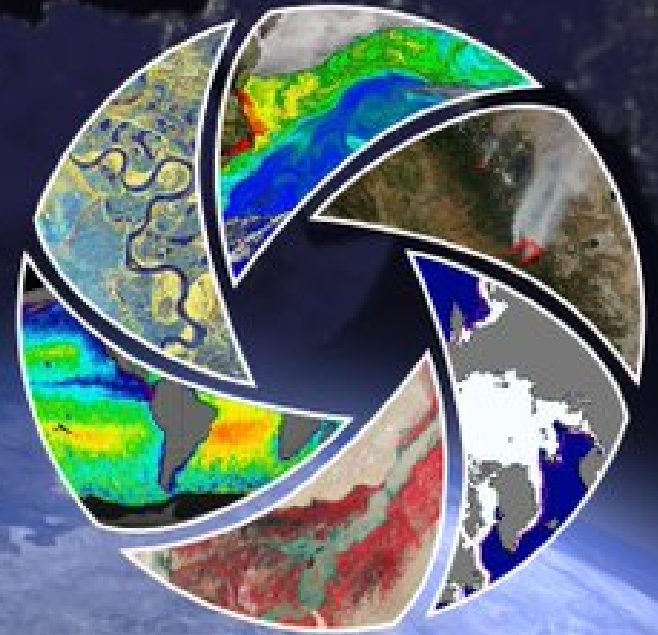


# Worldview for SOS

[worldview.earthdata.nasa.gov](http://worldview.earthdata.nasa.gov)

# EARTHDATA



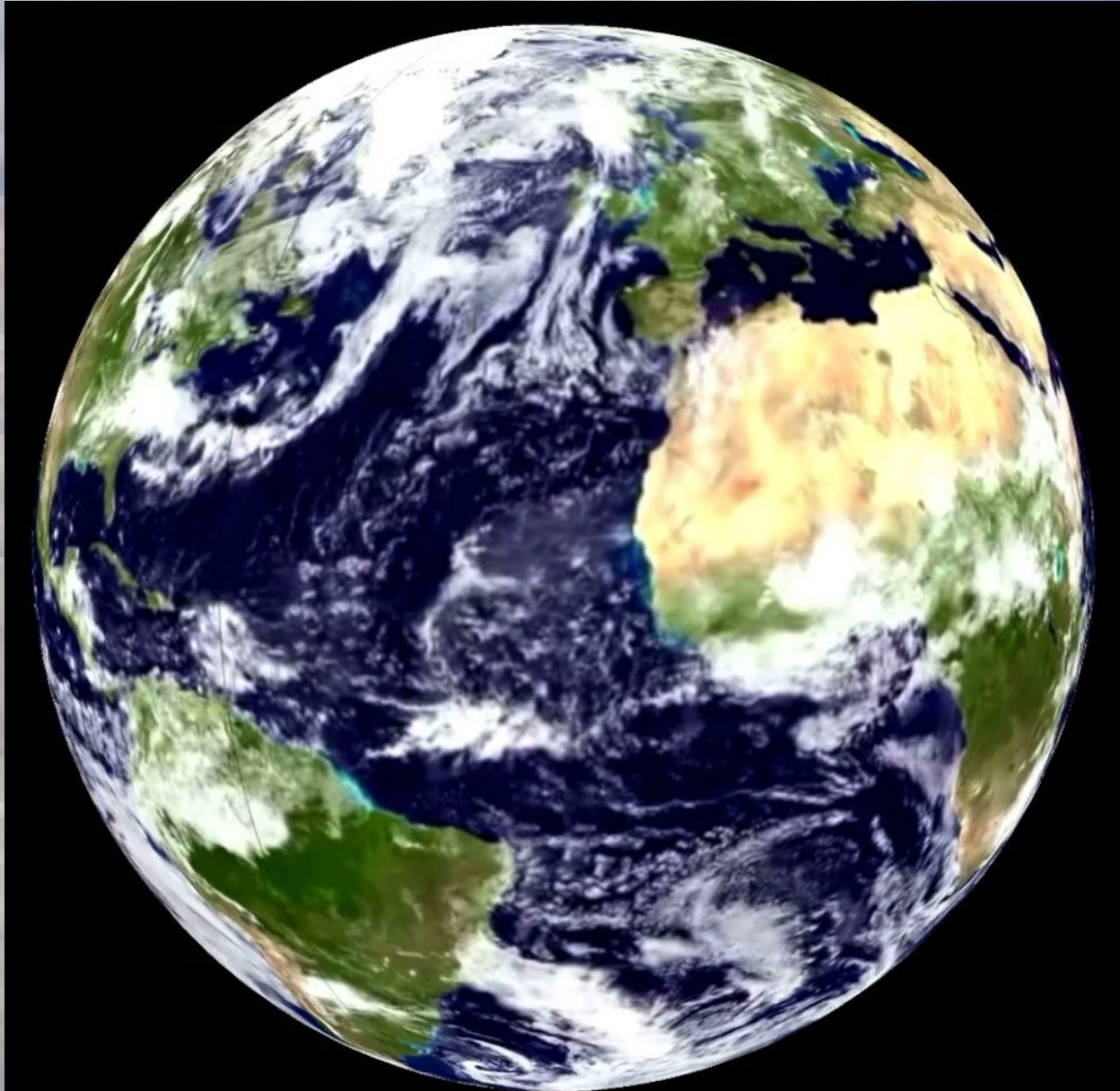
[Maurice.Henderson@nasa.gov](mailto:Maurice.Henderson@nasa.gov)

