

What's it like to see Earth from space? Viewing your world with NASA's Worldview!

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NASA Earth Science Data and Information System (ESDIS)

AGU Fall Meeting 2018: IN51A-01

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NASA Earth Science Missions

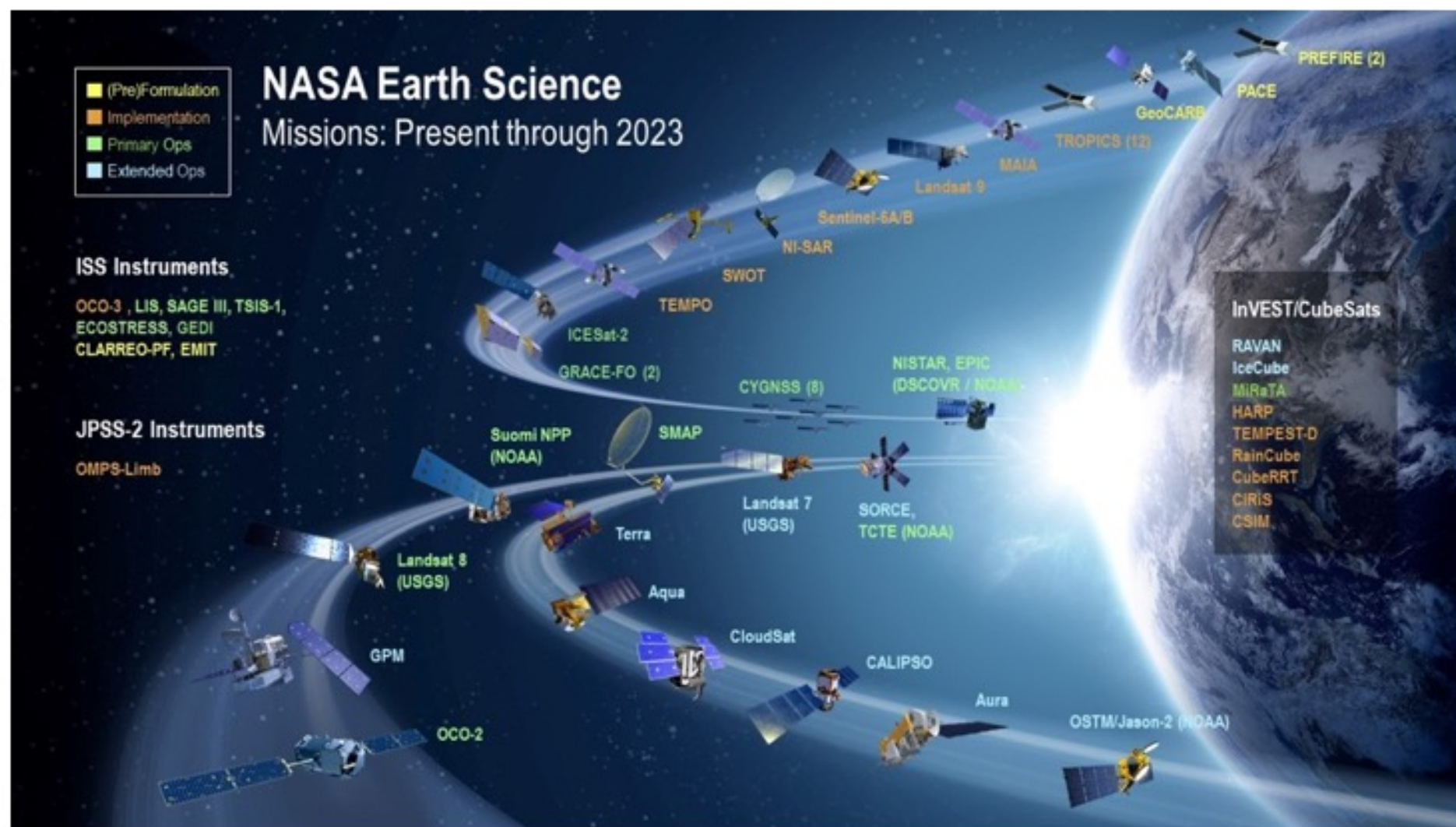


Image credit: "NASA Earth Science Missions: Present through 2023". NASA Earth Science: Science Mission Directorate, accessed on 9 November 2018 at science.nasa.gov/earth-science

What is NASA 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 map tool** to interactively browse NASA's global satellite imagery within hours of it being acquired and over the past few decades. Download the imagery and its data for further analyses.

worldview.earthdata.nasa.gov/

GIBS is a **system** providing fast and open access to 800+ NASA imagery products for Worldview and any other application via standards-based APIs.

