

Using NASA Resources to Promote Climate Literacy



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students 2009- present

Next Generation Science Standards

DCI: Global Climate Change

Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

Through computer simulations and other studies, **important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities.**



OSTM/Jason 2
(NOAA)

Aquarius

QuikSCAT

TRMM

Terra

ISS-RapidScat,
CATS

E0-1

SMAP

Landsat 7
(USGS)

Aqua

Suomi NPP
(NOAA)

SORCE,
TCTE (NOAA)

Landsat 8
(USGS)

Aura

GPM

GRACE (2)

CALIPSO

CloudSat

OCO-2

NASA's Eyes on the Earth

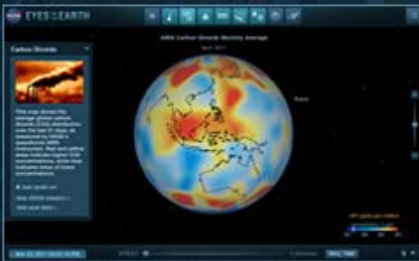


EYES ON THE EARTH
Vital Signs of the Planet

Travel in time and explore NASA satellite visualizations in 3D

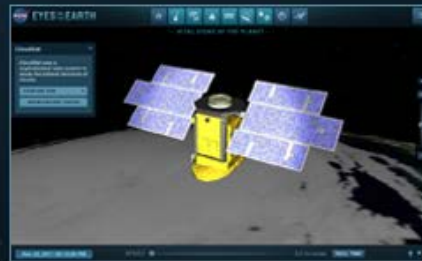
[climate change website](#) | [contact us](#) | [credits](#)

Explore Earth's Vital Signs



View recent data for air temperature, carbon dioxide, carbon monoxide, sea level, ozone, ice and water.

Fly along with NASA Satellites



Follow NASA satellites and learn how they collect critical data about Earth's atmosphere, land and oceans.

View the latest Image of the Day

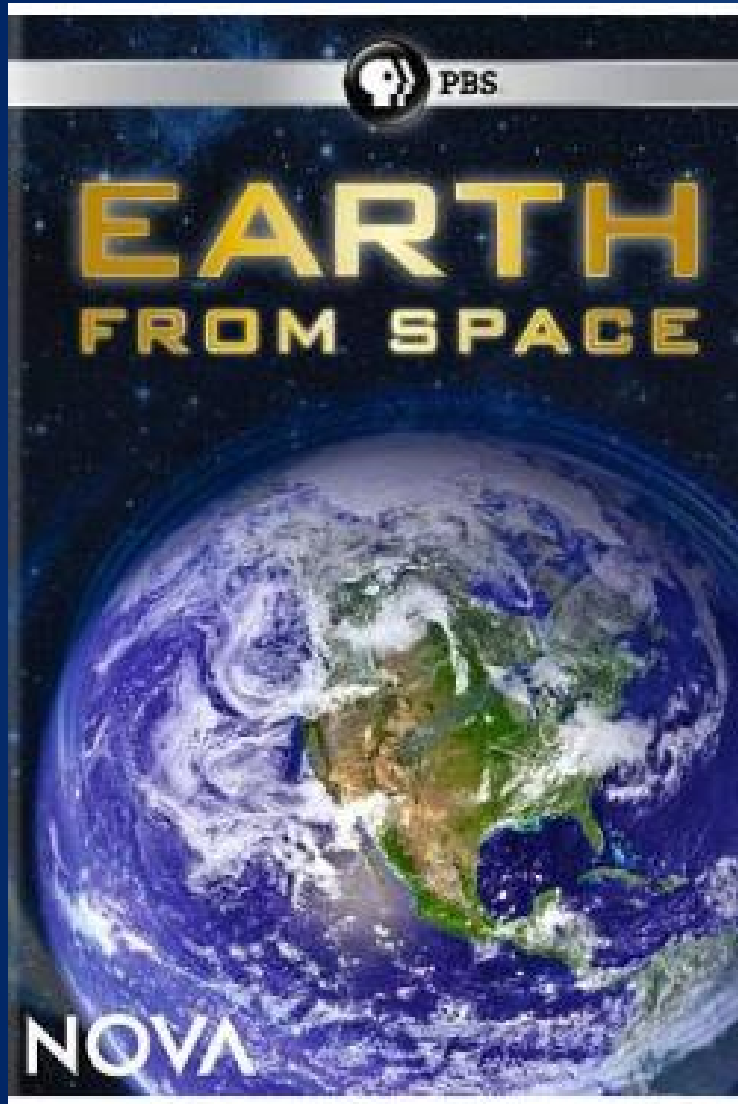


Spectacular views of our home planet from space, updated daily.

Eyes on the Earth is a
Java-launched Unity3D application

START

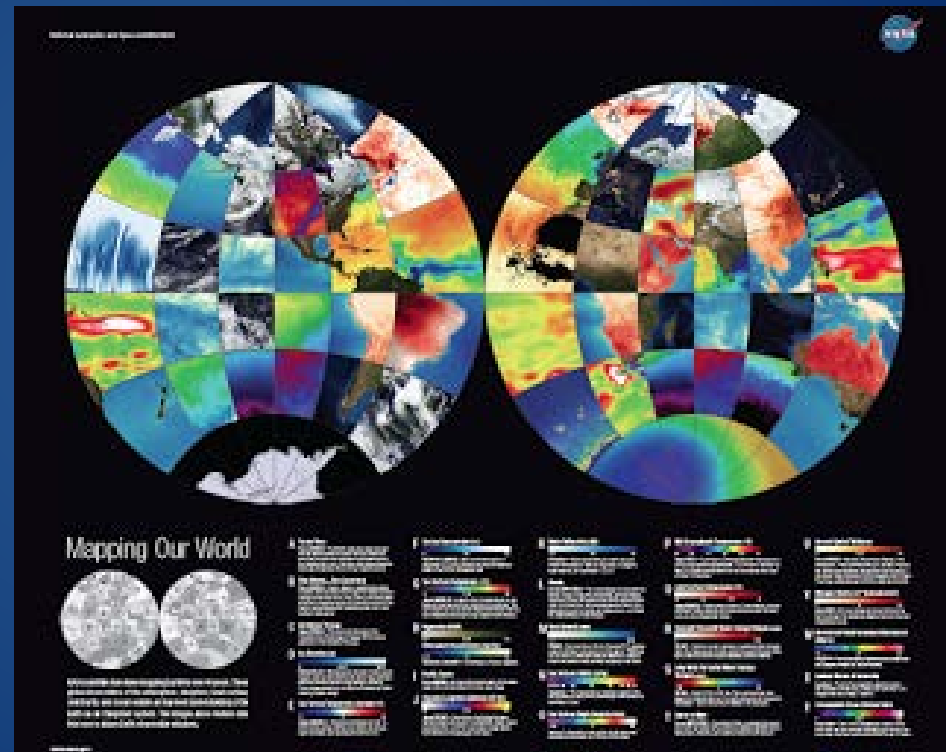
<http://eyes.jpl.nasa.gov/earth/>



Produced in extensive consultation with NASA scientists, this 2 hour special reveals a spectacular new space-based vision of our planet.