11/27/2018

# Introduction

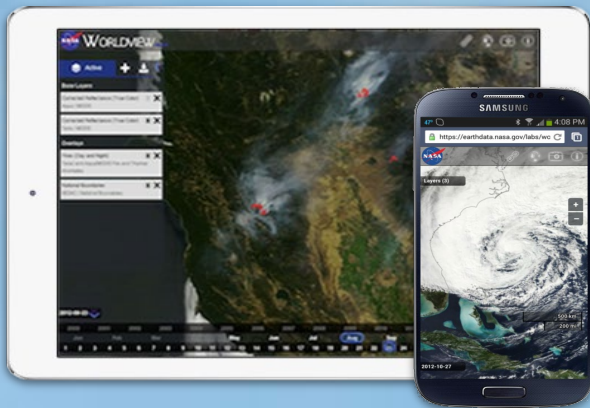
- **Early SOS User Network meeting: Access to Data!**
- **Near Real-Time Streams introduced**
- **Failed to provide story telling support**
- **Our first attempt provides a target view, NESO prototype**
- **Demo Worldview daily satellite imagery on SOS**

# NESO



# What is Worldview and GIBS?

Worldview and the Global Imagery Browse Services (GIBS) provide a **visual-first** approach to finding and using Earth observations



- **Worldview** is a **web app** to interactively browse NASA's global satellite imagery within hours of it being acquired
- **GIBS** is a **system** providing fast and open access to 800+ NASA imagery products for Worldview and any other application via standards-based APIs

<https://worldview.earthdata.nasa.gov/>



# EOSDIS

NASA'S EARTH OBSERVING SYSTEM  
DATA AND INFORMATION SYSTEM

**WORLDVIEW**

Layers Events Data

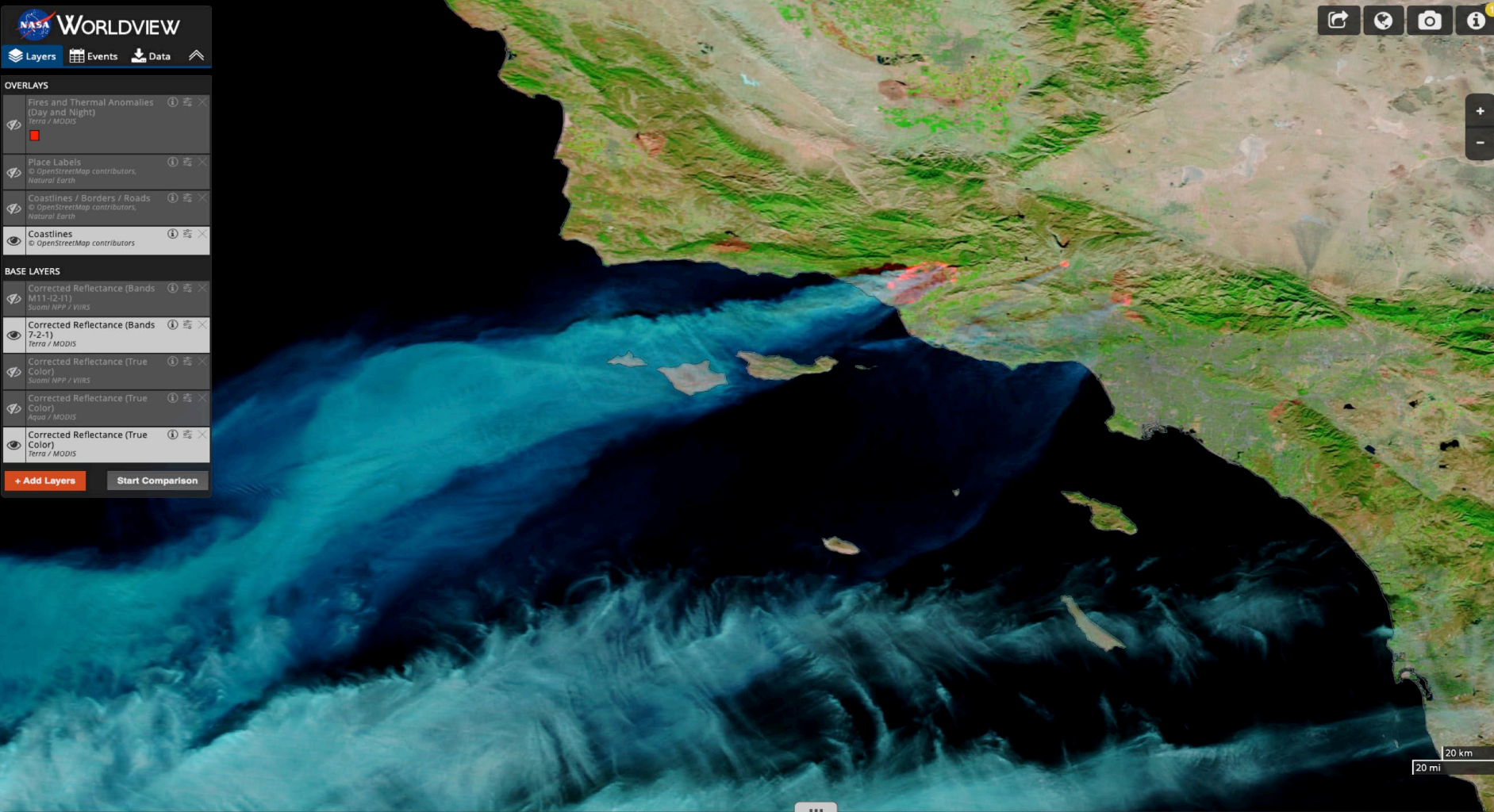
**OVERLAYS**

- Fires and Thermal Anomalies (Day and Night) Terra / MODIS
- Place Labels OpenStreetMap contributors, Natural Earth
- Coastlines / Borders / Roads OpenStreetMap contributors, Natural Earth
- Coastlines OpenStreetMap contributors

**BASE LAYERS**

- Corrected Reflectance (Bands M11-12-11) Suomi NPP / VIIRS
- Corrected Reflectance (Bands 7-2-1) Terra / MODIS
- Corrected Reflectance (True Color) Suomi NPP / VIIRS
- Corrected Reflectance (True Color) Aqua / MODIS
- Corrected Reflectance (True Color) Terra / MODIS

+ Add Layers Start Comparison



DAYS

2017 DEC 05

OCT 2017 NOV 2017 DEC 2017 JAN 2018 FEB 2018

# GIBS Imagery Products

## 800 imagery Data Products from the NASA

- Earth Observing System Data and Information System(EOSDIS)
- Many are near real time
- Native Instrument and Temporal resolution over the life of the mission
- Daily, 8Day, Monthly, and Annual layers
- Time series representing almost two decades of observations