Learn more about GIBS in the next talk!

earthdata.nasa.gov/gibs

Imagery visualization components of the NASA Earth Observing System Data and Information System (EOSDIS).

History of Worldview

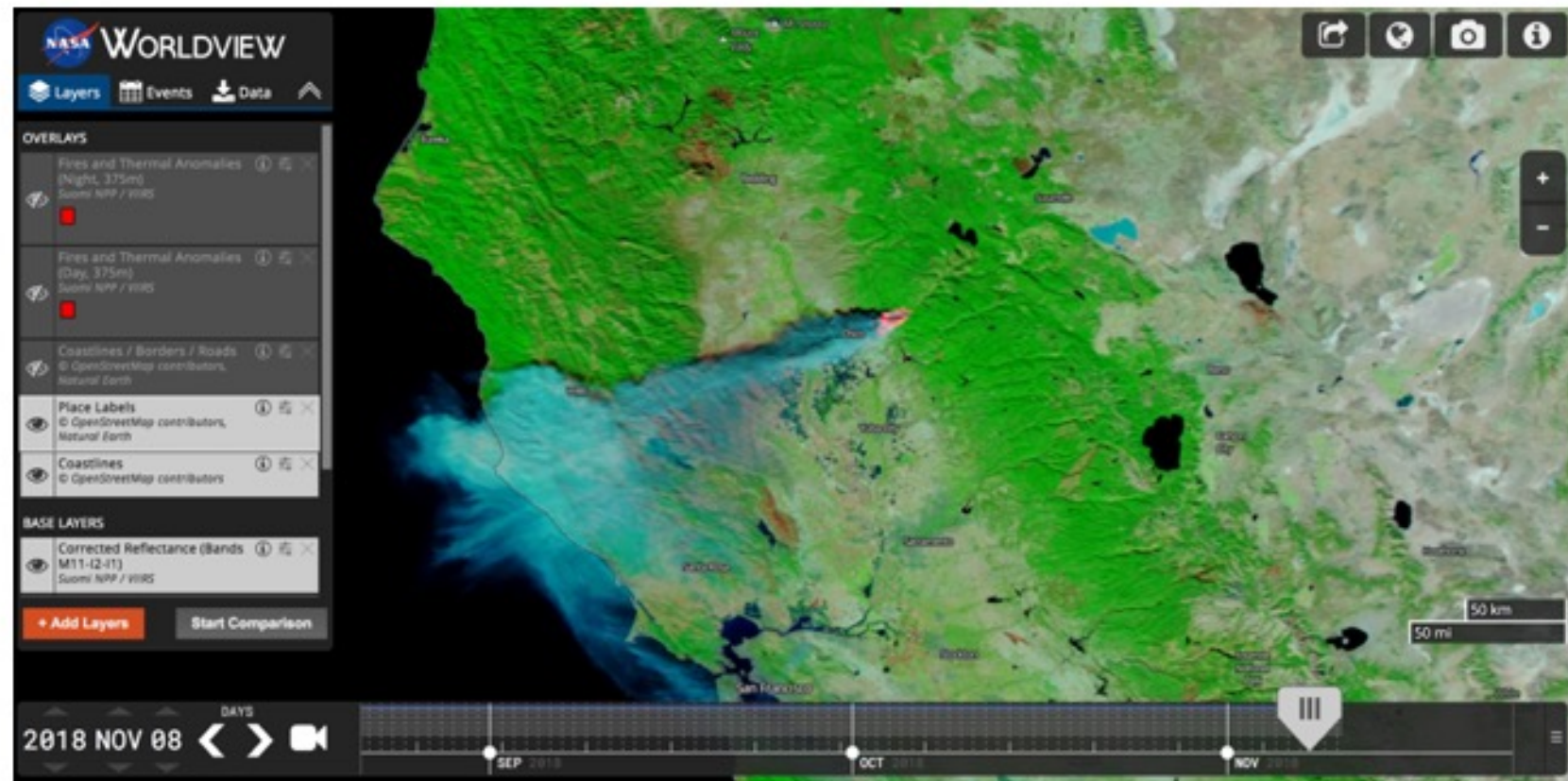
- Rapid Response
 - 2000 and 2001 US fire seasons were experiencing larger, more frequent and more numerous wildfires. Initially started with hand crafted fire imagery and data products using data from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument on the new Terra satellite.
 - Rapid Response developed in 2001 in response to needs of the U.S. Forest Service (USFS), National Interagency Fire Center (NIFC) and other federal and state users.
- Land, Atmosphere Near real-time Capability for Earth Observing System (EOS) (LANCE) started in 2009 to provide expedited data that used optimized science algorithms so that data could be accessible within 3 hours of satellite overpass.
- Circa 2012, GIBS and Worldview built upon the successes of Rapid Response and LANCE to provide users with quick, easy, and stable access to daily, global imagery in near real-time.
- Worldview open sourced April 2014 – code is made freely available for redistribution and modification.
- Continuing to improve and develop Worldview; GIBS continuing to serve new imagery products.
- Rapid Response still very popular, but with the retirement of Jeff Schmaltz, we have developed a new lightweight, low bandwidth tool called Worldview Snapshots.



