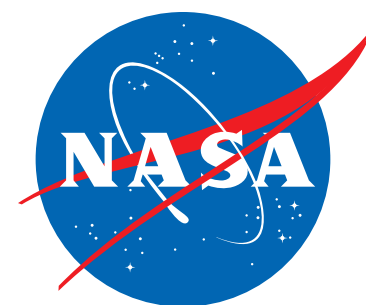


# Earth Day

45 YEARS OF CHANGE



# EARTH RIGHT NOW!

YOUR PLANET IS CHANGING, WE'RE ON IT.

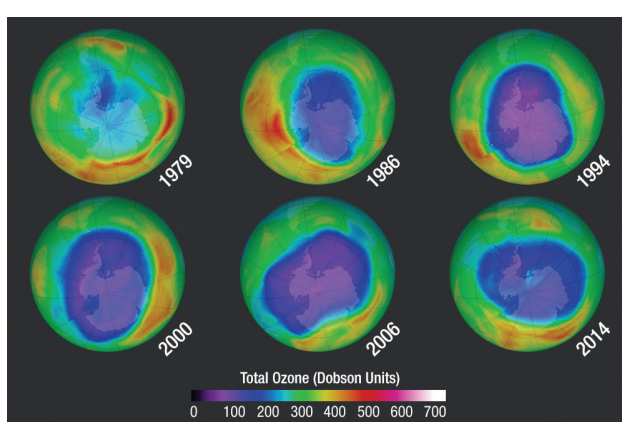
Earth is constantly changing. Some changes are a natural part of the Earth system while other changes reveal humanity's impact on our planet. Here's a brief look at how changes in our planet's atmosphere, land, ocean, and biosphere have been revealed over the last 45 years through advances in NASA Earth observations.



## Stratospheric Ozone

Multiple Missions

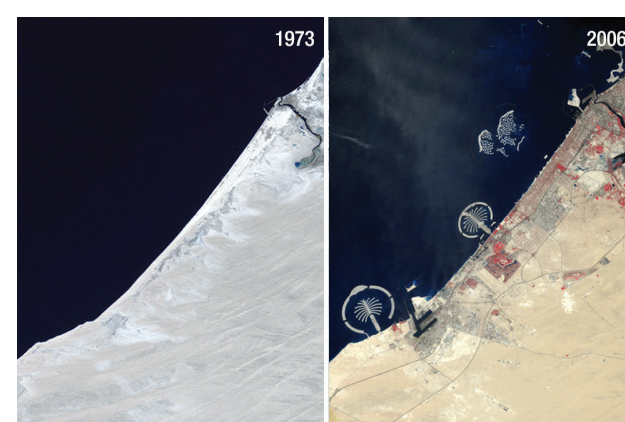
NASA's continuous stratospheric ozone measurements since the 1970s show the Antarctic ozone hole formation, continued presence, and its early signs of recovery.



## Land Cover Change

Landsat Program

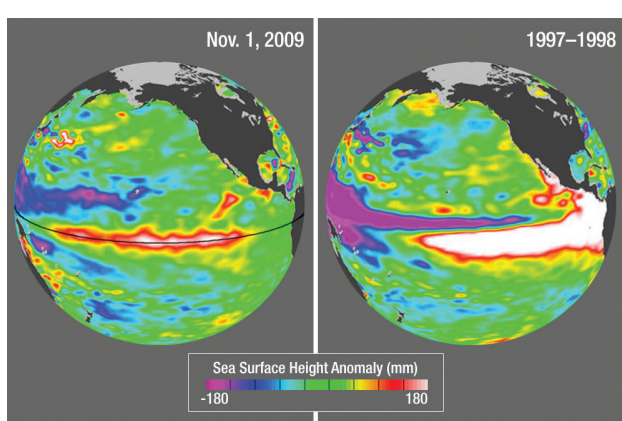
The city of Dubai, United Arab Emirates, transformed dramatically with rapid urban expansion and the addition of artificial archipelagos along its shoreline called the Palm Islands.



