The Importance of VIIRS to the NWS Mission

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VIIRS User Meeting - Celebrating 10 years of SNPP, 29 June 2022
Extent of the Observations Portfolio

The Office of Observations operates, maintains, leverages, and purchases a broad range of observing platforms, capabilities and data, serving as a key component to the NWS mission.
NWS Target for Satellite Spatial Coverage

The NWS service area is far more expansive than the contiguous United States.
Satellite programs

Training community

Science community

NWS integration

Aviation  Fire  Marine  Public  Severe  Space  Tropical  Winter  Hydro  Climate  Tsunami

NATIONAL WEATHER SERVICE
Use of VIIRS by NWS meteorologists

All NWS forecasters receive:

- VIIRS Day-Night Band (DNB) / Near Constant Contrast (NCC) imagery
- VIIRS I-Band Active Fires EDR
- VIIRS Flood Mapping will be available later in CY22

- NWS Alaska Region uses several VIIRS imagery bands and L2 products received via Direct Broadcast.
- NWS Pacific Region also uses data products from Direct Broadcast.
- National Centers use additional data products obtained directly from PDA or Direct Broadcast.

- The latest AWIPS baseline is partially configured for 4 VIIRS EDRs:
  - Ice Concentration
  - Volcanic Ash
  - Aerosol Detection
  - Aerosol Optical Depth
VIIRS I-Band Fires EDR points in AWIPS CAVE
Advantages of VIIRS spatial resolution

- High latitudes, where parallax and pixel size broadening significantly impact quality of imagery

- Pinpointing the boundaries of wildfires, or of flooded areas
  - Also provides precise terrain / parallax correction for surface features
Yellow to red represents greater degree of flooding.
Advantages of VIIRS spectral bands

- The panchromatic sensor (DNB) on VIIRS is sensitive to clouds, snow, etc. under low-light conditions
- VIIRS provides greater spectral detail in the visible and near-infrared band (e.g., M01, M04, M06)
- VIIRS provides additional spectral coverage compared to ABI (e.g., M08, useful for detecting snow characteristics)
- VIIRS provides spectral bands for natural color imagery
The Snowmelt RGB (M5, M8, M10) uses the 1.24 μm to provide surface snow/ice characteristics.

This includes:
- Wet vs. dry snow
- Fresh vs. old snow
- Sleet accumulation
- Freezing rain accumulation

Source: Curtis Seaman, CIRA

30 December 2020
Leveraging the strengths of VIIRS

The challenge is to identify circumstances where they can fill a gap -- *i.e.*, supporting forecasting tasks that can benefit from...

- The finer spatial resolution of VIIRS,
- The unique spectral bands of VIIRS, and/or
- The OCONUS, marine, and global coverage of VIIRS

... and where the rapid refresh and low latency of geostationary imagery are not essential or available.
Leveraging the strengths of VIIRS

- Direct broadcast (low latency) is largely responsible for elevating the value of VIIRS for operational meteorology.

- The contribution of VIIRS for establishing cloud masks for multi-instrument products is an underappreciated benefit.

- The prospect of three VIIRS in an evenly spaced orbital sequence enhances the likelihood of valuable derived winds.
Examples of Satellite Observations from LEO

CIRA ALPW

CIRA Merged TPW

Blended TPW

NUCAPS

Source: Andrew Orrison
Direct Broadcast Satellite Applications in the US National Weather Service (NWS) Pacific Region

William Brandon Aydlett
Science & Operations Officer
National Weather Service
Tiyan, Guam
Saipan Wildfires

Himawari-8 3.89um

Himawari-8
Fire Temp RGB

VIIRS 3.74um

William Brandon Aydlett
Hawaii Tropical Storm Flossie (40 kt)
29 July 2013
VIIRS DNB: Before & After 2018 Typhoon Mangkhut
Super Typhoon Yutu in the Mariana Islands
24 October 2018
The Future
Opportunities for the future

● Meteorologists would benefit from more consistent and reliable satellite observations, which is difficult to attain in the LEO orbit without a critical number of satellites.

● The NWS continues to emphasize the importance of multi-spectral water vapor imaging in the infrared. Future LEO imagers should not omit mid-wave spectral coverage.

● Unique opportunity for multi-spectral low-light imaging.
Imagery over Alaska between 3 and 8 UTC is currently provided from NOAA POES. The eventual loss of EOS/MODIS imagery will maximize the gap in imagery.

Source: Carl Dierking, GINA
Summary

• VIIRS provides imagery that has contributed to the quality of the output for some NWS Mission Service Areas, particularly in data sparse regions such as outside of the contiguous United States (OCONUS).

• The NWS is excited to work with the LEO program to continue and advance the JPSS-era capabilities such as VIIRS on next-generation polar-orbiting satellites.

• VIIRS has demonstrated that a more sustained low-light imaging capability has the potential to distinctively advance the NWS mission from the 2030s onward.

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