## Multiband Imagery

Visible false color products

## Science Parameter Visualizations

## Utility Layers

Mask and Reference

<https://wiki.earthdata.nasa.gov/display/GIBS/GIBS+Available+Imagery+Products>

# Demo

- **Timeline/Slider for time series**
- **Layer Picker – Base Layer**
  - Layer and band combinations
- **Pan/Zoom**
- **Snapshot and Comparison tools**
- **Share views, projections, data**
- **Create animated GIFs(<40 frames)**
- **Events archive**

# Aral Sea

NASA WORLDVIEW

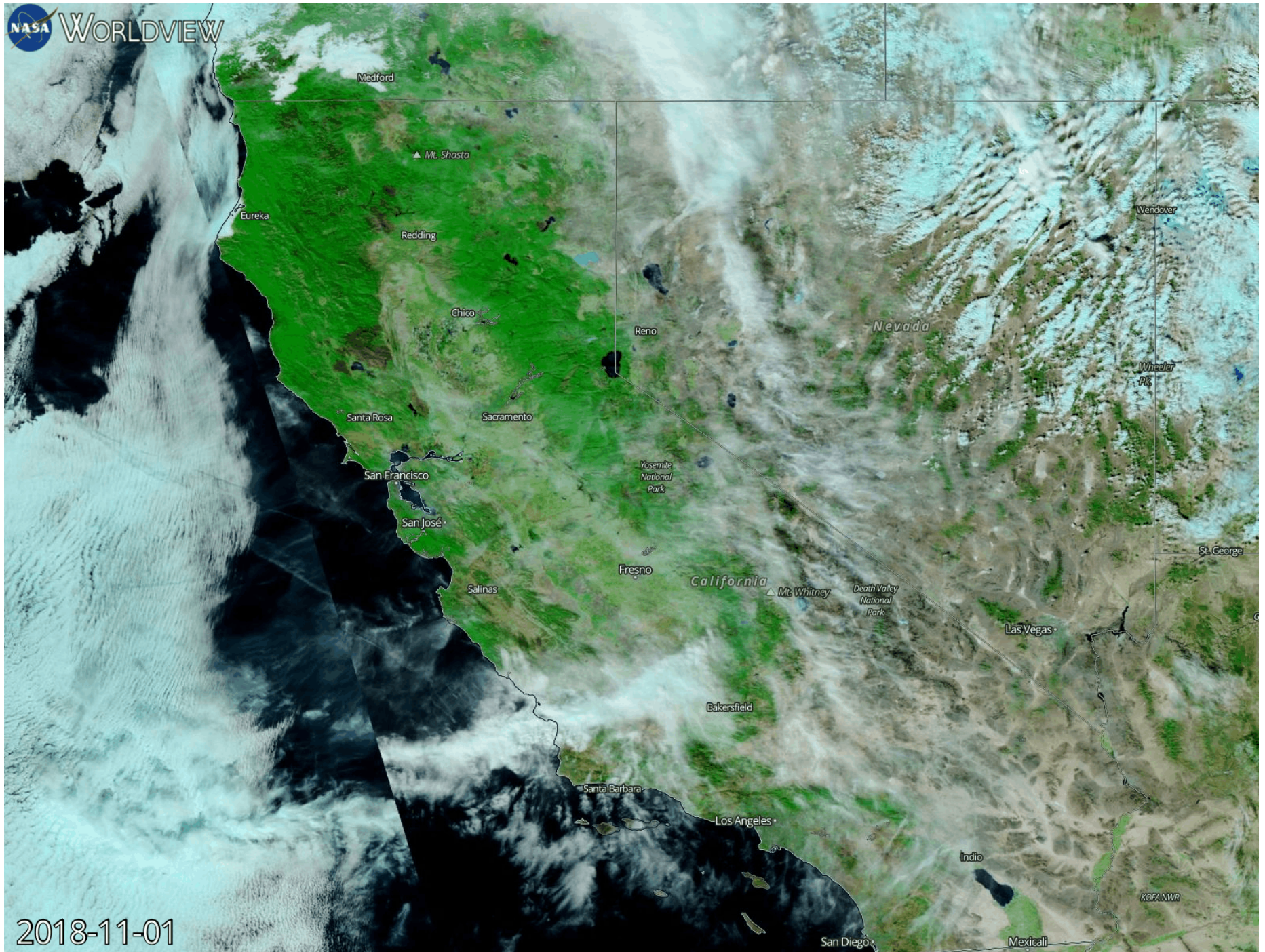


2000-08-01



# Selected Views

- Suomi-NPP VIIRS Corrected Reflectance
  - True Color, jpeg
  - 250m per pixel, 445 pixels/degree
  - California Fires E.g. <https://go.nasa.gov/2KxeLaE>
- MODIS NDVI GPP Ocean Chlorophyll
  - 250m per pixel 2000 to present
  - Global timeseries
  - <https://go.nasa.gov/2KtWsTJ>
- Events archive



