

- The initiative will address:
  - Exploitation and enhancement of snowfall rate, water vapor, soil moisture and snow cover products
  - User engagement with NWS regions, forecast offices and national centers
  - Potential synergies with GOES-R PGRR program
Objectives

- To enhance the existing snowfall rate (SFR) algorithm for passive microwave (MW) sensors (AMSU-A/MHS and ATMS)
- To develop SFR algorithm for new MW sensors and over ocean
- Product assessment at NWS for its value in operation

Primary sensors involved

- SSMIS on DMSP F17, F18, and F19
- GMI on NASA GPM
- AMSU-A/MHS on NOAA-18/-19 and Metop-A/-B

Primary ground data

- MRMS and StageIV radar/gauge precip data
- QCLCD hourly gauge data

Targeted end users

- NCEP/CPC
- NWS Weather Forecast Offices and National Centers
Layered Blended Water Vapor (LPW)
[John Forsythe, Colorado State]

Example of 4-layer blended LPW product produced in near-realtime at CIRA at 0900 UTC 24 February 2015.

Product uses NESDIS MiRS derived PW from S-NPP, NOAA-18 and -19, DMSP F-18 and F-19 and S-NPP NUCAPS
Early Mar 2015 Snowfall
Fog/Stratus Across Western Lake Superior

Suomi NPP VIIRS Visible (0.64 µm) image with METAR surface reports, RTMA surface winds, and surface frontal analysis
Suomi NPP VIIRS true-color and false-color images, visualized using the [SSEC RealEarth](https://www.ssec.wisc.edu/) web map server. In the false-color image, snow cover and ice appear as darker shades of cyan.
NCC/DNB in AWIPS II
25 Dec 2015
Summary

• The JPSS PGRRR Program has provided critical funds encouraging the transition SNPP capabilities from research to operations in preparation for JPSS

• PGRRR Initiatives provide the forum for vital interaction between Project Teams and their users

• Through innovative ideas shared in these forums, NOAA users have made SNPP capabilities a valuable part of their integrated observation system

• Basic satellite, and specific product, training helps maintain initiatives over the long term

• NOAA users have experienced the operational value of the use of satellite data and have become agents of change to drive even more creative ways of using SNPP and JPSS data
For More Information on the JPSS Program
(WWW.JPSS.NOAA.GOV)