JOINT POLAR SATELLITE SYSTEM PROGRAM

NEWSLETTER

2016 • QUARTER #3

FROM HARRY

As we close out the fiscal year, our team remains energized as we move the JPSS-1 satellite on its path towards launch in 2017. Data from the NOAA/NASA Suomi NPP satellite, the first of our Joint Polar Satellite System (JPSS) missions, is consistently in the news for its ability to capture weather events and their impacts, and our user community continues to grow as more users adopt our data streams and new applications for our data are developed. We look forward to the new opportunities that the fiscal year will bring.

To learn more, you can read previous issues of the JPSS Newsletter here.

JPSS SATELLITES HELP SHIPS NAVIGATE THE NORTHWEST PASSAGE

▲ A two-week composite of the Moderate Resolution Imaging Spectroradiometer (MODIS) aboard NASA's Aqua satellite imagery and the VIIRS instrument on the Joint Polar Satellite System's Suomi NPP satellite in August of 2016 showing the Northwest Passage's clear path.

For centuries, global commercial interests have been eyeing the Northwest Passage as a shorter trade route between Europe and Asia. Unfortunately, this pathway through the Canadian Arctic is often choked with ice, making navigation too risky for most ocean vessels—or at least it used to be.

In 2015, NOAA's Climate.gov reported that, for the first time in recorded human history, the Northwest Passage may become a useful shipping route during the Arctic summer. If that assessment is correct, and current climate trends suggest it is, safe travel will require up to date monitoring of ice-flows and weather conditions. Thankfully, JPSS spacecraft are already on the job, providing this information to transporters around the globe.

The Northwest Passage connects the northern Atlantic and Pacific Oceans through the Arctic Ocean (marked in red in the map on the next page). The route is about 9,000 kilometers shorter than the way through the Panama Canal and 17,000 kilometers shorter than the trip around South America's Cape Horn. Therefore, ships that can travel via the Northwest Passage stand to benefit economically from the shorter, more efficient route. The risk to navigators remains high, however, as thousands of icebergs—some rising to 300 feet—can make the Northwest Passage a treacherous place to do business.

In 2011, a route through the straits of the Canadian Arctic Archipelago opened for the fifth year in a row. Other routes across the Arctic may also open, providing ships with viable alternatives to traveling through the Panama Canal or around the southern tip of South America.

A melting Arctic will have impacts not only on the environment, but also on the global economy and national security, as nations compete to gain rights to shipping lanes and newly accessible resources in the region. As ships traverse the Northwest Passage, satellite data will continue to be a critical component in safe navigation.

The Suomi NPP satellite provides critical data for nearly all weather forecasting in Alaska, filling gaps over areas that are not well covered by observing systems on the ground. In addition, the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument aboard the satellite can observe the entire Arctic within 12 hours and at sub-kilometer spatial resolution.

This imagery is helping reveal which paths through the Northwest Passage are free of ice and therefore safe to travel.

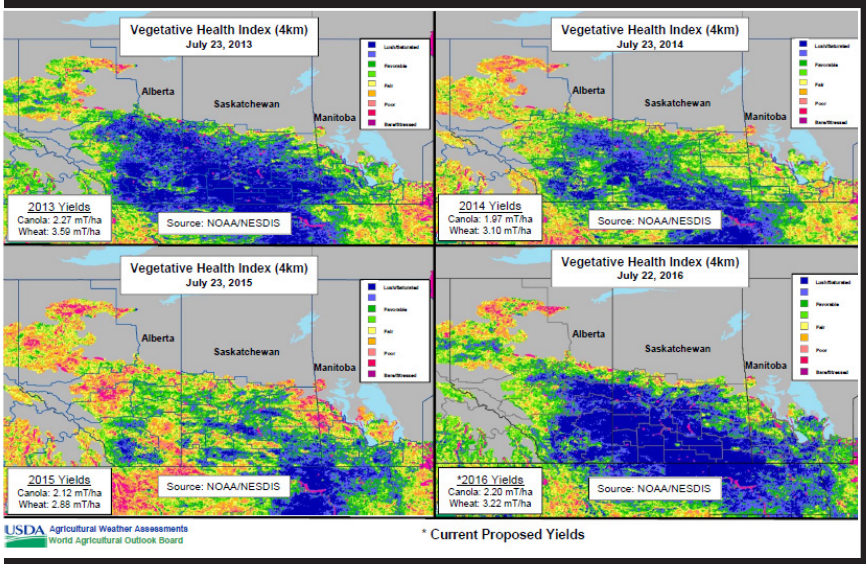
The Northwest Passage.
Encyclopædia Britannica, Inc.