NASA Worldview Features

- Add Layers – 800+ layers to choose from!
- Events - natural events happening around the world right now
- Polar Stereographic views: Arctic - EPSG:3413 and Antarctic - EPSG:3031
- Data download
- Timeline
- Image snapshot
- Link sharing
- Animation
- Comparison

worldview.earthdata.nasa.gov/



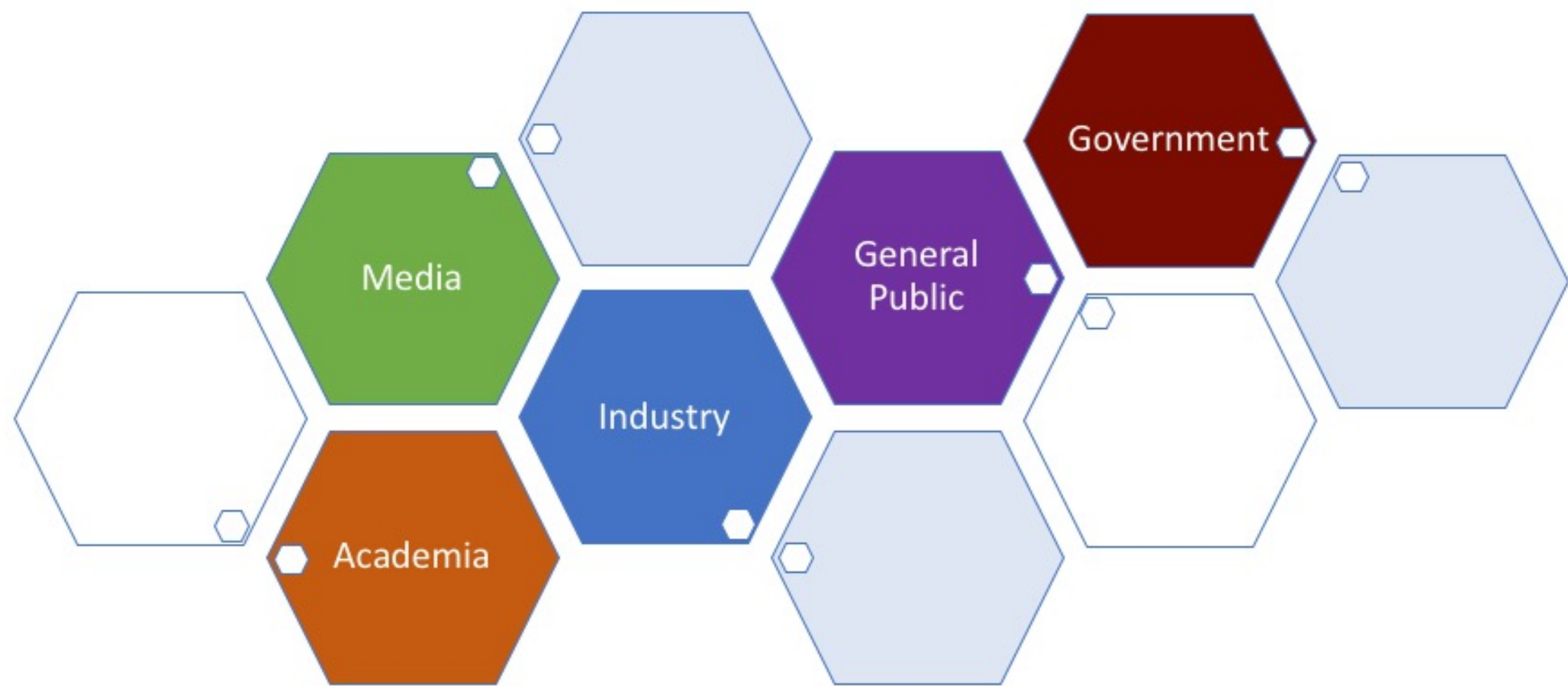
NASA Worldview Features – Demo (video)