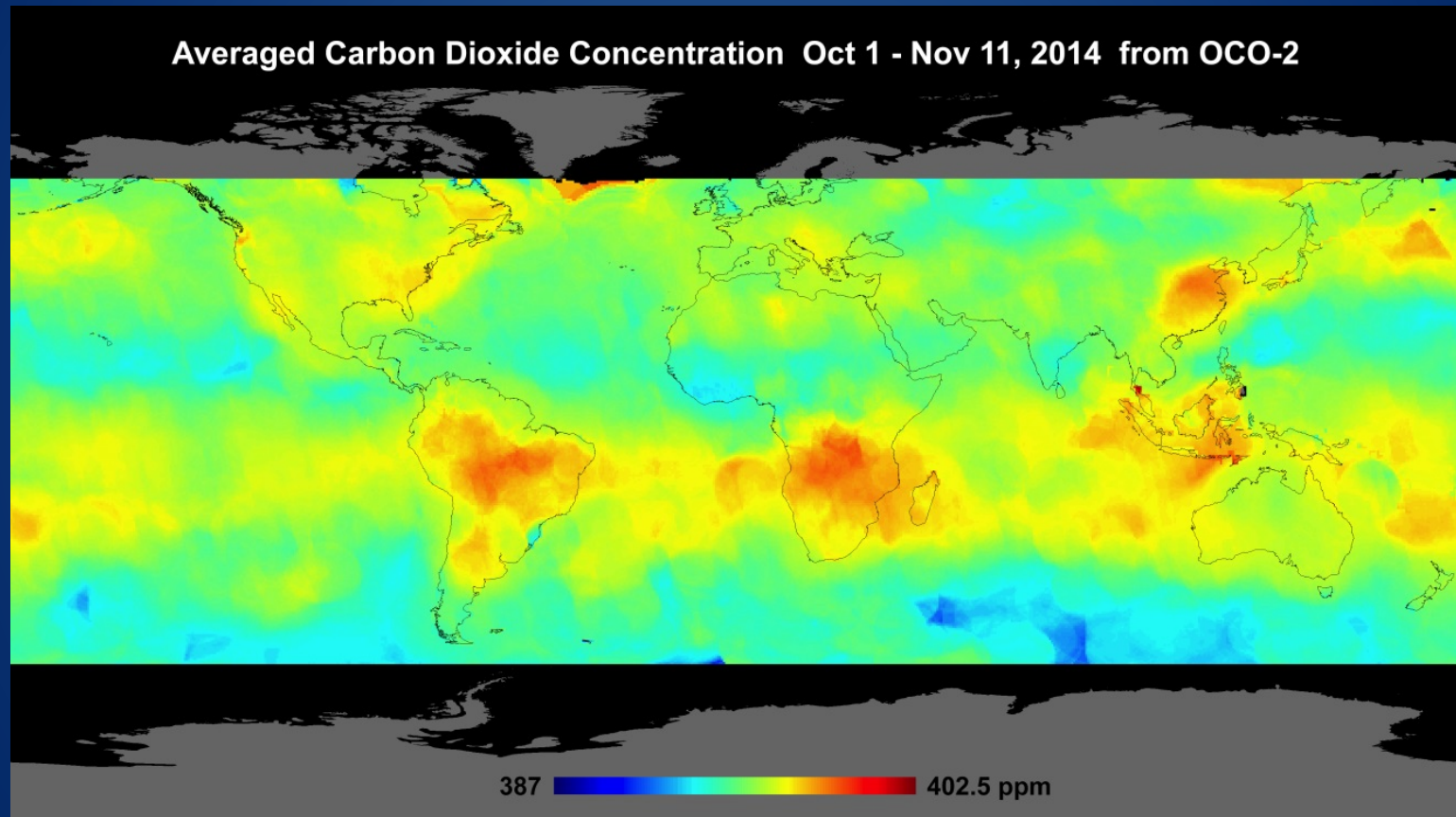
<http://www.pbs.org/wgbh/nova/space/earth-from-space.html>

Educators Guide to NASA Earth Science Images and Data



http://nasaesw.strategies.org/wp-content/uploads/2013/08/EducGuide_508Fin.pdf

NASA's Orbiting Carbon Observatory (OCO-2)



Will take more than 100,000 measurements of carbon dioxide in Earth's atmosphere every day in order to characterize CO₂ **sources and sinks** on regional scales.



Alaska's unwelcome guests

Climate change provides invasive species new horizons on the "last frontier."

[READ MORE](#)

CARBON DIOXIDE

> **↑ 400.71** parts per million

GLOBAL TEMPERATURE

↑ 1.4 °F since 1880

ARCTIC ICE MINIMUM

↓ 13.3 percent per decade

LAND ICE

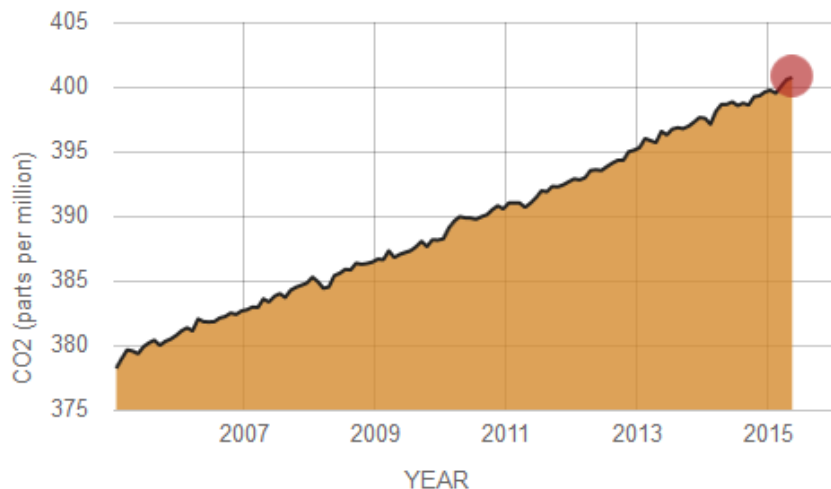
↓ 287 billion metric tons per year >



Carbon Dioxide

DIRECT MEASUREMENTS: 2005-PRESENT

Data source: Monthly measurements (corrected for average seasonal cycle). Credit: [NOAA](#)