**NASA WORLDVIEW**

Layers Events Data

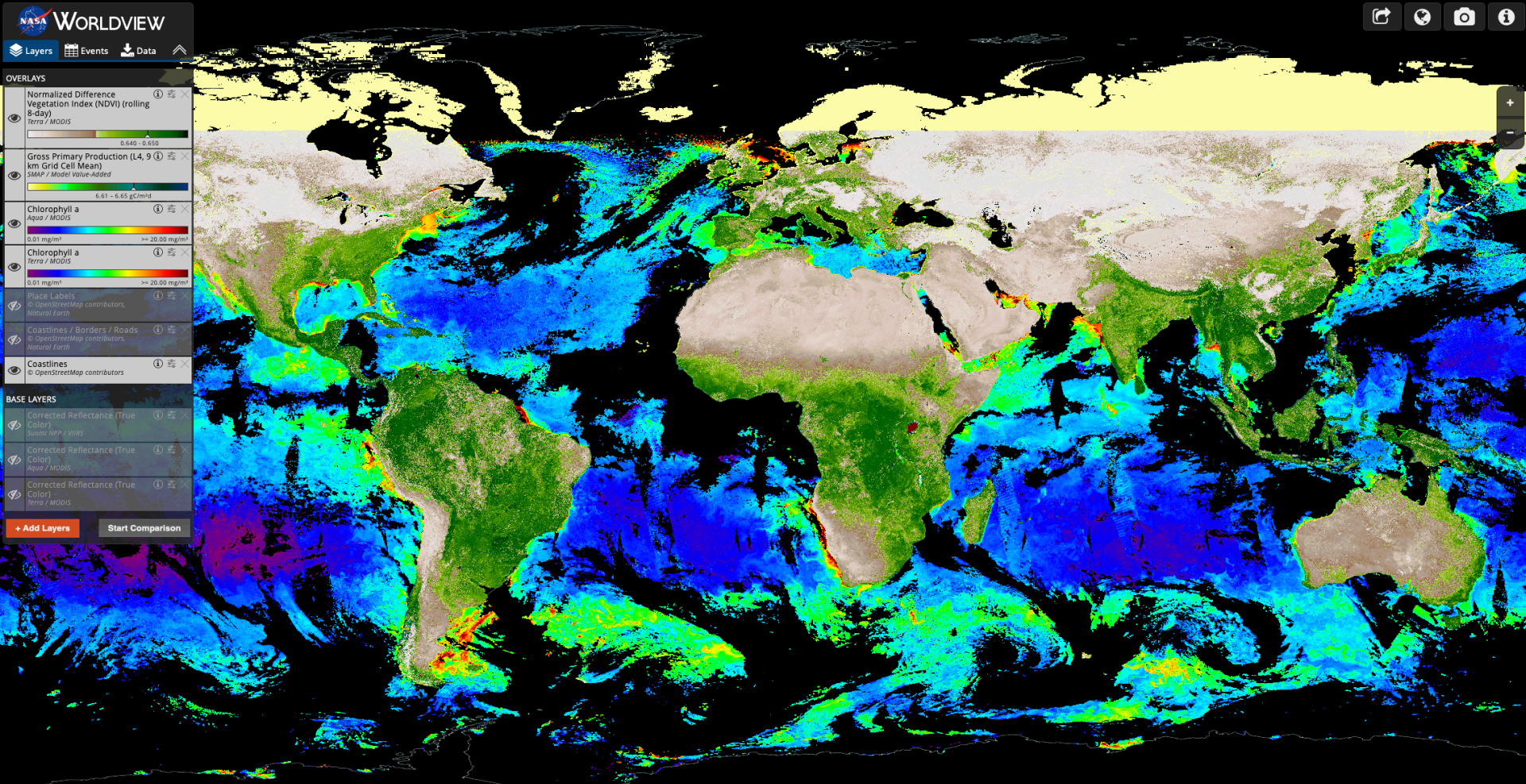
**OVERLAYS**

- Normalized Difference Vegetation Index (NDVI) (rolling 8-day) Terra / MODIS  
0.646 - 0.650
- Gross Primary Production (L4, 9 km Grid Cell Mean) SMAP / Model Value-Added  
6.61 - 6.65 gC/mid
- Chlorophyll a Aqua / MODIS  
0.01 mg/m<sup>3</sup> >= 20.00 mg/m<sup>3</sup>
- Chlorophyll a Terra / MODIS  
0.01 mg/m<sup>3</sup> >= 20.00 mg/m<sup>3</sup>
- Place Labels © OpenStreetMap contributors, Natural Earth
- Coastlines / Borders / Roads © OpenStreetMap contributors, Natural Earth
- Coastlines © OpenStreetMap contributors

**BASE LAYERS**

- Corrected Reflectance (True Color) Suomi NPP / VIIRS
- Corrected Reflectance (True Color) Aqua / MODIS
- Corrected Reflectance (True Color) Terra / MODIS

