Satellites See the World

NOAA Satellite Conference
Melting ice may be quite dark causing underestimate of the ice concentration.
During the 21 May nighttime hours, a Suomi NPP VIIRS infrared Brightness Temperature Difference (11.45 – 3.74 µm) “Fog/Stratus Product” image at 0910 UTC (below) revealed that the fog/stratus plume covered much of the Strait (especially along the Washington coast), and that the leading edge had begun to spread both northward and southward from Whidbey Island. In addition, note the presence of a linear ship track (darker red enhancement) extending southwestward from Cape Flattery.

Credit: Scott Bachmeier, CIMSS
Gravity Waves and Lightning on DNB – 29 May 2017
Tropical Cyclone Donna – 8 May 2017

Near Vanuatu islands NE of Australia – became the strongest May Southern Hemisphere TC on record
Small Eddy and Coastal Jet off the Coast of Northern CA (VIIRS) – 4 May 2017
Red River of the North Spring Snowmelt

March 20, 2017

March 29, 2017

- Lack of inundation indicated ground was thawing and allowing water to infiltrate soil
- Flood Area product was also used to validate AMSR2 NASA project results
Suomi NPP VIIRS, 7 March 2017, 2038 UTC: Colorado Dust Storm

Credit: Jorel Torres
OK Fires – 7 Mar 2017

Credit: William Straka
Tropical Cyclone Enawo in DNB
6 March 2017

Credit: CIRA Blog
Northeast US Winter Storm
9 Feb 2017

Suomi NPP VIIRS Visible (0.64 µm) and Infrared Window (11.45 µm) image
CA Flooding in Jan 2017
Lake Effect Snow from VIIRS
5 Jan 2017

Credit: NOAA's Environmental Visualization Laboratory
Super Typhoon Nock-Ten
24 Dec 2016
An Oasis in the Sahara – 2 Dec 2016

VIIRS true-color image of the Inner Niger Delta, a large area of lakes in the semi-arid transition zone known as the Sahel between the Sahara and the Sudanian Savanna

Credit: Environmental Visualization Lab
Hurricane Otto – 24 Nov 2016

Image shows the presence of cloud-top gravity waves propagating westward along the Nicaragua/Costa Rica border; these waves were likely a response to deep convective bursts offshore near the center of Otto.

Credit: William Straka and CIMSS Blog
Fires in the Southeastern United States
14 Nov 2016

According to the National Interagency Fire Center, more than 30 fires burning in the southeastern United States blackened greater than 80,000 acres in North Carolina, Georgia, Tennessee and Kentucky.

Credit: Environmental Visualization Lab
2016 Lake Erie Algal Bloom "Mild" Compared to Those of Recent Years

VIIRS true-color image showing the extent of the algal blooms in Lake Erie on October 11, 2015 (left), and, by way of comparison, October 10, 2016 (right)

Credit: Environmental Visualization Lab
Above is VIIRS imager showing the hazy signature of large amounts of airborne glacial silt and sand from the Copper River Valley being transported southward over the adjacent offshore waters of the Gulf of Alaska. The fine glacial silt and sand particles were being lofted by strong katabatic gap winds being channeled southward down the Copper River Valley — these winds were the result of a strong pressure gradient between arctic high pressure that was moving from the Interior of Alaska to the Yukon Territory of Canada (surface analyses) and a large occluded low centered off the coast of British Columbia and the US Pacific Northwest.

Credit: CIMSS Blog 25 Oct
Super Typhoon Haima
19 Oct 2016

Credit: William Straka
Strong Storm Hits the Northwest
15-16 Oct 2016

Image from the Suomi-NPP Satellite provided by the [NOAA Environmental Visualization Laboratory](https://www.earthdata.nasa.gov/).
Sand and Pilot Fires Burn Scars
Bluecut Fire - Active

August 16th

Sand Fire
41,432 Acres
7/22
98% contained

Bluecut Fire
32,976 Acres
8/16
26% contained

Pilot Fire
8,110 Acres
8/7
100% contained
Suomi SNPP True Color – 13 May 2016
Image from NESDIS Facebook
The progression of the leading edge of the dry trade wind surge could also be followed on daily composites of Suomi NPP VIIRS true-color Red/Green/Blue (RGB) images.
VIIRS Image (5 Apr 2016) NE Snowstorm