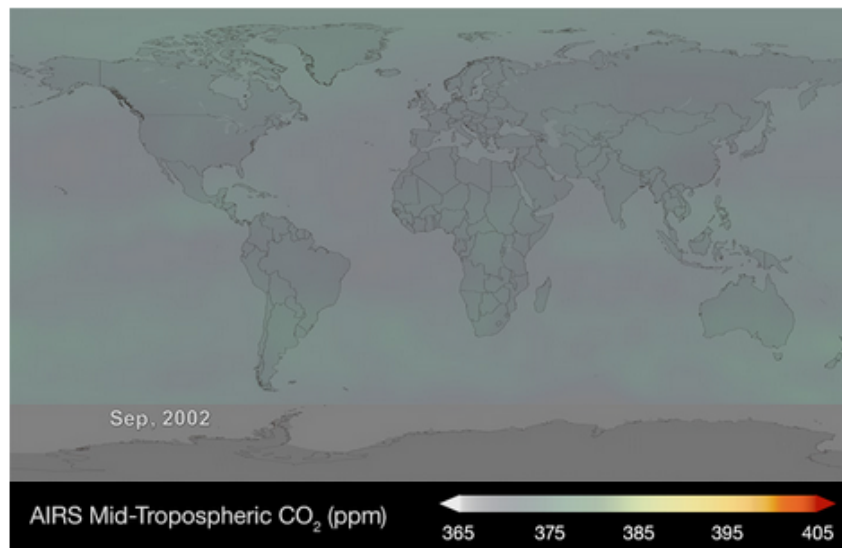
Carbon dioxide (CO₂) is an important heat-trapping (greenhouse) gas, which is released through human activities.

TIME SERIES: 2002-2014

Data source: Atmospheric Infrared Sounder (AIRS). Credit: [NASA](#)

SEPTEMBER

2002



▶ 2002 ◯ 2014

CARBON DIOXIDE

Carbon dioxide levels in the air are at their highest in 650,000 years

GLOBAL TEMPERATURE

↑ 1.4 °F since 1880

ARCTIC ICE MINIMUM

↓ 13.3 percent per decade

LAND ICE

↓ 287 billion metric tons per year

ice melt

NASA Jet Propulsion Laboratory | California Institute of Technology

CLIMATE TIME MACHINE

The red outline shows the ice cap extent in 1979

1980 1985 1990 1995 2000 2005 2007

This visualization shows the annual Arctic sea ice minimum from 1979 to 2007. At the end of each summer, the sea ice cover reaches its minimum extent, leaving what is called the perennial ice cover. The area of the perennial ice has been steadily decreasing since the satellite record began in 1979. (Credit: NASA/Goddard Scientific Visualization Studio)

Ice Melt Sea Level CO₂ Emissions Average Global Temperature

NASA GLOBAL CLIMATE CHANGE | Vital Signs of the Planet

GLOBAL ICE VIEWER

Sentinels of Climate Change

Ice, which covers 10 percent of Earth's surface, is disappearing rapidly. Select a topic below to see how climate change has affected glaciers, sea ice, and continental ice sheets worldwide.

GLACIERS GREENLAND ARCTIC ANTARCTICA

sources | credits | find out more | Global Climate Change website

Jet Propulsion Laboratory | California Institute of Technology

SEA LEVEL VIEWER

sea level in millimeters relative to normal

180
140
100
60
20
-20
-60
-100
-140
-180

click on arrows for more information

speed +

OVERVIEW MISSIONS

Latest View
January 2013

Large El Niño
November 1997

Hurricane Katrina
August 2005

Indian Ocean Tsunami
December 2004

La Niña
February 1999

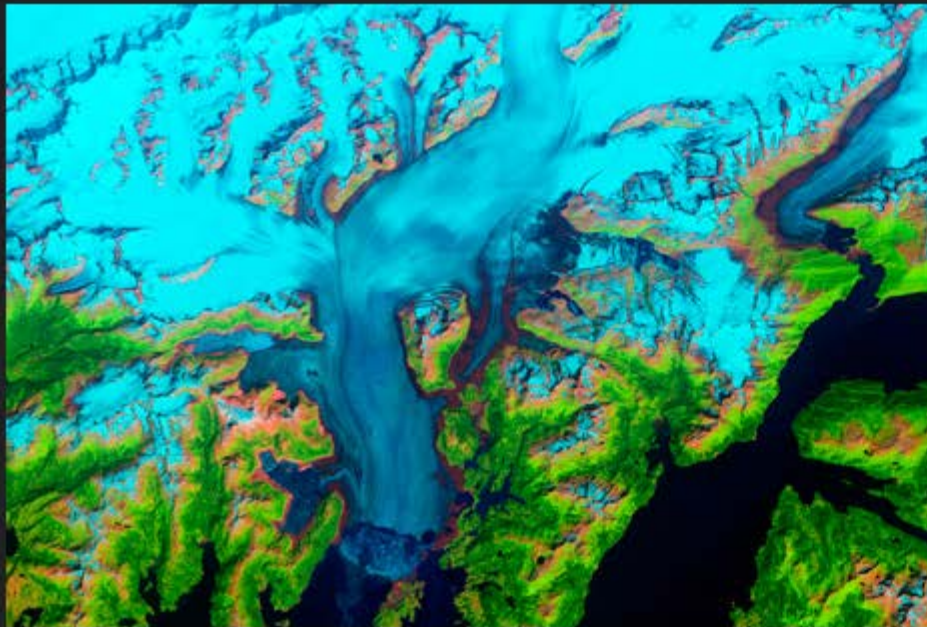
CC on off find out more credits music on off