+ Add Layers Start Comparison



Animate Map In Monthly Increments

▶ ◀ 1 Frames Per Second

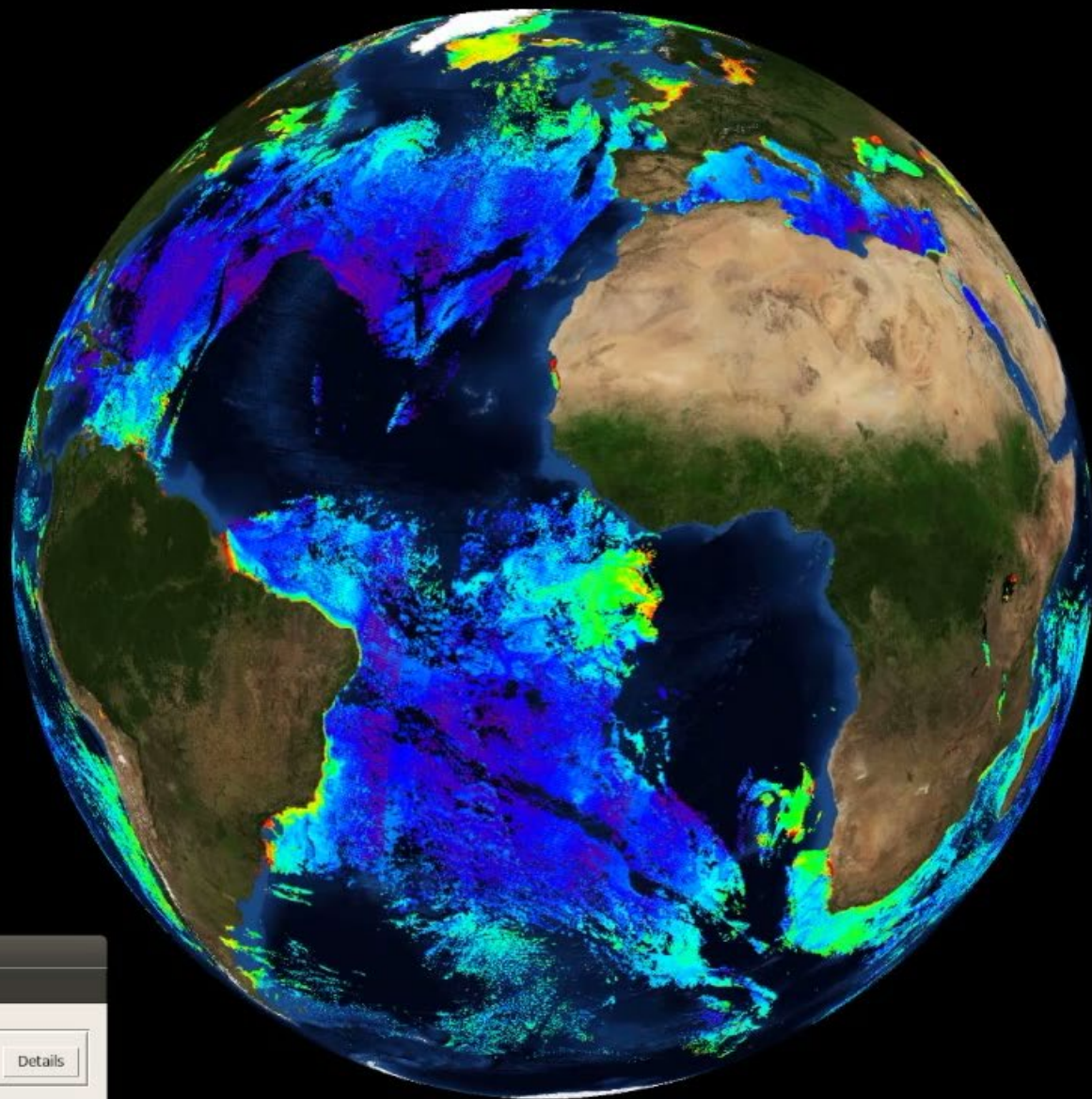
2013 JUL 25 To 2018 NOV 10

MONTHS

2016 DEC 25 ◀ ▶

2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019

1000 km  
1000 mi  
-28.2656°, -57.8672° EPSG:4326



SOS Stream GUI - /home/sos/sosrc/normal-demo.sos

SOS File Library Controls Utilities

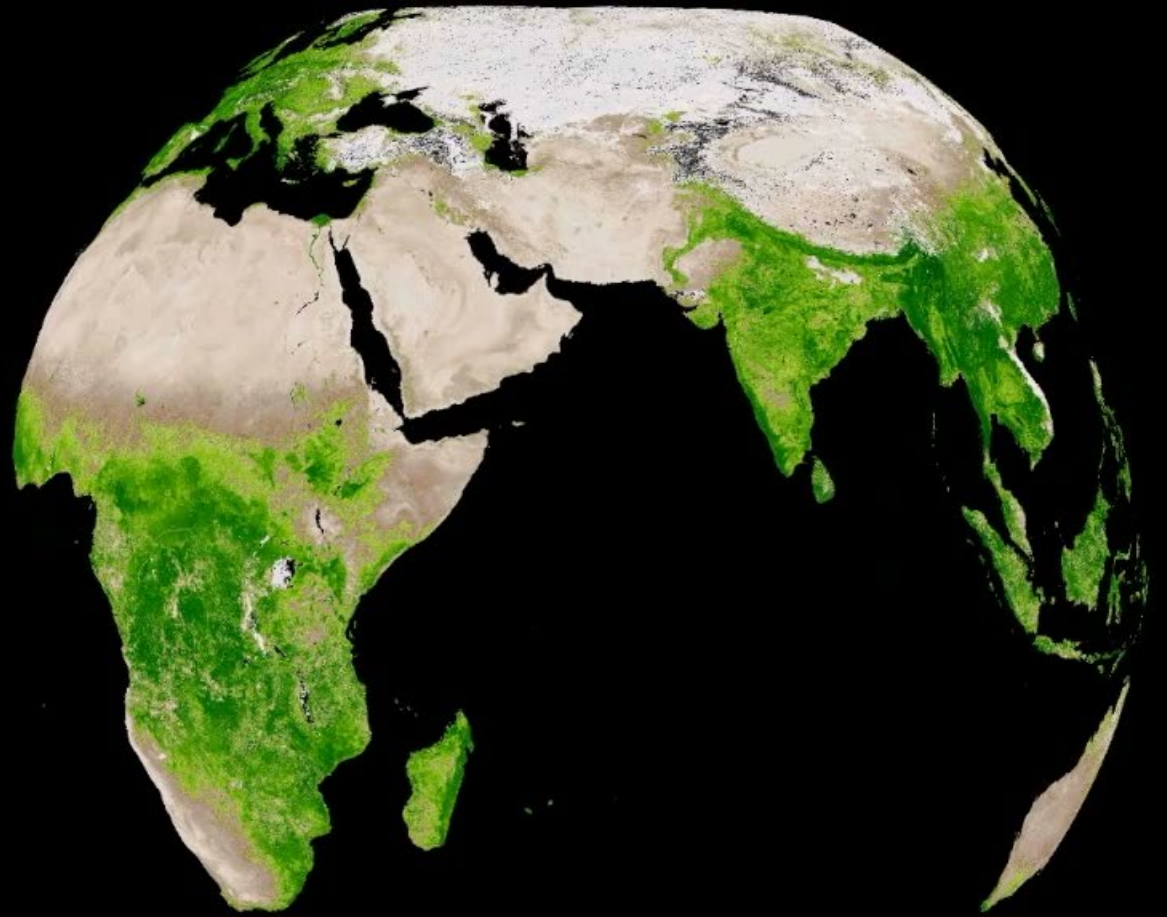
CURRENT DATASET

Name: File /shared/sos/media/site-custom/worldview\_test/sosn [Details](#)