The screenshot displays the NASA Worldview web application interface. A search menu is open, showing a list of science disciplines. The background shows a satellite map of a coastal area with a search bar and navigation controls. The search menu is organized into several categories, each with a representative image:

- All**: Absolute Dynamic Topography, Aerosol Index, Aerosol Optical Depth, Aerosol Albedo, Amphibian Richness, Areas of No Data (mask), ...
- Atmosphere**: Aerosol Albedo, Aerosol Index, Aerosol Optical Depth, Cloud Albedo, Carbon Dioxide, Carbon Monoxide, ...
- Biosphere**: Amphibian Richness, Forests, Mangrove, Gross Primary Productivity, Heterotrophic Respiration, Human Footprint, Land Cover, ...
- Cryosphere**: Freeze/Thaw, Frozen Area, Ice Surface Temperature, Sea Ice, Sea Ice Brightness Temperature, Sea Surface Temperature, ...
- Human Dimensions**: Cyclone Hazard, Dams, Drought Hazard, Earth at Night, Fires and Thermal Anomalies, Flood Hazard, ...
- Land Surface**: Blue Marble, Corrected Reflectance, DHR Reflectance, Evaporation, Fires and Thermal Anomalies, Global Digital Elevation Map, ...
- Oceans**: Absolute Dynamic Topography, ...
- Spectral/Engineering**: Brightness Temperature, ...
- Terrestrial Hydrosphere**: Flood Hazard, ...

At the bottom of the interface, a timeline shows the date 2015 APR 23, with navigation arrows and a slider for time. The background map includes a scale bar for 0 km and 100 mi.

NASA Worldview's User Communities



Recent Examples

Abrupt cloud clearing of marine stratocumulus in the subtropical southeast Atlantic
BY SANDRA E. YUTER, JOHN D. HADER, MATTHEW A. MILLER, DAVID B. MECHEM
SCIENCE 17 AUG 2018 : 697-701

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Abrupt cloud clearing of marine stratocumulus in the subtropical southeast Atlantic

Sandra E. Yuter^{1,2}, John D. Hader^{1,2}, Matthew A. Miller¹, David B. Mechem¹

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Science 17 Aug 2018
DOI: 10.1126/science.1257191
10.1126/science.1257191

Article Figures & Data Info & Metrics eLetters PDF

A shrinking marine refrigerator

Low subtropical marine clouds scatter solar radiation back to space and thereby cool the climate system. Most work on understanding changes in the coverage of these types of clouds has focused on the effects of sea surface temperatures or on aerosols. Yuter et al. show that dynamic effects due to atmospheric gravity waves are responsible for the rapid clearing of large areas of these clouds. This phenomenon also has implications for marine ecology and biogeochemistry.