NASA Climate Interactives



IMAGE VIEW MAP VIEW ALL IMAGES

11 of 304



July 28, 1986

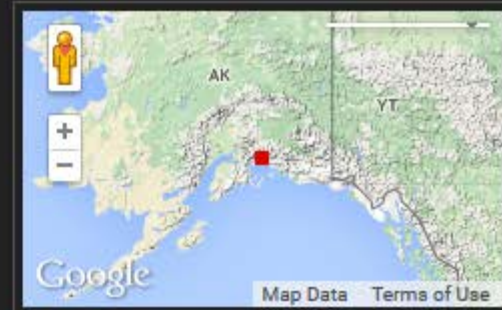


July 2, 2014

Shrinking glacier, Alaska

Alaska's Columbia Glacier descends through the Chugach Mountains into Prince William Sound. When British explorers surveyed the glacier in 1794, its nose extended to the northern edge of Heather Island, near the mouth of Columbia Bay. The glacier held that position until 1980, when it began a rapid retreat. The glacier has thinned so much that the up and down motion of the tides affects its flow as much as 12 kilometers (7.5 miles) upstream, until the glacier bed rises above sea level and the ice loses contact with the ocean.

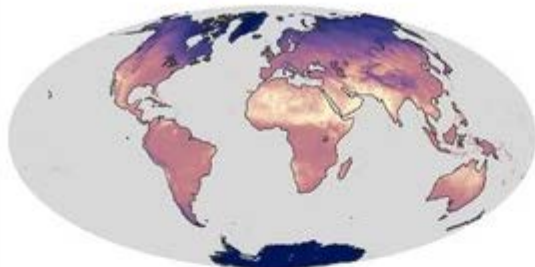
[show credits](#) [download image](#)



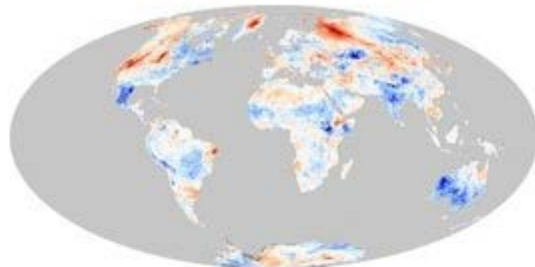
NASA's Earth Observatory

The screenshot displays the NASA Earth Observatory website interface. At the top, the NASA logo and "EARTH OBSERVATORY" are visible. Navigation tabs include Home, Images, Global Maps, Features, News & Notes, and a search bar. The main content area features a global map titled "2012 Temperature Anomaly (°C)" with a color scale from -4 to 4. Below the map is a line graph showing "Temperature Anomaly (°C)" from 1950 to 2012, with four data series: NASA Goddard Institute for Space Studies, Met Office Hadley Centre/Climatic Research Unit, NOAA National Climatic Data Center, and Japanese Meteorological Agency. The graph shows a clear upward trend in temperature anomalies over the period. On the right sidebar, there is a news article titled "Long-Term Global Warming Trend Continues" dated January 16, 2013, with social media sharing options. Below the article is a "More Images of the Day" section with two small images. Further down is a "SUBSCRIBE TODAY" banner and a "Our Twitter" section featuring a tweet from NASA Earth (@NASA_EO) with 36 million followers, mentioning a link to a satellite image of Siberia.