PLAYBACK

0

⏪ ⏴ ⏵ ⏩ ⏸ Clear



SOS Stream GUI - /home/sos/sosrc/normal-demo.sos

SOS File Library Controls Utilities

CURRENT DATASET

Name: File Details  
/shared/sos/media/site-custom/worldview\_test/NDVI

---

PLAYBACK

16

⏪ ⏴ ⏵ ⏩ ⏹ Clear

# Journalist using Worldview

- NYTimes ([agricultural burning in India](#))
- Discovery Magazine
  - [winter sea ice in the Bering Sea has been shrinking dramatically](#)
  - [southwest is bone dry and still waiting for winter](#)

## Farmers' Unchecked Crop Burning Fuels India's Air Pollution



A farmer burned a harvested wheat field last month on the outskirts of Jalandhar, India. Shantini Mishra/Agence France-Presse — Getty Images

By Geeta Anand

Nov. 2, 2016



MAULVIWALA, India — Desperate to reduce the pollution that has made New Delhi's air quality among the worst in the world, the city has banned private cars for two-week periods and campaigned to reduce its ubiquitous fireworks during holiday celebrations.

But one thing India has not seriously tried could make the most difference: curtailing the fires set to rice fields by hundreds of thousands of farmers in the nearby states of Punjab and Haryana, where much of the nation's wheat and rice is grown.

Although India's environmental court, the National Green Tribunal, told the government last year to stop farmers from burning the straw left over from their rice harvests, NASA satellite images in recent weeks have shown virtually no abatement. Farmers are continuing to burn most of the leftover straw — an estimated 32 million tons — to make room to plant their winter wheat crop.

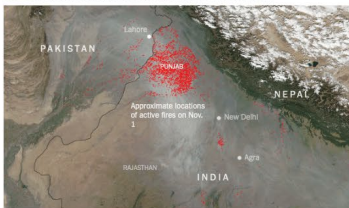
curtailing the fires set to rice fields by hundreds of thousands of farmers in the nearby states of Punjab and Haryana, where much of the nation's wheat and rice is grown.

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While fireworks associated with the Hindu holiday of Diwali were blamed for a particularly bad smog problem in recent days, smoke from the crop fires blowing across the northern plains into New Delhi accounts for about one-quarter of the most dangerous air pollution in the winter months. In the growing metropolis of nearly 20 million people, pollution soared well above hazardous levels in the past week.

### Agricultural Fires in India

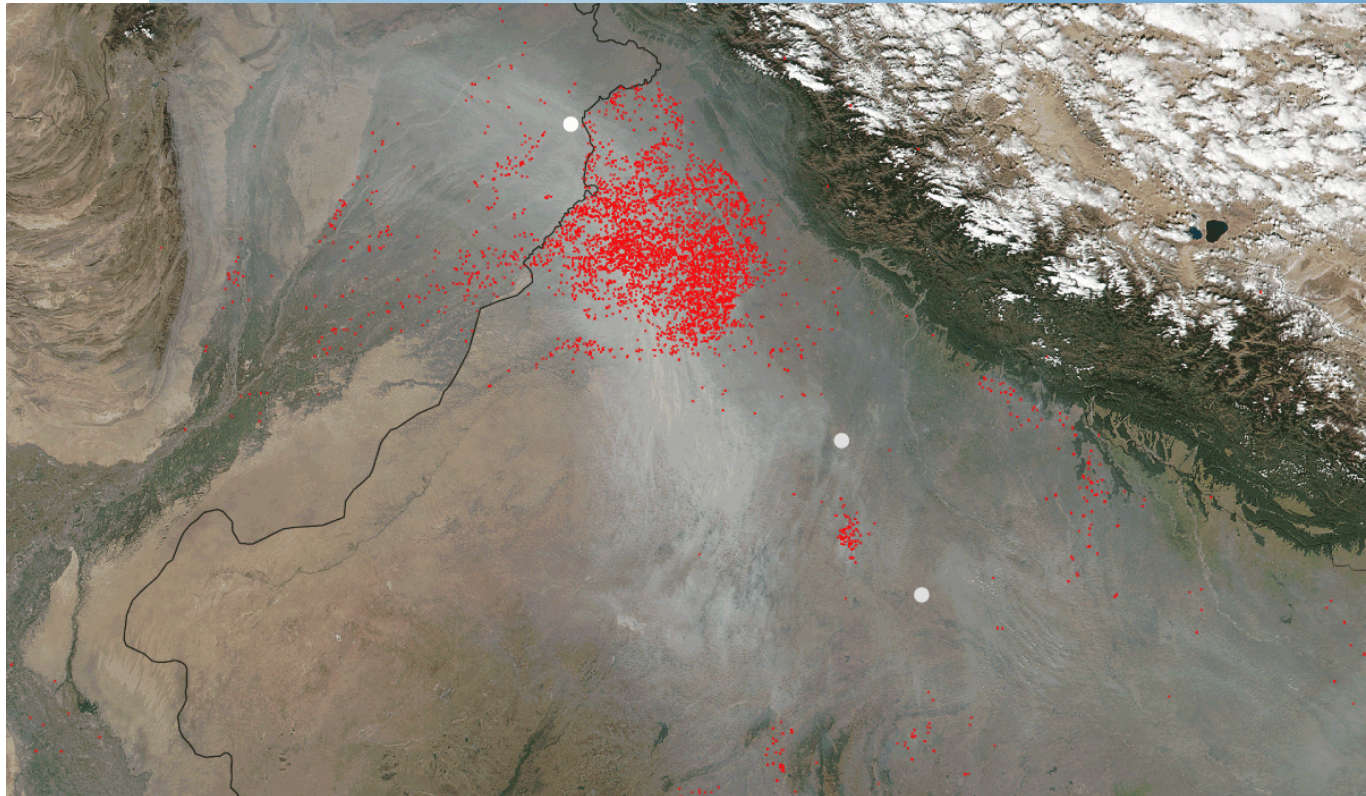
Farmers start fires to clear out pests and turn crop residue into fertilizing ash.