Science, this issue p. 697

Abstract

We document rapid and abrupt clearings of large portions of the subtropical marine low cloud deck that have implications for the global radiation balance and climate sensitivity. Over the southeast Atlantic, large areas of stratocumulus are quickly eroded, yielding partial or complete clearing along sharp transitions hundreds to thousands of kilometers in length that move westward at 8 to 12 meters per second and travel as far as 1000+ kilometers from the African coast. The westward-moving cloudiness reductions have an annual peak in occurrence in the period from April through June. The cloud erosion boundaries reduce cloud at $\approx 10^\circ$

Source:
<http://science.sciencemag.org/content/361/6403/697>
Accessed on 9 November 2018.

Science News from research organizations
Click to enlarge

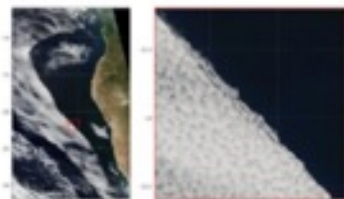
Rapid cloud clearing phenomenon could provide another piece of climate puzzle

Date: July 19, 2018
Source: North Carolina State University
Summary: Researchers have described rapid and dramatic clearing of low cloud cover off the southwest coast of Africa. This newly observed phenomenon could help climatologists understand how clouds affect Earth's heating and cooling.

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Example of a westward-moving cloudiness transition in the southeast Atlantic off the coast of Africa. (left) regional view and (right) showing detail of the sharp edge of the transition boundary.

Credit: Satellite data courtesy of NASA Worldview

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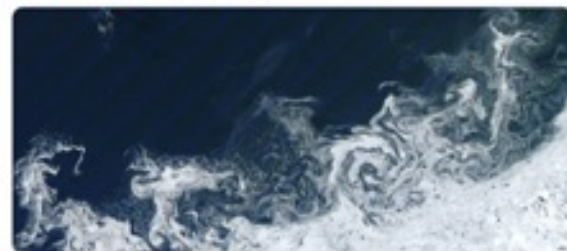
Researchers from North Carolina State University have described rapid and dramatic clearing of low cloud cover off the southwest coast of Africa. This newly observed phenomenon could help climatolo-

Source:
<https://www.sciencedaily.com/releases/2018/07/180719142157.htm>
Accessed on 9 November 2018.

Zack Labe @ZLabe Follow

High pressure over the Beaufort Sea (#Arctic) is allowing for clear satellite views this week of the gorgeous swirling sea ice along the ice edge.

[#MODIS imagery from @NASAEarthData at go.nasa.gov/2Pe1fKo]



9:48 PM - 4 Oct 2018

50 Retweets 142 Likes

4 96 142

Source: <https://twitter.com/ZLabe/status/1048072423252213762>
Accessed 9 November 2018. Post from 4 October 2018

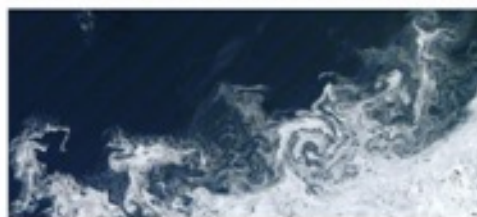
It Looks Like Clouds But It Is Sea Ice - So Why Is It Swirling?

Marshall Shepherd Contributor Science

There is a very famous saying that atmospheric scientists like myself learned along the way in our undergraduate or graduate studies. It goes,

“ Big whorls have little whorls, That feed on their velocity; And little whorls have lesser whorls, And so on to viscosity.

In modern translation, “whorls” is often replaced with “whirls.” The saying is attributed to noted meteorologist and mathematician Lewis Fry Richardson. He is a pioneer of modern weather forecasting. Richardson was driven by a desire to use the laws of physics to predict how the atmosphere changes. This fact was a central to his important work on finite differencing methods, a technique for putting complex equations in format that the earliest computers could handle. The rhyming quote from Richardson, appearing in his classic *Weather Prediction by Numerical Processes* text, captured his postulation that cascading levels of turbulence that ultimately dissipate at the smallest scale described atmospheric processes. Upon first glance at the image below, I thought it was swirling mass of clouds, but then I realized that it was sea ice. Why is sea ice swirling?