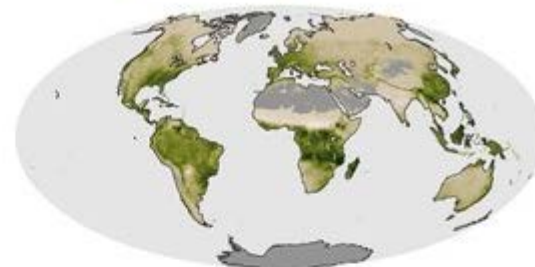
Land Surface Temperature



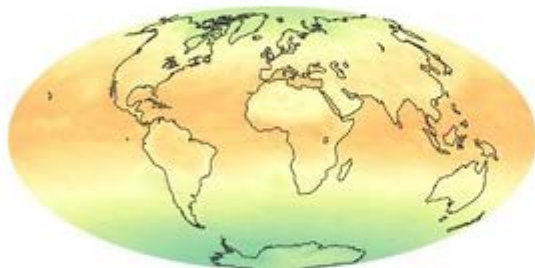
Land Surface Temperature Anomaly



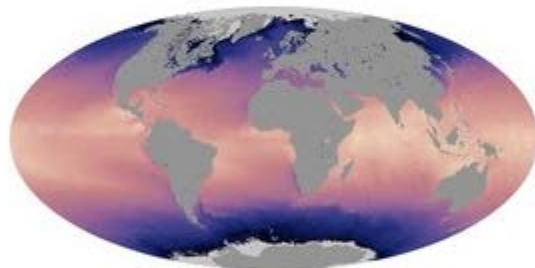
Net Primary Productivity



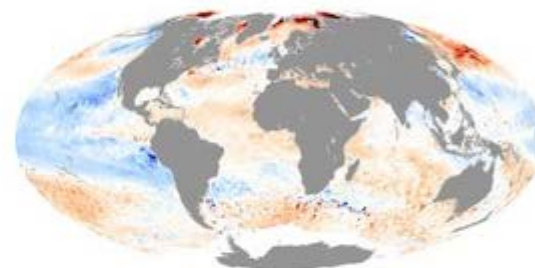
Net Radiation



Sea Surface Temperature



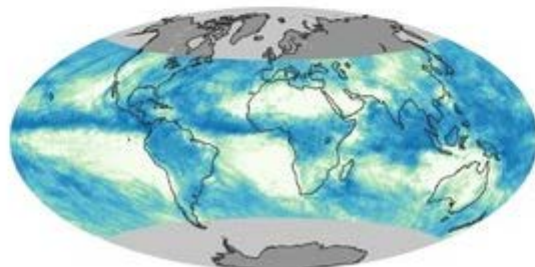
Sea Surface Temperature Anomaly



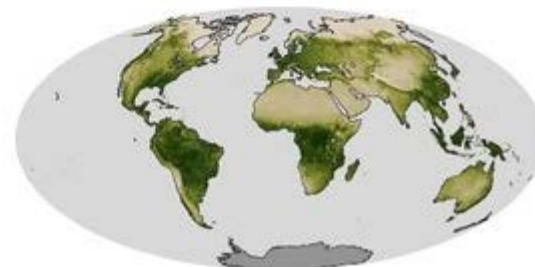
Snow Cover



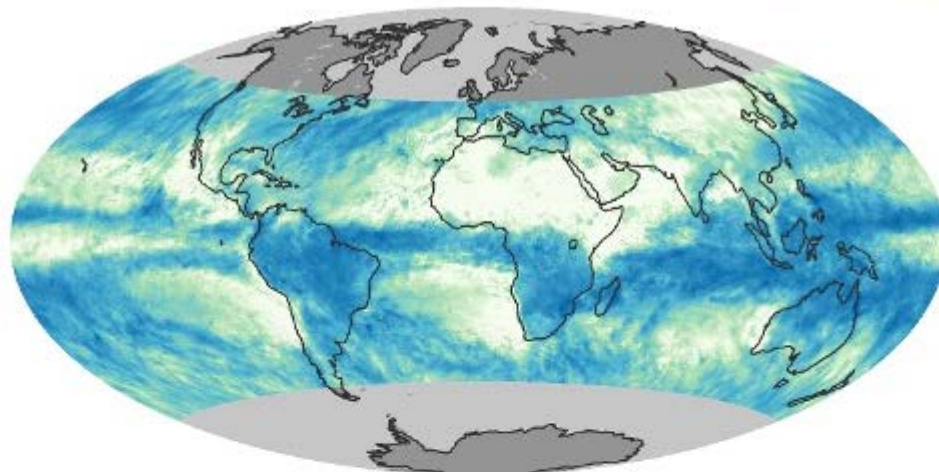
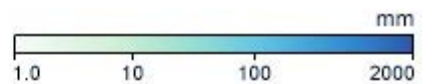
Total Rainfall



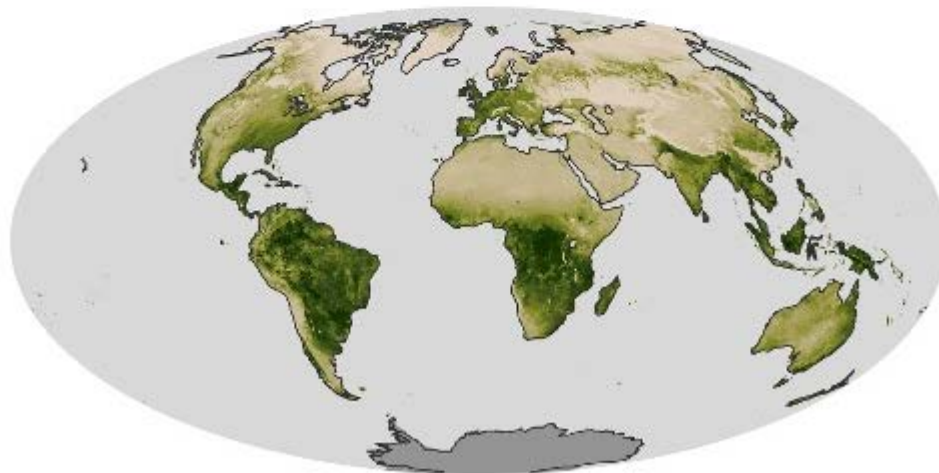
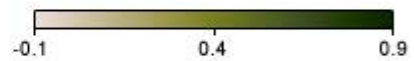
Vegetation