JPSS-1 SATELLITE PROGRESS UNDERWAY

With launch scheduled in 2017, work remains underway on both the flight and ground segments to execute the necessary testing that will ensure operational readiness. For the spacecraft, thermal vacuum testing remains underway with the conclusion anticipated in October. Repairs to the Advanced Technology Microwave Sounder (ATMS) instrument are also underway to ensure all channels are operating nominally in preparation for shipment and subsequent integration with the spacecraft. The JPSS-1 Flight Operations Review was conducted in September, which ensures future data and data products will meet the needed requirements over the mission lifetime. The ground segment continues to make progress in the completion and delivery of the activity known as Block 2.0, which is a major update to the current satellite ground system being used for Suomi NPP. The update provides modern hardware and software, automation, high availability, high resiliency, modern security, and multi-mission capability. Suomi NPP and other supported missions will transition to it, JPSS-1 will be launched and commissioned with it, and the current system will be retired once existing missions are transitioned to Block 2.0.

SATELLITE DATA HELPS MONITOR THE TRICKLE-DOWN EFFECTS OF DROUGHTS

Perhaps you have noticed the price of avocados rising the last time you were at the store. Around 90 percent of the nation's avocado crop is produced in California, where drought conditions are expected to impact California's avocado yield. In order to assess weather conditions and help farmer's decision making, the California Avocado Commission relies on the United States Drought Monitor for monthly weather outlooks that will allow farmers to maximize production of the fruit.



▲ The charts above show that this year's yield of Canada wheat and canola are similar in appearance to the record 2013 season. Credit: USDA

Droughts affect all agricultural areas and are among the nation's most costly weather related events. In 2016, drought has already cost an estimated 4.5 billion, hitting the western states the hardest. That's why farmers and livestock producers across the nation look to the U.S. Department of Agriculture (USDA), and in turn NOAA, to assist them in preparing for and responding to changing weather and climate conditions.

Key to the success of this effort are products derived from satellites like those in the JPSS constellation, which can be of particular use to the agricultural community. Among these are blended or derived products that appear in the form of maps illustrating climactic conditions such as drought, precipitation totals, soil moisture, snow depth, and temperature.

While not fully replacing in-situ data, the information is critical in providing information in data-sparse areas.

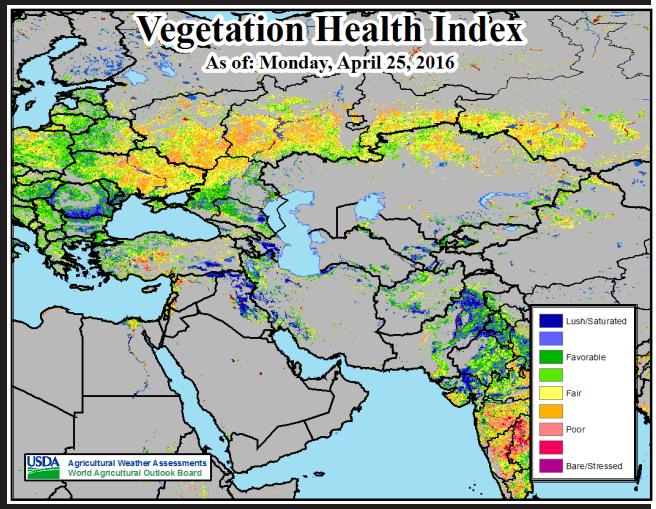
USDA uses the satellite weather data to look for potential problem areas. Satellites like JPSS have unique advantages over conventional observations of drought, due to their ability to acquire information over large geographical areas, measure and analyze key features of droughts routinely with increased

spatial detail of vegetation conditions improving early drought detection. The VIIRS instrument on JPSS is able to provide vegetation health data, with eight times more detail, and at a much higher and more consistent quality than earlier satellite radiometer instruments. Using this data, NOAA's Center for Satellite Applications and Research (STAR) has created the Vegetation Health Indices (VHI) product.

"The VHI has quickly become an important component in USDA's effort to monitor world agricultural production, particularly in areas where in-situ data is sparse or non-existent," said Mark Brusberg, Deputy Chief Meteorologist at USDA.

VHI is used often to estimate crop condition and anticipated yield. A low index indicates different levels of vegetation stress such that losses of crop and pasture production might be expected; whereas high indices indicate a favorable condition where plentiful production might be expected. VHI is very useful for an advanced prediction of crop losses.