Source: NASA image courtesy Jeff Schmaltz LANCE/EOSSIS MODIS Rapid Response Team, GSFC

By The New York Times

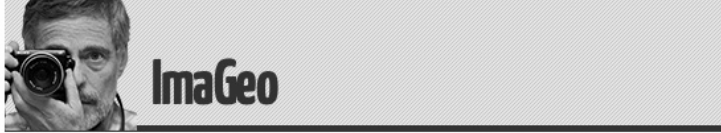
# The New York Times





BLOGS

D-brief | The Crux | Body Horrors | Citizen Science Salon | Dead Things | ImaGeo | Inkfish | Lovesick Cyborg | Neuroskeptic | Out There | Science Sushi | Seriously, Science? | Field Notes | Science & Food | Vintage Space | Rocky Planet | Drone360



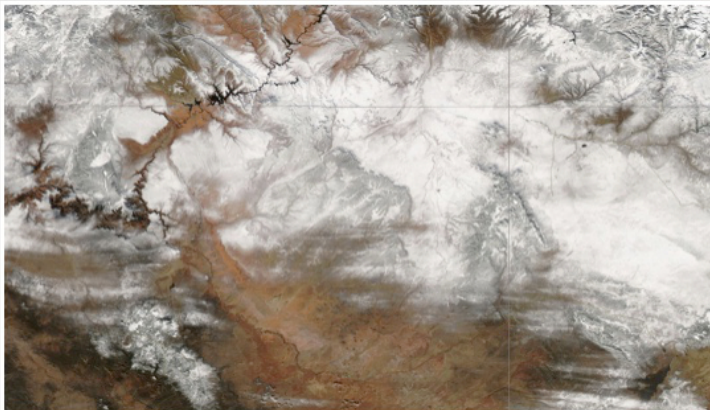
« On the very day the bomb cyclone exploded, we learned that 2017 was one of the very warmest on record. Last year was downright biblical when it came to weather and climate disasters — particularly in the United States »

## While parts of the U.S. are wet and frigid, the Southwest is bone dry and still waiting for winter to arrive

By Tom Yulsman | January 8, 2018 4:18 pm



A wide area around the Four Corners region of the U.S. Southwest is now in severe drought — and the three-month outlook is grim



When it comes to snow cover, a comparison of satellite images shows just how much a difference a year can make. (Images: NASA Worldview. Animation: Tom Yulsman)

While downtown Boston streets were flooding and then freezing as a result of a bomb cyclone that pummeled the U.S. East Coast, folks in the West were no doubt wondering when they might get even just a

**NEW ON DISCOVER**

Baby, it's cold outside — but global warming has not taken a Thanksgiving break

How Firing Lead At Dust Clumps is Informing Our Theory of Planetary Formation

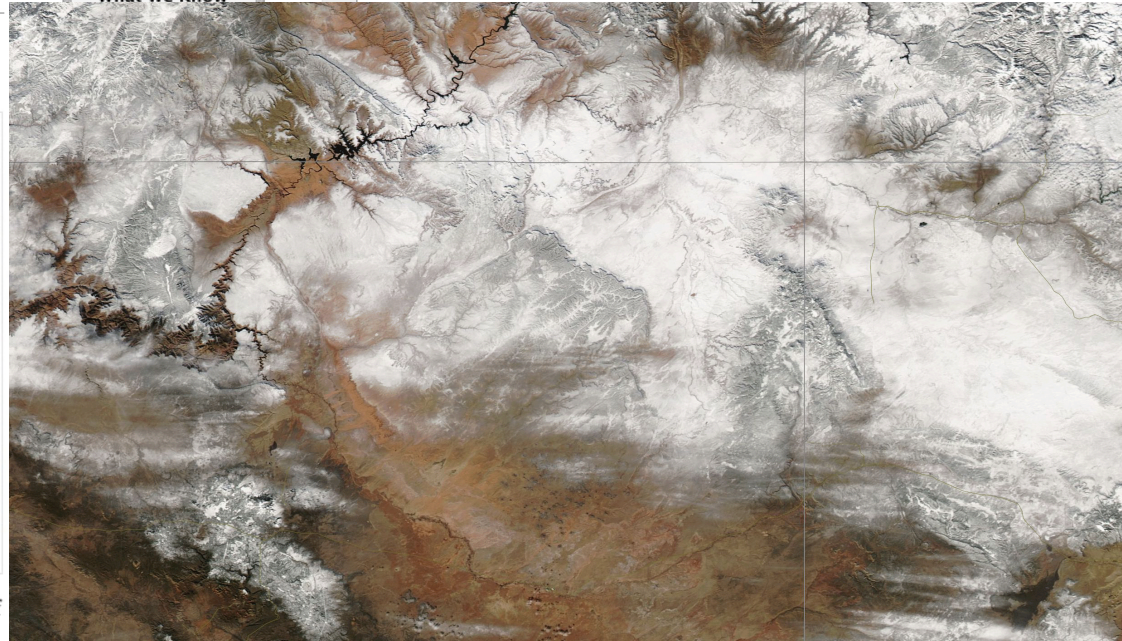
What We Know

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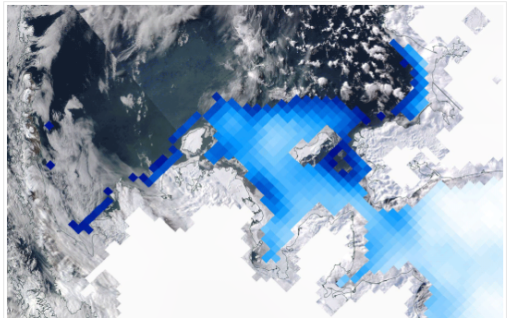
« As Trump Seeks Climate Funding Cuts, Intelligence Community Highlights Risks  
 Watch: Not just one but TWO hurricane-force storms swirling in the North Atlantic Ocean »