## El Niño and La Niña

OSTM/Jason 2 Mission

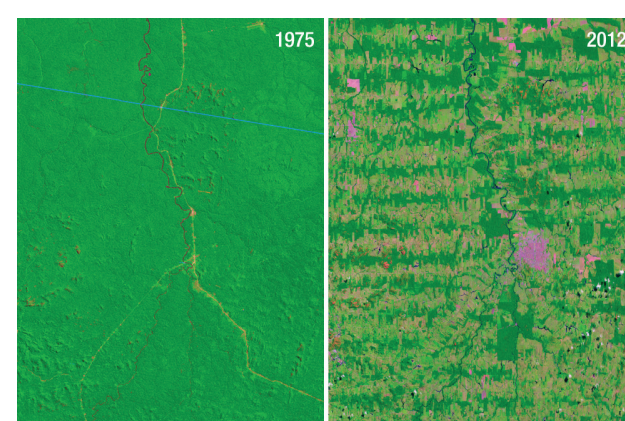
Precise measurements of Pacific Ocean surface heights enabled scientists to closely monitor the 2009–2010 El Niño, which was much smaller compared to the El Niño of 1997–1998.



## Monitoring Forests

Landsat Program

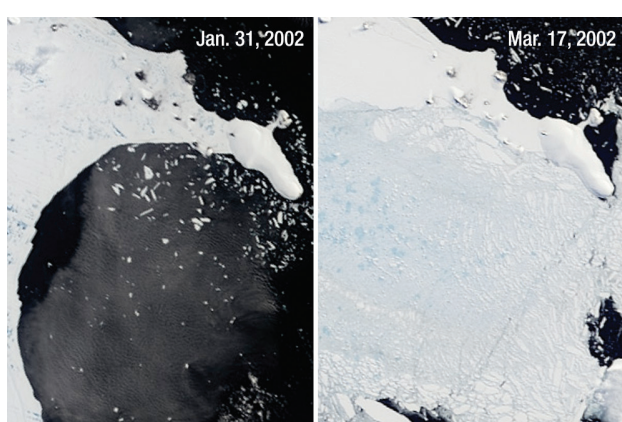
Continuous land observations since the 1970s have provided an unprecedented record of land use such as the clearing or degrading of over 60,000 square kilometers of forests in Rondônia.



## Ice Shelf Collapse

Terra Mission

Over just a few weeks in 2002, almost the entire Larsen B Ice Shelf along the Antarctic Peninsula splintered and collapsed. Terra captured this dramatic and important event.



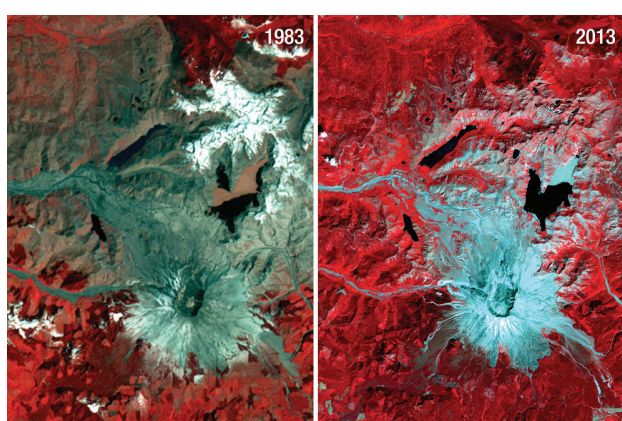
# Advances in Earth Observations

NASA Earth-observing missions have provided long-term global observations of the Earth system. From measuring water deep underground to monitoring gases in the atmosphere, scientists are able to study our planet like never before.

## Mount St. Helens

Landsat Program

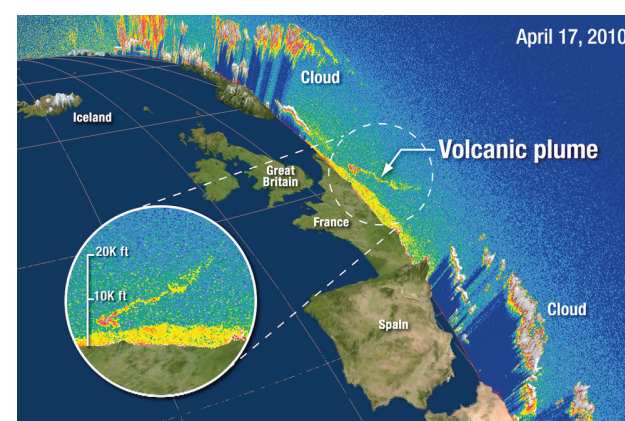
The 1980 volcanic eruption obliterated the landscape around Mount St. Helens with a cataclysmic flank collapse. Red indicates vegetated areas and gray-brown indicates non-vegetated areas.