Credit: NOAA Environmental Vis Lab
Thunderstorms in FL – 24 Feb 2016

NCC in AWIPS II

Credit: Dan Lindey and Jorel Torres
Cold-Air Advection – NE Coast
15 Feb 2016

Visible vs snow/ice/ice_cloud RGB

Credit: Scott Bachmeir
Weather Forecasting

Advanced Forecast Enterprise

Observations + Models + Supercomputers + Expert Forecasters

2011 Irene Forecast

“2001” Irene Forecast
ATMS Monitors Rain and Atmospheric Rivers
CrIS/ATMS provides vertical temperature and moisture information to supplement radiosonde reports

- **NUCAPS vs. Observed (RAOB) and Forecast (RAP Model) Soundings**
  - [http://goesrhwt.blogspot.com/2016/04/on-large-scale-thursday-afternoon.html](http://goesrhwt.blogspot.com/2016/04/on-large-scale-thursday-afternoon.html)

  - **Top Left:** ARM SGP RAOB at 17Z
  - **Bottom Left:** NUCAPS closest accepted at 19Z
  - **Top Right:** RAP model at 20Z
  - **Bottom Right:** GOES 13 & 15 water vapor plan view from 17z to 20z.

- GOES water vapor imagery showed an influx of dry air sinking south across the Central Plains through the early afternoon hours.

- This explained the drier feature captured by NUCAPS at 19Z and also confirmed by the RAP model at 20Z.
VIIRS Sees Snow at Night

Cirrus Clouds
Low Clouds
Snow Cover
Clear Land
City Lights

Colorado

Alaska Region

Night

Day

Terminator
Dangerous Phenomena: Fires
New Capabilities

Detection of lights from small/nascent fires (e.g., lightning triggered) initially undetected by thermal infrared bands.

Help firefighters monitor the status of nocturnal fire lines.

Rim Fire: ~Aug 2013

Ft. McMurray Fire: 4-6 May 2016
Dangerous Phenomena: Smoke
Combining the DNB with other VIIRS bands allows us to create novel nighttime imagery.

Offers the same sharp contrast of low-level and surface features as we are used to seeing in daytime imagery.
Dangerous Phenomena: Floods

Galena, AK Floods
May 2013

- VIIRS can identify river ice jams which can lead to large flood events
- Flooding from ice jams can occur in a very short time
- Flooding can occur from snow melt and heavy rains
Florida Algae Bloom Leads to Record Manatee Deaths

A manatee off Peanut Island, Fla.

NOAA Harmful Algal Bloom Operational Forecast System (HAB-OFS) Bulletins
Movement of Individual Ships

Derived Ship Speed:
DNB Imagery: 11.67 kt
Taimyr Position Data: 11.61 kt

Bounding Speeds of Taimyr:
18.5 kt in open water
3 kt in 2.2 m thick ice
Coral

Thailand closes dive sites over coral bleaching crisis

In a rare move to shun tourism profits for environmental protection, 10 popular dive sites have been shut down in a bid to slow a coral bleaching crisis.
Suomi NPP VIIRS Global Surface Type Composite (ST-EDR)

2 Nov 2016

Land Conditions

Weekly GVF 7/26/15
S-NPP/VIIRS-500m Vegetation health, June 12, USA, California, Central Valley
Vegetation and Agriculture Data Products

Vegetation health products

Drought
SE. Europe
S. Ukraine
N. Kazakhstan

Fires
Brazil

Fires
E. Russia

Malaria Risk
Sub Sahara AFRICA
S. AFRICA
W. India
Vegetation and Agriculture Data Products

- Vegetation health products
- Soil moisture, land surface temperature
- Land type
  - arid vs. semi arid
- Snow cover and snow water equivalent
  - water resources
- Precipitation
  - especially important for areas without radar
- Global assessments and historical perspective
Transportation and Commerce

Feb. 16, 2013

- Aviation route planning
- Commercial shipping and navigation
- Recreational boating
- Railways
- Ground transportation
- Power utilities

April 15, 2013
COLOR KEY
Gold = no changes to lights
Red = possible power outages
Green = ‘new lights’ (e.g., moonlight, diffusion of lights by clouds, or search and rescue / disaster relief)
Department of Remote Sensing and Environmental Applications
Teledetección y Aplicaciones Ambientales

MONTHLY MAXIMUM Images

SUOMI NPP - VIIRS
Land Surface Temperature
(Ground frost)

NOAA-18
12-JUNE-15 . 08:28 UTC

Channel 4 . 11 µm
Land Surface Temperature “LST”

SUOMI NPP-VIIRS
18-AUG-15
750m
Sea Surface Temperature

SUMMER

WINTER

4°C 7.1°C 10.2°C 13.3°C 16.3°C 19.4°C 22.5°C 25.5°C 28.6°C
Real color (RGB143). It is possible to observe the presence of phytoplankton in the Argentine Sea.