## Rather than growing like it should in winter, sea ice off Alaska has been shrinking dramatically

By Tom Yulsman | February 18, 2018 3:07 pm

f t e m + 92

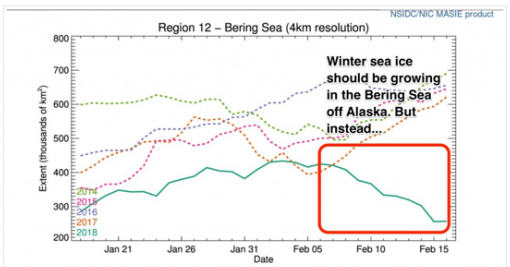
Meanwhile, ice losses elsewhere allowed a Russian tanker to make the first ever independent winter crossing of the Arctic



This should not be happening: a dramatic wintertime decline in sea ice in the Bering Sea between Feb. 6-16. Darker blue colors show areas with the lowest sea ice concentrations. One hundred percent ice coverage (and snow as well) is shown in white. Western Alaska is at the bottom, the Aleutians to the left, and Siberia in the upper right. From top to bottom, the scene covers about 600 miles. The animation consists of imagery from NASA's Terra satellite with an overlay of microwave data from the Defense Meteorological Satellite Program. (Images and sea ice data: NASA Worldview. Animation: Tom Yulsman)

The Bering Sea off Alaska's west coast has just experienced a shocking loss of ice over a 10-day period — in winter.

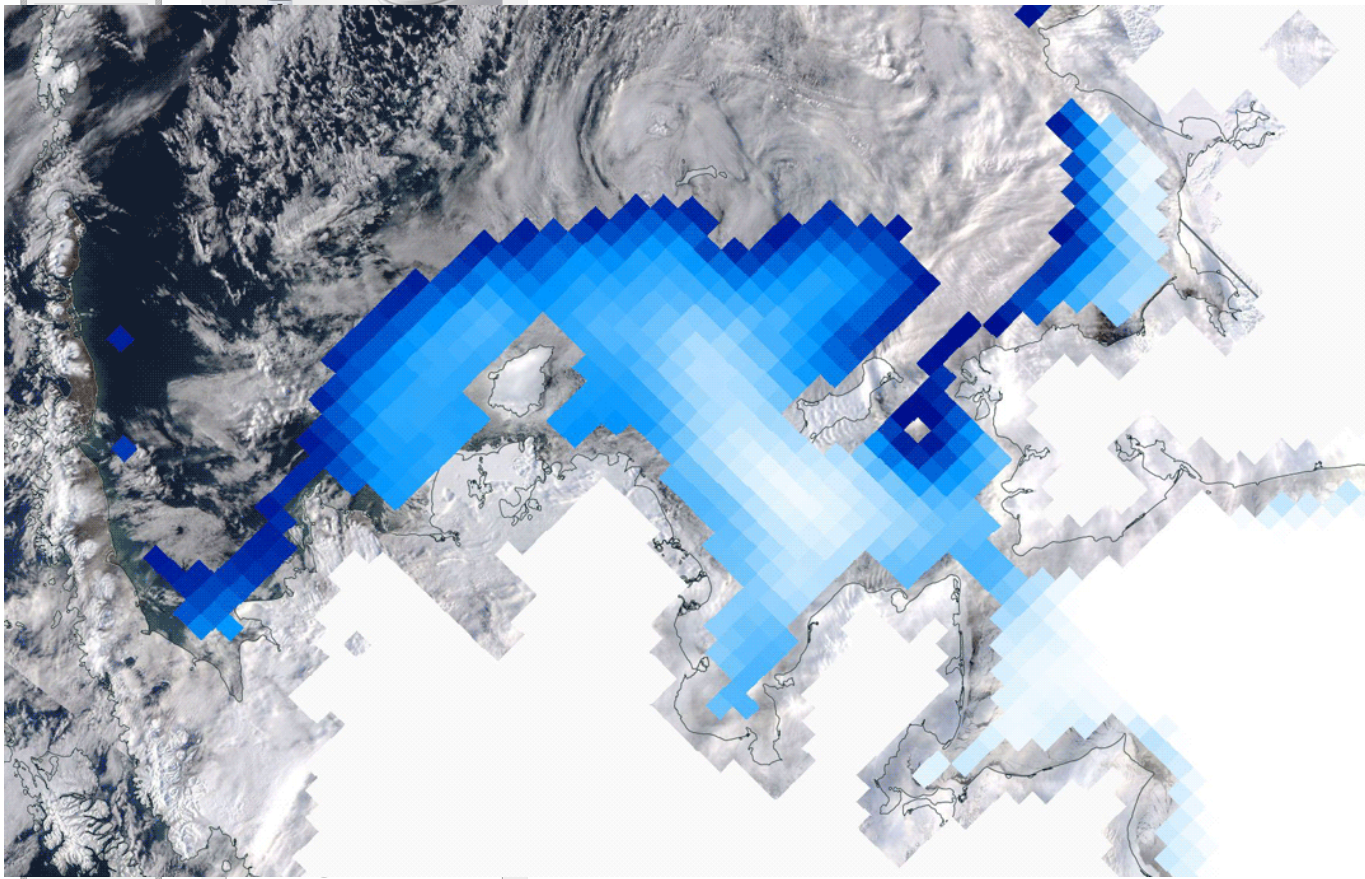
See the graph below for the details. To my eye it looks like sea ice extent declined from about 420,000 square kilometers on Feb. 6 to about 260,000 square kilometers on the 16th.



Sea ice extent for the Bering Sea off Alaska's west coast. (Source: Multisensor Analyzed Sea Ice Extent/NSIDC)

**NEW ON DISCOVER**  
 Baby, it's cold outside — but global warming has not taken a Thanksgiving break  
 Gut Feelings

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 THE BATHROOM ADDITION THAT GIVES BACK TO THE PLANET.



**Where's Our Hangover Pill?**  
 Blazars Are Like Staring Down a Black Hole's Throat

D-brief | The Crux | Body Horrors | Citizen Science Salon | Dead Things | ImaGeo

# SOS Support

- **Extracting singular high resolution global maps (256k by 128k)**
- **Extracting global scale animation series**
- **Next step to extract and graph time series from animation series. Build trends**
- **Looking for interested partners to review and try-out the methodology**

**Thank You!**

**Questions?**