Total Rainfall



Vegetation



February 2000



October 2014



ATMOSPHERE

ENERGY

LAND

LIFE

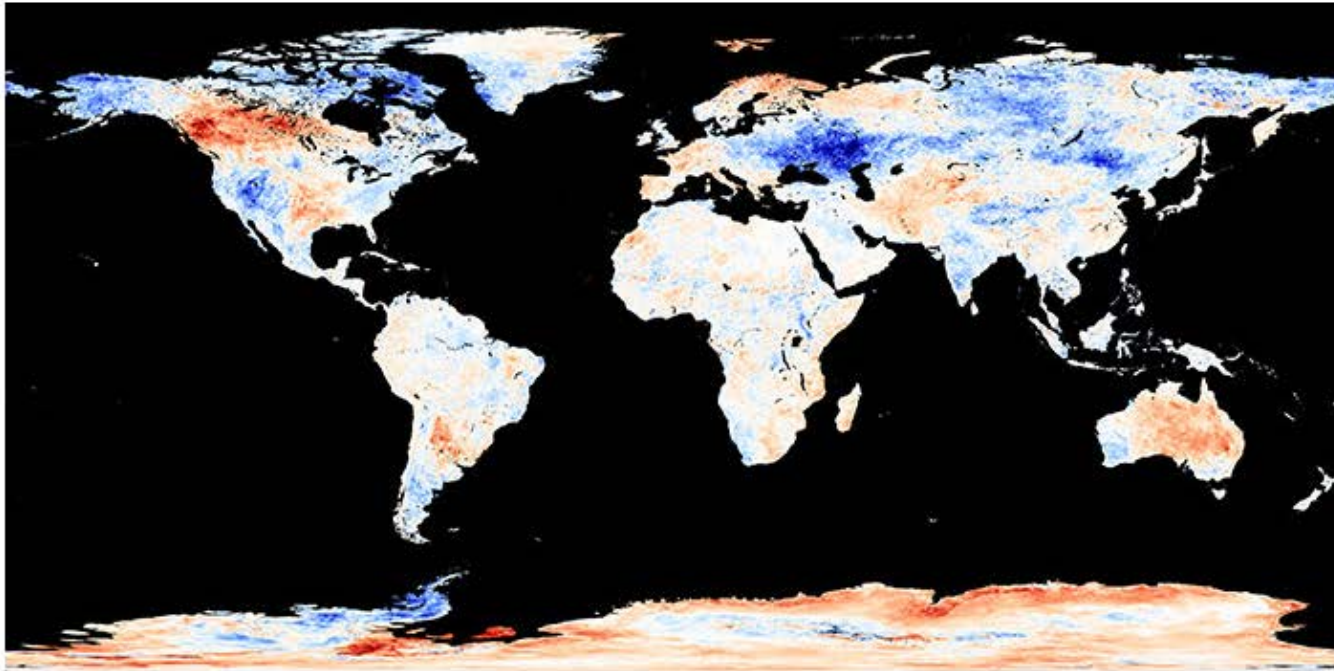
OCEAN

NEWS

ABOUT

0 IMAGES

ANALYZE >

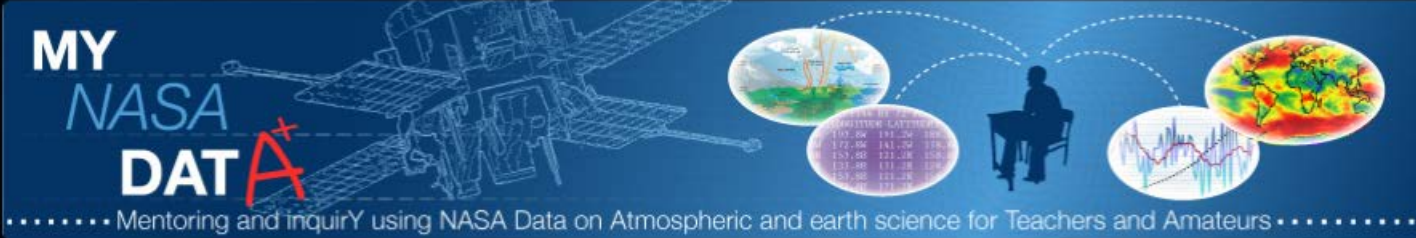


LAND

Land Surface Temperature Anomaly

Land surface temperature is how hot or cold the ground feels to the touch. An anomaly is when something is different from average. These maps show where Earth's surface was warmer or cooler in the daytime than the average temperatures for the same week or month from 2001-2010. [Read more](#)

My NASA DATA



..... Mentoring and inquiry using NASA Data on Atmospheric and earth science for Teachers and Amateurs

MY NASA DATA

Home

Live Access Server

Lesson Plans

Data Sources

Mission

Mission Support

Observe Your World

Conferences

Meet the Team

MND News

Google™ Custom Search

Educators

Students

Citizen Scientists

Researchers

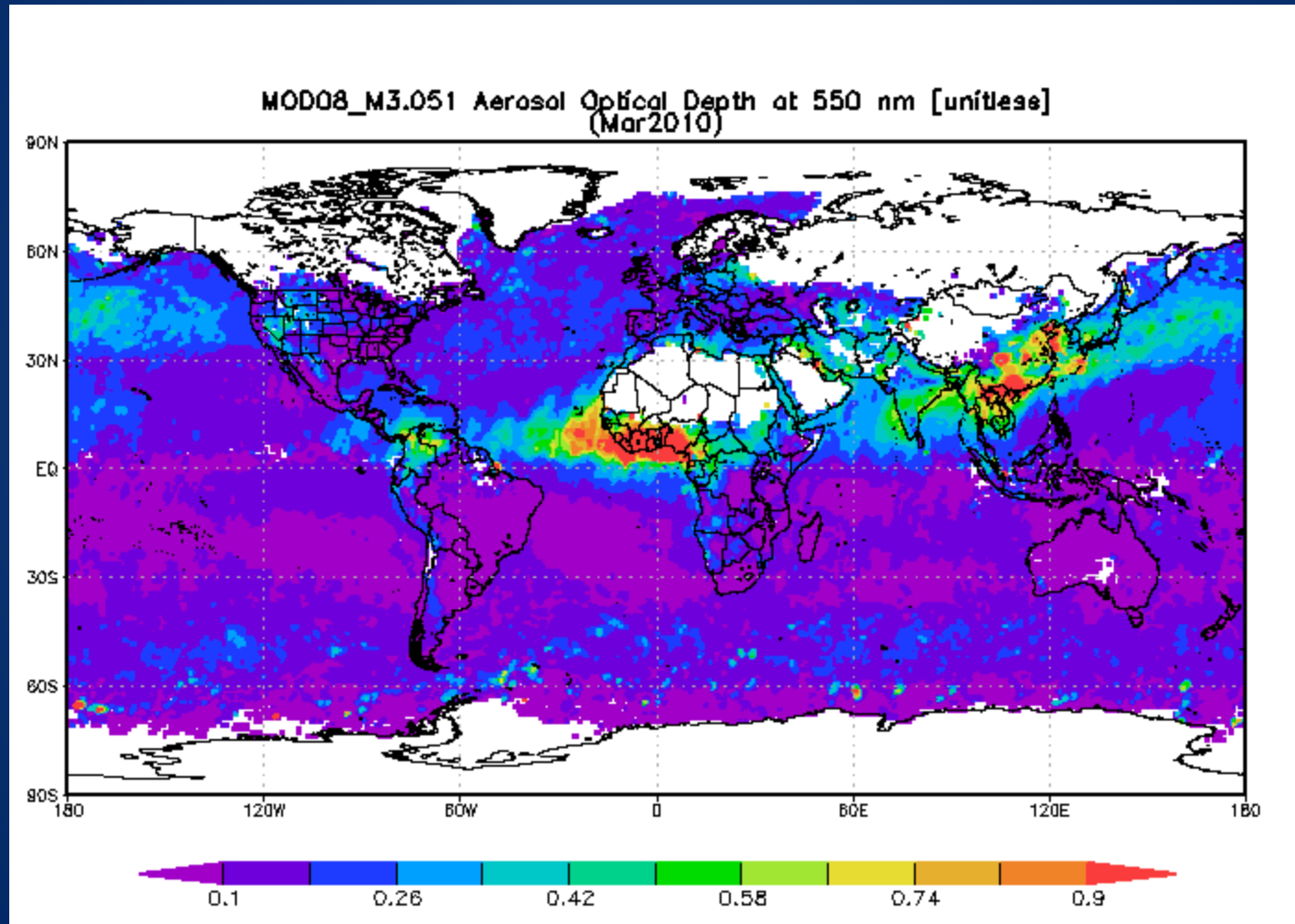
Using My NASA Data

Over 200 Data Sets that will fit into any Science Classroom!

NASA WEB SEMINARS

<http://mynasadata.larc.nasa.gov/>

Data Enhanced Investigations for Climate Change Education



Climate Essentials Multimedia Gallery

The screenshot shows the NASA Goddard Space Flight Center website's Climate Essentials Multimedia Gallery. At the top, the NASA logo and "GODDARD SPACE FLIGHT CENTER" are on the left, and "+ Visit NASA.gov" is on the right. Below this is a large banner with the text "Goddard Multimedia" in orange over a background of a bright sun or star. A navigation bar contains links for "+ HOME", "+ PROJECTS", "+ LINKS", "+ HELP", and "+ MAP".