Meteorologists from USDA have increasingly become reliant on products like the VHI to aid in their assessments of crop yield in key international farming areas. The success of programs like this underscore the importance of satellite monitoring to farmers, as well as policy makers, who need to quickly respond to a variety of challenges posed by weather and climate phenomena that cannot be monitored by station data alone.



MEET THE TEAM: DR. MITCH GOLDBERG

Q: What are your name, title, and organization?

A: Dr. Mitch Goldberg, JPSS Program Scientist, NOAA/NESDIS/JPSS.

Q: What is the role of the JPSS Program Scientist?

A: As the JPSS Program Scientist, I provide overarching science leadership for the Program and a link between the JPSS operational user community and the JPSS Program. I also represent the program in national and international science forums, bi-lateral and multilateral cooperation forums, with National and International partners, with NOAA users, and through chairing the Low Earth Orbiting Requirements Working Group for gathering and defining requirements. In addition, I manage the JPSS Proving Ground and Risk Reduction program to foster improved user applications and science feedback. I also work closely with NESDIS STAR and the JPSS Algorithm Management Program to make sure science and user requirements are being met.

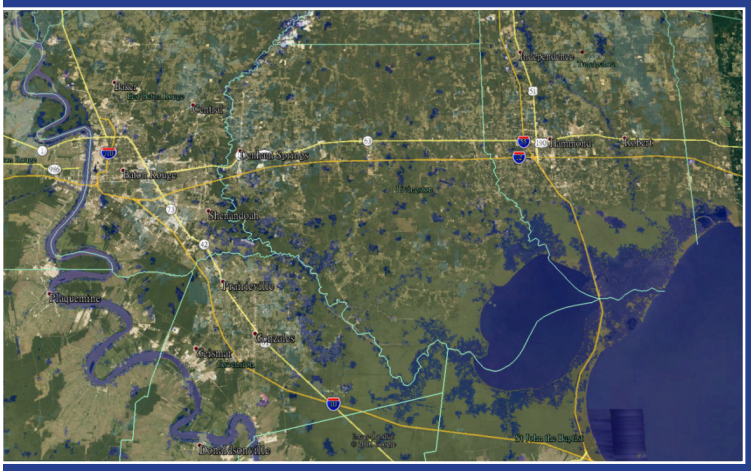
Q: How do other organizations rely on data from JPSS satellites?

A: The Advanced Technology Microwave Sounder (ATMS) and Cross-track Infrared Sounder (CrIS) contain a wealth of information about atmospheric temperature, humidity, surface properties and trace gases. Together they provide high vertical resolution temperature and water vapor information needed to maintain and improve forecast skill out to five to seven days in advance for extreme weather events, including hurricanes. All numerical weather prediction centers throughout the world depends on ATMS and CrIS for providing accurate forecasts. VIIRS advanced imaging capabilities continues to impress NOAA users because of its sub-kilometer spatial resolution and global coverage. The Day-Night Band on VIIRS is essential for the data-sparse Alaskan region, and the importance of this capability was validated when the National Weather Service (NWS) requested it be defined as a JPSS Key Performance Parameter. VIIRS is now a key part of NOAA's toolkit for vegetation and drought monitoring, providing agricultural users significant value in crop planning and risk mitigation. The United States Department of Agriculture (USDA) uses VIIRS vegetation products for crop yield assessment and predictions. NWS also uses VIIRS for improved fire smoke forecasting as well as flood and river ice assessments. The VIIRS flood product, coupled with a high spatial resolution digital elevation map, provides an enhanced flood map at 30 meters, and has provided critical information to the NWS River Forecast Centers (RFCs) and FEMA for emergency response and damage assessments. VIIRS is used for the detection of volcanic eruptions by national and international advisory centers. Our National Ocean Service and National Marine Fisheries Service rely on VIIRS data for monitoring ocean and coastal water quality and for fish stock assessments. Finally, the Ozone Mapping and Profiler Suite (OMPS) provides global ozone used in UV forecasts and weather models, and also provides excellent information on ash and sulfur dioxide from volcanic eruptions.

Q: How does data from JPSS satellites improve safety and/or protect lives and local economies as it relates to your organization?

A: NWS incorporates JPSS data into its weather prediction models that help generate medium-to-long range forecasts to better predict medium and long-term weather, including severe weather phenomena. Weather data plays one of the largest roles in influencing many decision support systems across the nation. With the assimilation of Suomi NPP data, forecast models have seen an improvement in the notification of impending natural disasters such as hurricanes, drought, and blizzards.