## Ash Plume, Iceland

CALIPSO Mission

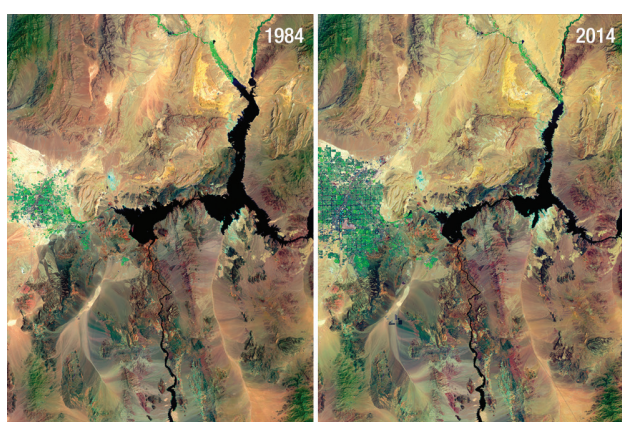
The CALIPSO satellite uses lasers to actively sense aerosol composition such as this ash in a plume from the Eyjafjallajökull volcano in 2010.



## Las Vegas and Lake Mead

Landsat Program

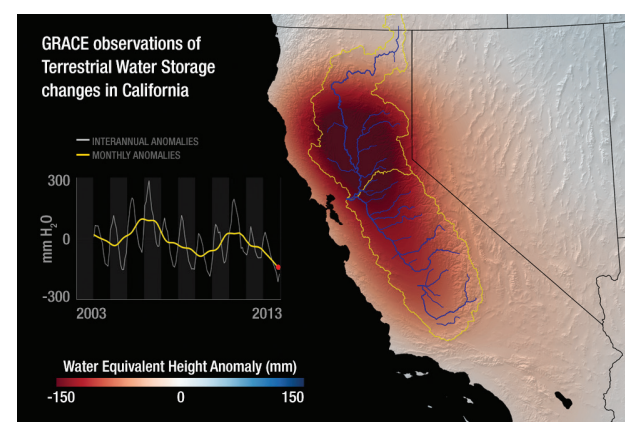
Strained by increasing human demand and persistent drought, water levels in Lake Mead have dropped over the last three decades as Las Vegas has continued to grow.



## Groundwater Storage

GRACE Mission

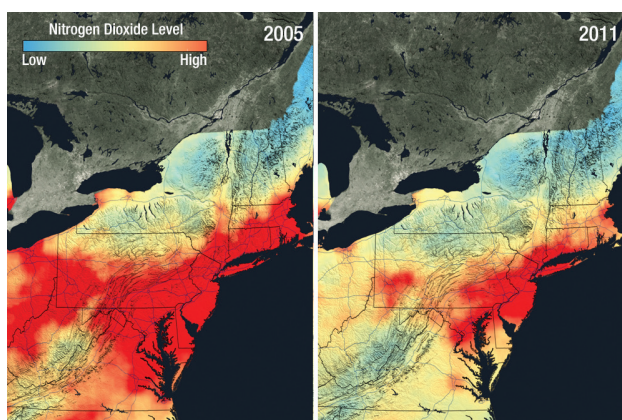
GRACE uses twin satellites to make detailed measurements of Earth's gravity field, revealing changes in groundwater storage around the planet.



## Air Pollution Reduction

Aura Mission

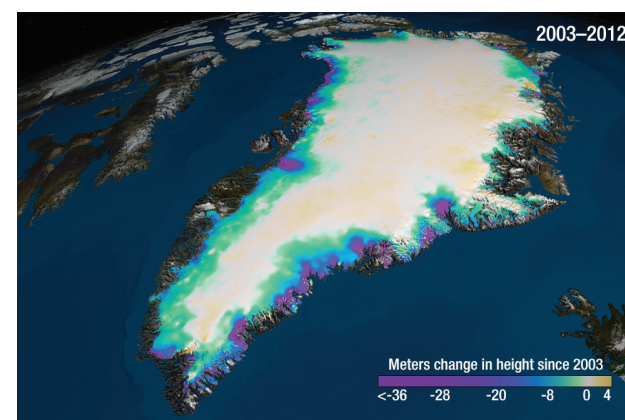
This satellite view of nitrogen dioxide pollution shows a marked decrease (20–40%) in the U.S. due to the implementation of emission control devices on cars and coal-burning power plants.