On the left side, there is a search bar with a "Search" button and a link to "+ Advanced Search". Below the search bar is a vertical menu with the following options: "+ MOST RECENT IMAGERY", "+ GALLERY", "+ IMAGERY BY KEYWORD", "+ IMAGERY BY INSTRUMENT", "+ IMAGERY BY SERIES", "+ IMAGERY BY SCIENTIST", "+ IMAGERY BY ANIMATOR", "+ IMAGERY BY ID NUMBER", and "+ OTHER SEARCHES". At the bottom of this menu is the "NASA VIZ VISUALIZATION EXPLORER" logo.

The main content area is titled "Climate Essentials" and contains a paragraph: "This Climate Essentials multimedia gallery brings together the latest and most popular climate-related images, data visualizations and video features from Goddard Space Flight Center on one web page. Browse our top ten most popular climate resources, or select from the categories below. You can download the imagery in a variety of formats directly from this site. For more multimedia resources on climate and other topics, search the [Scientific Visualization Studio](#). To learn more about NASA's contribution to understanding Earth's climate, visit the [Global Climate Change site](#)."

Below the text is a section titled "The Essentials" which features a grid of ten climate-related images, each with a caption below it:

- Sea Ice
- Greenland Ice Sheet
- Global Temperature
- Ozone
- SST
- Carbon Dioxide
- Deforestation
- Population and Urban Growth
- Drought and Agriculture
- Wildfire

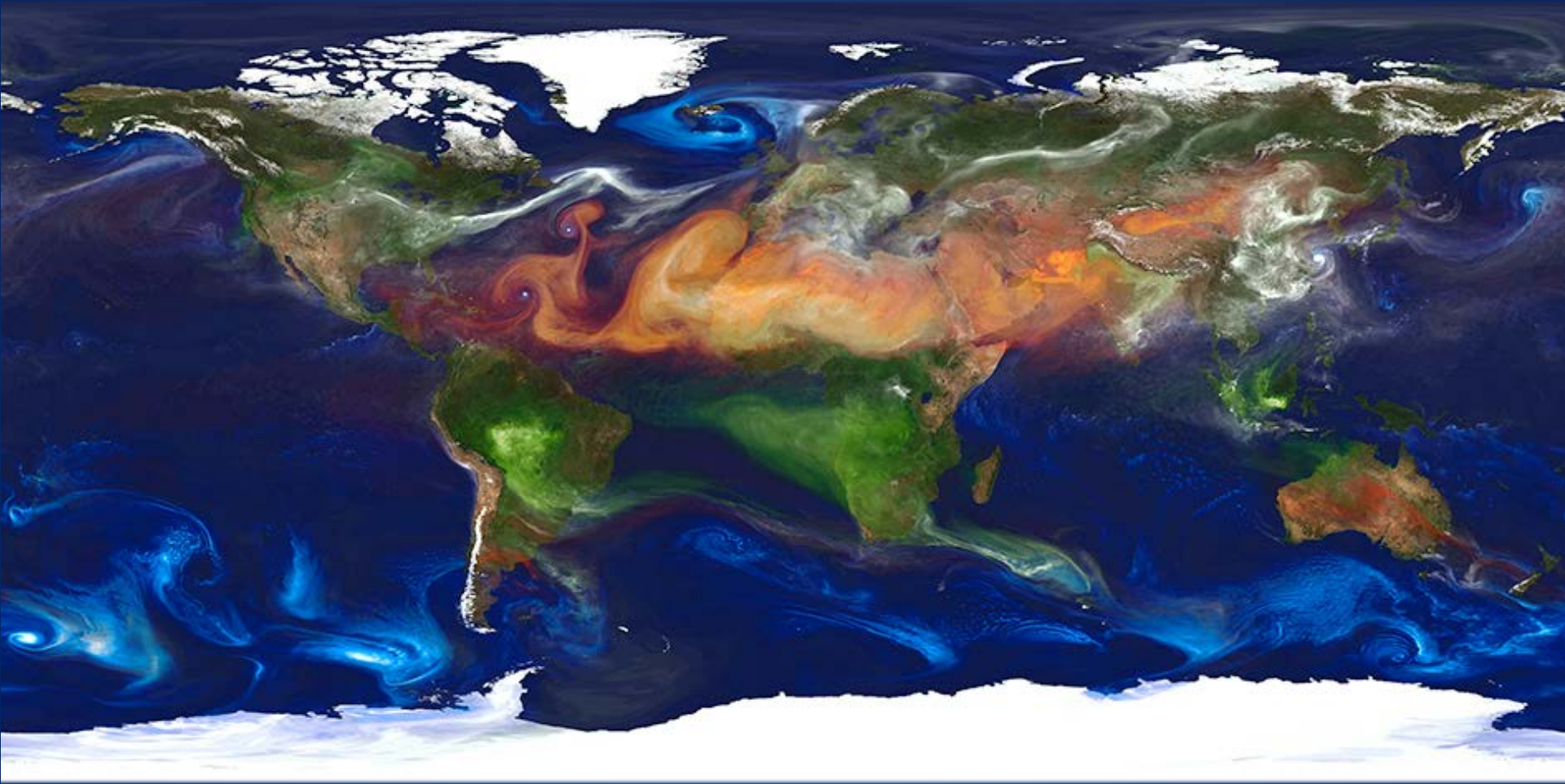
At the bottom of the main content area is a link for "Multimedia Resources".

Timelapse powered by Google Earth Engine

The image shows a screenshot of the Google Earth Engine interface. At the top left is the Google logo and a search bar with the text "Search anywhere (e.g. 'Las Vegas') to see its timelapse". Below the search bar, the text "Earth Engine > Landsat Annual Timelapse 1984-2012" is visible. The main content area is split into two parts. On the left is a world map with a navigation control (compass, zoom in, zoom out) and a scale bar showing 4000 km and 2000 mi. A timeline at the bottom of the map shows a play button, the year 2012, the word "Fast", the year 1984, and a question mark icon. On the right is a large satellite image of the Columbia Glacier in 1984, with the Google logo and the year 1984 overlaid. Below this image is a grey bar with the text "Columbia Glacier Retreat, 1984-2011".