DNB (at night). Observed lights of possible fishing vessels coinciding with the highest concentration of phytoplankton.
Surface Temperature of Río de la Plata

08-JUNE-2012
05:50 UTC
NOAA-18
Turbidity map of Río de la Plata in nephelometric units (FNU). More reddish colors indicate greater water turbidity. The processing algorithm uses bands 1 (645nm) and 2 (859nm), corrected by atmosphere using bands 5 (1240nm) and 7 (2130nm). Algorithm developed by Dogliotti et al., 2015. Data source: OceanColor NASA - AQUA-MODIS.
The rivers, lagoons and flooded areas are seen in bright blue. The less intense blue tones correspond to different levels of soil moisture.
The area affected by the fires, is observed in red tones and in cyan the evolution of the column of smoke.
In the darkest image the smoke is observed, generated by the fires in Brazil and Bolivia, which covers as far north as Argentina.

In the other color composition are observed the active fires and the areas burned in red-edge and part of the smoke in cyan.
Snow map built from a classification tree with data from multiple bands.
Teledetección y Aplicaciones Ambientales

SNOW

TERRA-MODIS
Resolution 250 mtrs.
07-NOV-15 . 14:10UTC

Glacier Area
Teledetección y Aplicaciones Ambientales

MODIS AQUA
500 METROS
19-JUL-2010
17:15 UTC

DUST CLOUD

MODIS AQUA
500 METROS
18-JUL-2010
18:15 UTC

Salar de Uyuni
Altiplano Boliviano
Nube de polvo
Jujuy
Salta

2017 | Año de las Energías Renovables
Teledetección y Aplicaciones Ambientales

NOAA-18. AVHRR
08-JUL-2012. 19:30 UTC

Distance traveled 650Km

Salt cloud

NOAA-18 –AVHRR
29-JUL-2012. 19:01 UTC

Distance traveled 450Km

Salt cloud

NOAA-19. AVHRR
29-AGO-2009. 18:20 UTC

Salt cloud
Sequence of cloud top from 24 to 26 of June 2016

Twister in Cañuelas, Pcia. Buenos Aires
NOAA-15. 21-MAR-08. 21:49 UTC
Temporal sequence of the low-pressure system (Hurricane class I) that hit the southern coast of Brazil, from 26-Mar-04 to 28-Mar-04. NOAA-AVHRR SATELLITE SERIES.
Low-pressure System
Teledetección y Aplicaciones Ambientales

Cordón Caulle

Río Negro

La Pampa

Buenos Aires

Mendoza

Neuquén

AQUA-MODIS. Resolución 500mtrs.
06-JUN-11 . 18:40UTC

VOLCANOS
Image of the AVHRR sensor, corresponding to split windows or BTD (TB4 - TB5) process, the particles in suspension that are found in different levels of the atmosphere, belonging to the ashes of Cordón Caulle, are observed in bright yellow shades.
23-FEB-1995 – NOAA-12
Proatlas CONICET
TERRA-MODIS. Resolution: 250 meters
Projection: STEREOGRAPHIC POLAR
06-JUL-06 - 13:40 UTC

Central position: 60° 39' S, 52° 51' W
Larsen-C Ice Shelf Break observed by VIIRS

August 18, 2016

July 13, 2017

Iceberg as detected by VIIRS imager 11 micron band.
GOES-16 ABI

Credit: Bill Line
Preliminary, non-operational data.
Preliminary, non-operational data.

Credit: Bill Line
GOES-16 ABI

Credit: Bill Line
GOES-16 ABI

Preliminary, non-operational data.

Credit: Bill Line
GOES-16 ABI vs GOES-13 Imager

Credit: Bill Line
GOES-16 ABI

GOES-16 0.47 um and 3.9 um 2017-03-06 17:05:29Z
Preliminary, non-operational data.
Thanks to many:
JPSS VIIRS Imagery and Sounder Teams
GOES / GOES-R
AWG Imagery Team
CIMSS
CIRA
Department of Remote Sensing and Environmental Applications
NOAA NESDIS
Bill Line, etc.