Sea ice swirls in the Beaufort Sea during the first week of October 2018. NASA via ZACK LABE

The swirls were first brought to my attention in a Tweet this week by doctoral candidate and cryospheric-climate expert Zack Labe. He tweeted “high pressure over the Beaufort Sea (#Arctic) is allowing for clear satellite views this week of the gorgeous swirling sea ice along the ice edge.” By the way, Zack acquired this incredible image using the NASA Worldview website. If you are not familiar with it and want to explore our Earth from the vantage point of space, I highly recommend it. I gave an assignment to my freshman seminar class at the University of Georgia, and the students were blown away by Worldview, but I digress. Let's talk sea ice swirls because I was *inspired* by the *inspiration* of a scientist and someone that has thought that

Source:
<https://www.forbes.com/sites/marshallshepherd/2018/10/05/it-looks-like-clouds-but-it-is-sea-ice-so-why-is-it-swirling>. Accessed 9 November 2018. Article from 5 October 2018.



Deep Dwivedi | Updated November 01, 2018

712 SHARES

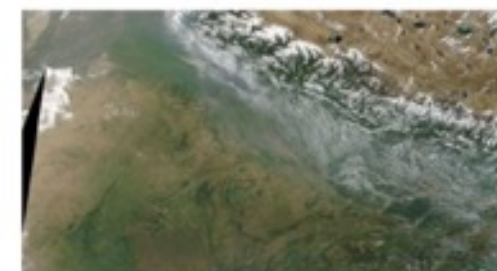
It's that time of year again, when farmers across Haryana engage in stubble burning.

It's a banned practice now for sure, but some just don't have the finances to pursue other methods to clear their fields. And so, Delhi is suffocating again.

There's been an onset of thick smog in the national capital region lately, thanks to smoke and particulate matter from these stubble burning incidents flowing down towards New Delhi and surrounding regions.

In fact, it's so bad you can actually see the effects from NASA's WorldView satellite feed.

Here's what the area looked like on September 28.



www.nasa.gov

And here's what it looked like on October 28, two days ago.



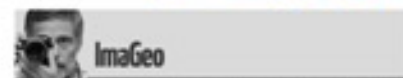
INDIA'S CHAI CULTURE

Source: <https://www.indiatimes.com/technology/science-and-future/stubble-burning-in-north-india-is-so-bad-you-can-see-the-smoke-from-nasa-s-orbiting-satellite-355770.html>

Accessed 9 November 2018. Article from 1 November 2018.

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BLOGS



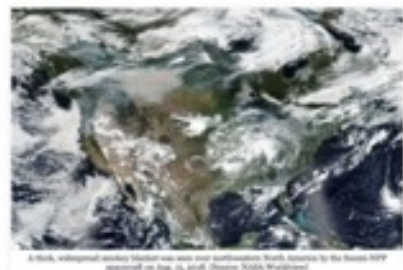
What caused this unusual heart-shaped hole in the cloud deck off the coast of California and how? This NASA animation shows something you could mistake for Star Trek pumping in an alien science system.

Smokey superlatives: widespread wildfire impacts seen from as far away as a million miles from Earth

By Tom Ichniowski | August 16, 2018 12:33 pm

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The smoky conditions are so bad that one Canadian newspaper has labeled it a "smoke-pocalypse"



I was going to take a break from covering the wildfires blazing across large swaths of western North America — and I checked on remote sensing data this morning and saw the satellite imagery above and lower down in this post.

In the image above, captured by the Suomi NPP satellite on Aug. 15, check out the thick, sandy-colored smudge of smoke blanketing a huge portion of western North America. At its greatest extent, I measure it at more than 1,000 miles west-to-east and 500 miles north to south.

In British Columbia, 500 fires burning as of Wednesday prompted the Canadian provincial government to declare a province-wide state of emergency for the second year in a row.

The smoke from all these fires, and 70 large blazes in the western United States, has raised health risks across large portions of Canada and the United States. On Wednesday, much of southwestern North America experienced unhealthy air quality — for all people, not just those at risk from conditions like asthma and heart disease.