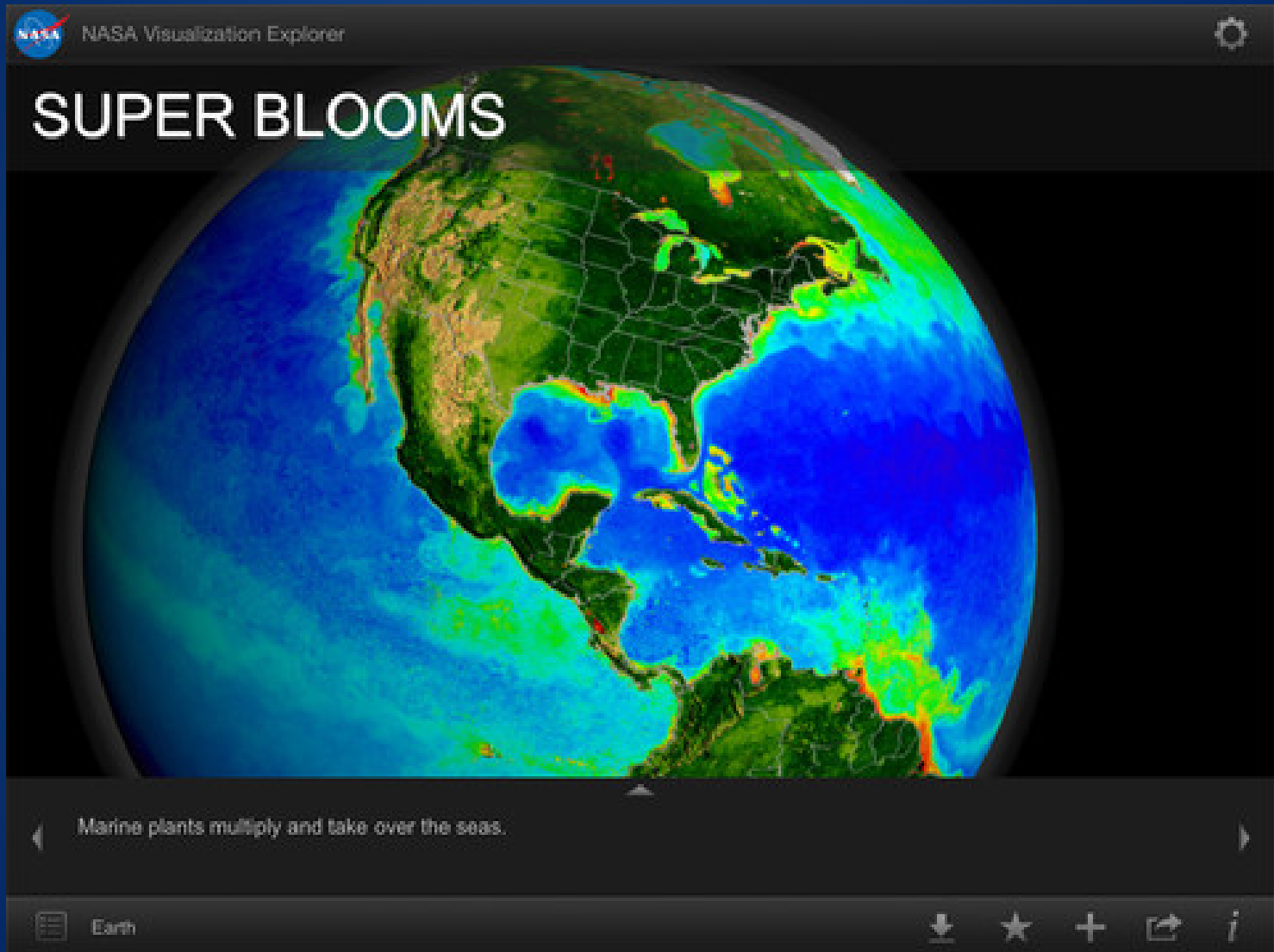
<http://world.time.com/timelapse/>

NASA's Paint by Particle

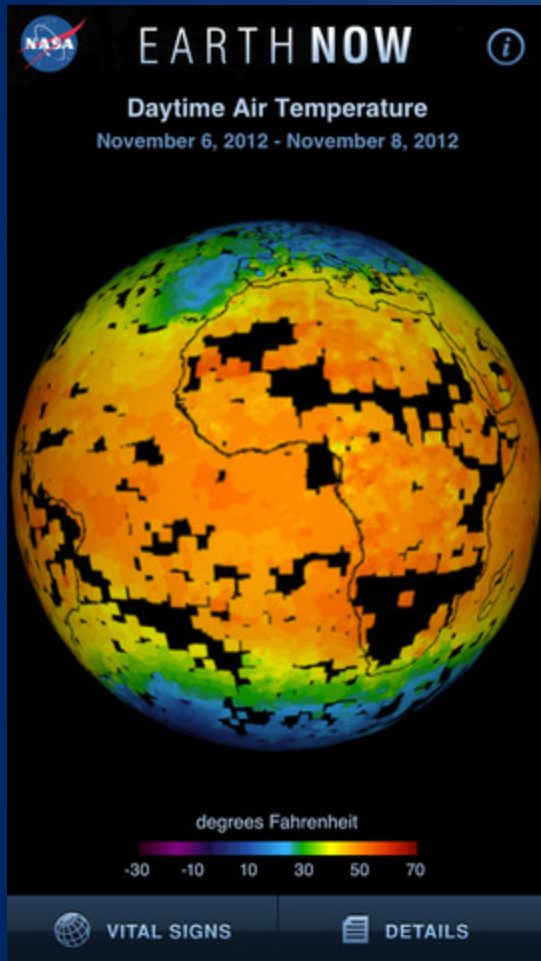


<http://svs.gsfc.nasa.gov/vis/a010000/a010900/a010977/>

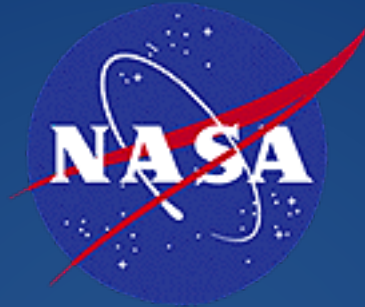
NASA's Visualization Explorer



NASA's Earth Now



Thank you!



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