As determined in the 2012 study done by the European Centre for Medium-Range Weather Forecasts (ECMWF), data from Suomi NPP proved pivotal in pinpointing super storm Sandy's track and time of landfall. Rather than identifying the New Jersey landfall location within 30 miles five-days before landfall, the models would have shown Sandy remaining at sea. Thus, data from satellites in JPSS constellation are essential to our nation.

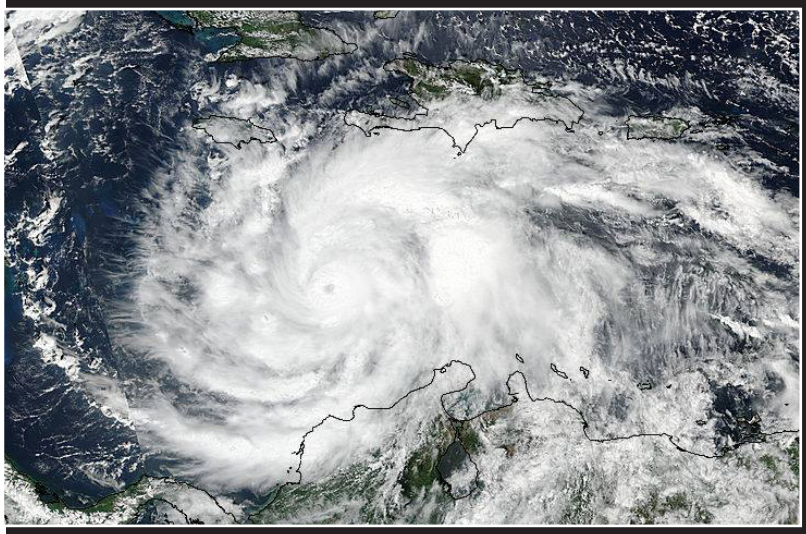


HISTORIC LOUISIANA FLOODING

Floods are the most frequent natural disasters around the globe, accounting for 50 percent of reported disasters worldwide. JPSS satellite data supports National Weather Service river forecasting operations, particularly in hard to reach places with few ground-based observing systems. Louisiana experienced a historic flooding event this August, with the full economic scope still being understood. The flooding was caused by record shattering levels of rain, including rainfall totals greater than 30 inches in some areas. FEMA reached out to the JPSS STAR team for VIIRS flood maps over Southern Louisiana. STAR was able to provide a VIIRS meter resolution using a 30 meter digital elevation map to derive relatively maximal flood extent in this region.

◀ An overview of flooding water near Baton Rouge using VIIRS 30-m flood map composited from August 15 and August 17, 2016. Light purple is water.

INTERESTING IMAGES



◀ HURRICANE MATTHEW

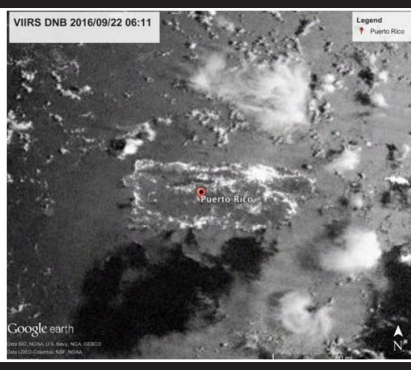
The NOAA/NASA Suomi NPP satellite captured this view of Hurricane Matthew on October 2 at 1:40 p.m. EDT. At the time of the image, the National Hurricane Center reported the storm as a category 4 hurricane with maximum sustained winds near 150 mph.

Credit: NOAA Vislab

PUERTO RICO POWER OUTAGE ▶

On September 22, a fire near the Aguierre Power Plant on the southern side of the island of Puerto Rico resulted in a power outage that impacted more than 1.5 million people and a loss of power for more than 12 hours. The fire triggered the explosion of a mineral oil tank at the plant. Here, the Day/Night Band of the VIIRS instrument on board Suomi NPP captures the obvious impacts of the fire and subsequent outage across the island. The image on the left captured on September 21 shows a well-lit Puerto Rico, whereas the image from 9/22 gives some indication of just how much the power outage reduced the anthropogenic light in area.

Credit: Cooperative Institute for Research in the Atmosphere (CIRA)



DID YOU KNOW?

JPSS produced an informational overview video about our mission. Learn about JPSS instruments and applications, you can view and download it here.