## Measuring Ice Loss

ICESat Mission; Operation IceBridge

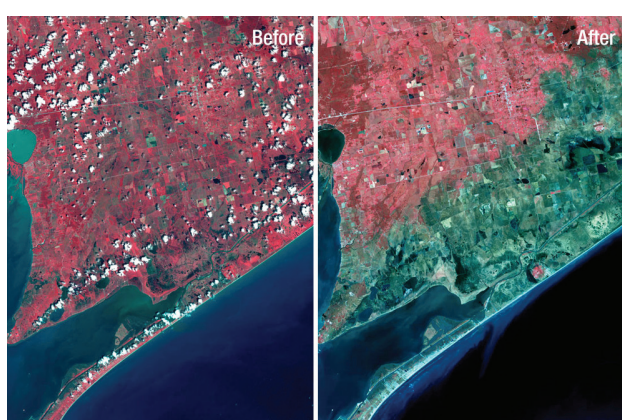
Laser altimeters onboard space and airborne missions have measured an average of 300 cubic kilometers of ice loss per year between 2003 and 2012 in Greenland.



## A Flood in Texas

Terra Mission

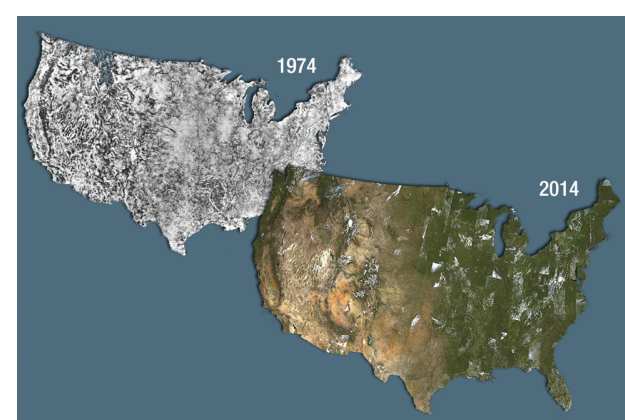
These before and after images of a 2006 hurricane in Galveston show the stunning aftermath of the flood. Vegetation is shown in red and areas inundated with saltwater are blue-green.



## Mosaic of the U.S.

Landsat Program

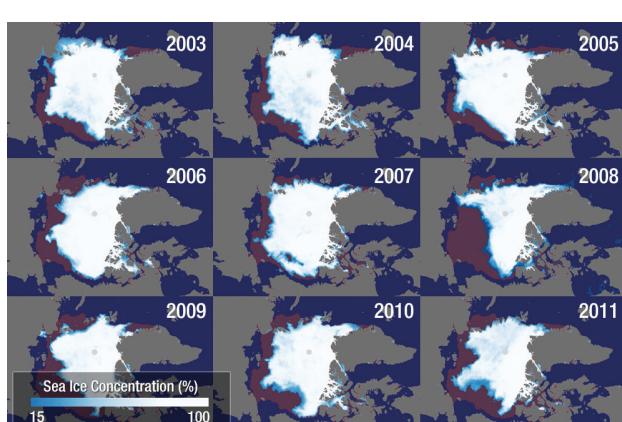
These two Landsat mosaics of the United States represent 40 years of improving sensor technology. The 2014 mosaic has reduced treatment of haze, aerosol, water vapor, and ozone effects.



## Arctic Sea Ice

Aqua Mission

Long-term satellite observations reveal marked changes in the Arctic sea ice cover, with decreases overall in every month, especially prominent in September, the month of minimum sea ice coverage.



## Global Biosphere

Multiple Missions

NASA has contributed to a continuous record of our biosphere—chlorophyll concentration in the ocean and vegetation index over land—processed to help observe climate trends.