Source: <http://blogs.discovermagazine.com/imaGeo/2018/08/16/smoke-superlatives-widespread-wildfire-impacts-seen-from-as-far-away-as-a-million-miles/#.W-Xr-npK19Y>. Accessed on 9 November 2018. Article from 16 August 2018.

NEW ON DISCOVER

To the World's Researcher's Have Finally Figured Out The Best Way to Kill Mosquitoes

Alan Watts Back To Back: Just Keeps Getting Wierder

The Sun's Magnetic Influence Helps Shape a Comet's Tail

Newsfeed, Tiny Jet Is Doing Job Other Stars in the Universe

With Big Data and Predictive Analytics, Scientists Are Getting Smarter About Outbreaks

@DISCOVERMAG ON TWITTER

The 18th-century Antarctic ice meltwater that could change climate models

Never stop exploring

The medieval war is not only one of the planet's most intense, but also one of the most recent ones

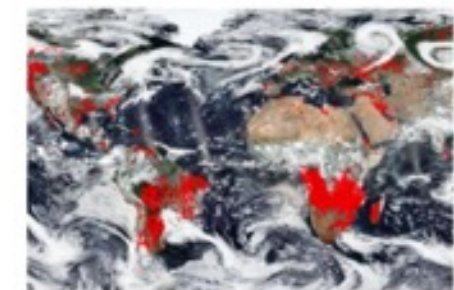
A new report found that the first American leg-trapped continents to arrive in America

We see more cases of delirium among patients than we do in the population

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GLOBAL WILDFIRES: NASA IMAGE FROM SPACE SHOWS 'WORLD IS ON FIRE'

By JENNIFER ON 8/25/18 AT 7:00 AM



NASA's Earth Observing System Data and Information System shows where fires are burning throughout the globe.

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U.S. WILDFIRES

A wildfires burned around the globe, NASA released a satellite image taken from space that showed "the world on fire."

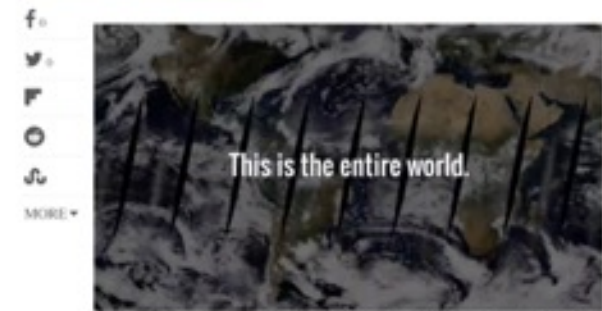
The NASA's Earth Observing System Data and Information System (EOSDIS) Worldview application uses images from 700 global, full-resolution satellites, updated within three hours of observations to show the world as it is "right now." The detection of thermal bands are displayed as red dots and an image taken on Wednesday appears to show, "the world is on fire."

NASA explained that the image seems to show that the most concentrated fires are taking place in Africa and the research organization reasoned that it's likely because most of the fires are agricultural fires.

Source: <https://www.newsweek.com/global-wildfires-nasa-image-space-shows-world-fire-1060339>. Accessed 9 November 2018. Article from 25 August 2018.

