Landsat & Climate

Landsat provides the longest and most complete record on the state of the global land surface in existence. As a result, Landsat data are widely used for studies of climate variability and change, and are essential for studying the impacts of climate variability and change on the Earth's surface. The U.S. Climate Change Science Program, representing 15 federal agencies, has identified Landsat as a critical observatory for climate and environmental change research due to the unbroken length of the Landsat record and its importance to identifying the root causes and impacts of climate change.

Landsat has provided key measures that link land change, shifts in the global carbon balance, and increased climate variability. These data are essential for monitoring the relationship between human induced changes of the planet and climate change. Specifically, Landsat images enable researchers to identify terrestrial source and sinks of atmospheric carbon dioxide and to assess possible future impacts of climate change on local communities and the national economy.

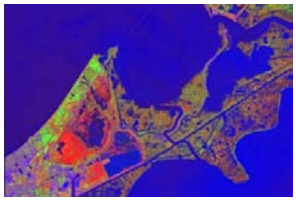
Landsat data are used by a wide range of federal climate researchers, including those of the National Science Foundation, NASA, the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, the Dept. of Energy, the Dept. of Health and Human Services, the Dept. of Defense, the Dept. of State and the Agency for International Development, and the Dept. of Agriculture, Transportation, and the Interior. Likewise, Landsat data are used for climate research by the Smithsonian Institution, the United Nations, and many national and international academic institutes and scientific organizations.

The Landsat series of Earth observing satellites began continuous observations of our planet in 1972. Newer versions of Landsat satellites are in orbit today, and work is underway to continue this legacy of critically important data and imagery with the launch of the next Landsat satellite in 2011. Landsat is jointly managed by NASA and the U.S. Geological Survey.

"A traditionally understood area of Landsat's significance is its use for basic research of Earth's climate changes."

-U.S. National Land Imaging Program Plan

Landsat Helps By:

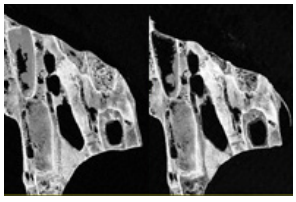


Calculating post-Katrina carbon impacts: *landsat.gsfc.nasa.gov/news/news-archive/sci_0019.html*

Estimating country-wide carbon stocks: *landsat.gsfc.nasa.gov/news/news-archive/sci_0001.html*

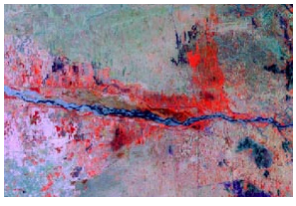
Providing the most detailed map ever of Antarctica: *landsat.gsfc.nasa.gov/news/news-archive/sci_0009.html*

Establishing the impact of bushfires on water yields: *landsat.gsfc.nasa.gov/news/news-archive/soc_0015.html*



Documenting Alaskan coastal erosion: *landsat.gsfc.nasa.gov/news/news-archive/soc_0014.html*

Mapping rift valley fever risk areas: *landsat.gsfc.nasa.gov/news/news-archive/soc_0001.html*



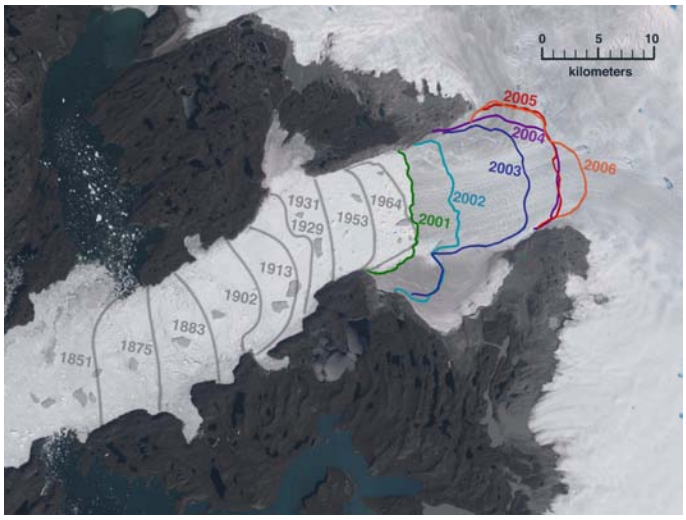
LANDSAT & climate change

Ice

Jakobshavn Isbrae is located on the west coast of Greenland. The ice front, where the glacier calves into the sea, receded more than 40 km between 1850 and 2006. Between 1850 and 1964 the ice front retreated at a steady rate of about 0.3 km/yr, and then stopped until 2001, when the ice front began to recede again, but far more rapidly (~3 km/yr). Recent calving front locations (2001–2006) derived from Landsat data are shown in color on this 2001 Landsat image.

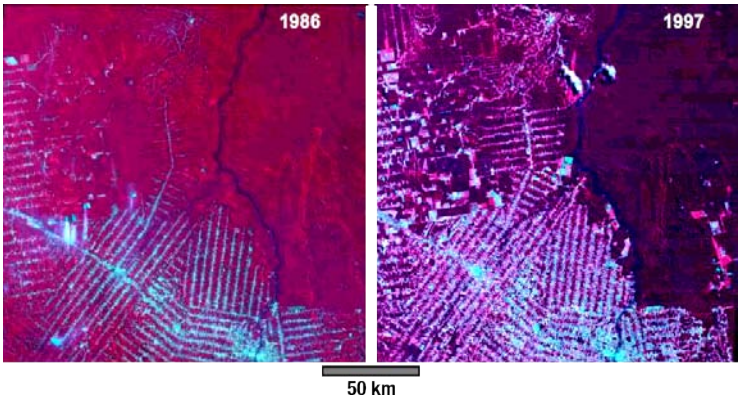
As more ice moves from glaciers on land into the ocean, it causes a rise in sea level. Jakobshavn Isbrae is Greenland's largest outlet glacier, draining 6.5 percent of Greenland's ice sheet area. The ice stream's speed-up has increased the rate of sea level rise by about .06 mm (about .002 inches) per year.

Source: Weidick and Bennike, 2007.



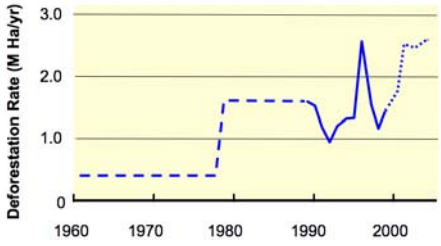
Credit: NASA/SVS; Weidick and Bennike.

Deforestation

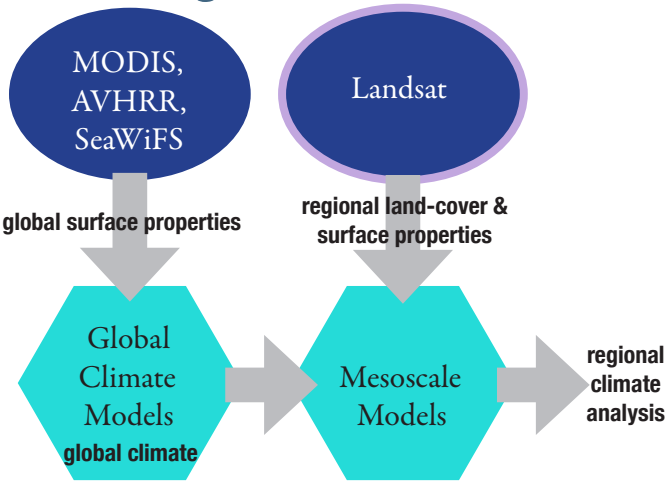


In this Landsat time series of images, the "herringbone" deforestation pattern can be seen in Rondonia, Brazil. Brazil's National Institute for Space Research (INPE) measures forest clearing each year using Landsat data. While deforestation rates vary by year, they have been rising steadily over the last 40 years.

Sources: Houghton et al., 2000; INPE/Brazil; Fearnside, 2005.



Modeling



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Note: First three paragraphs on first page excerpted from the U.S. National Land Imaging Program Plan.

National Aeronautics and Space Administration
Goddard Space Flight Center

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