Incredible NASA Video Crams 20 Years of Earth's Weather Into 2 Minutes

By Chelsea Gohet, Space.com Staff Writer | June 6, 2018 05:59pm ET



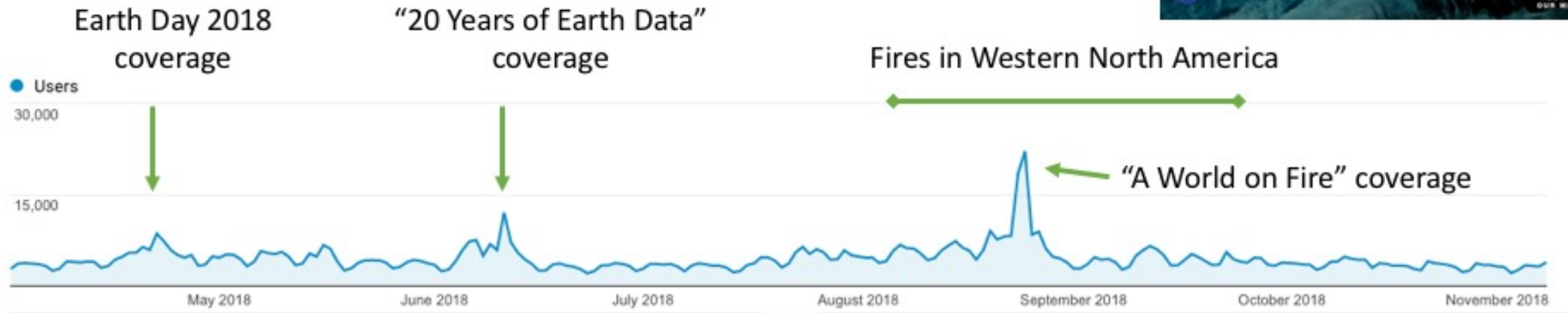
You can now watch almost two decades of weather patterns on Earth thanks to an incredible video from NASA.

This 17-second video, based on data from NASA's WorldView tool, shows weather on Earth has changed between 2000 and 2018, some of the planet's most dramatic weather moments.

Source: <https://www.space.com/40812-incredible-nasa-earth-weather-time-lapse-video.html>. Accessed 9 November 2018. Article from 6 June 2018.

NASA Worldview Metrics

1 April – 8 November 2018



Source: Google Analytics 360

Peaks in user metrics corresponding to natural events and media coverage in the news and social media

- Earth Day 2018: <https://www.nasa.gov/content/goddard/earth-day-2018>
- "20 Years of Earth Data Now at your Fingertips" article (<https://www.nasa.gov/feature/goddard/2018/20-years-of-earth-data-now-at-your-fingertips>) and video (<https://youtu.be/X16cfGPL2wA>)
- "A World on Fire" article: <https://www.nasa.gov/image-feature/goddard/2018/a-world-on-fire>

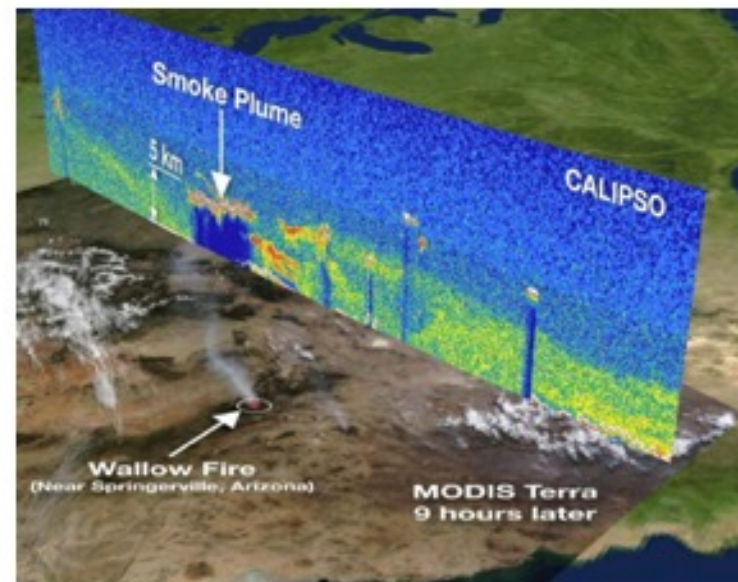
What's on the horizon?

Near-Term Goals

- Overhaul of the tour/tutorial section to better serve different user communities
- Overhaul of the timeline to improve temporal representation of imagery layers and improve user interaction with the timeline

Mid to Long Term Goals

- Display of historical/past events
- Vertical Profile/Data curtains



Source: https://www.nasa.gov/mission_pages/calipso/mission/5watts.html
Accessed 9 November 2018.

Questions?

Questions? Problems? Feature Requests?

- Contact us at support@earthdata.nasa.gov

Visit Worldview at <https://worldview.earthdata.nasa.gov>

Code is on GitHub: <https://github.com/nasa-gibs/worldview>