



VIEWING THE INVISIBLE 2005: ICE MARGIN DYNAMICS  
FROM SATELLITE IMAGERY (Life on the Edge)

VIEWING THE INVISIBLE: is an OSU exhibition of images created as by-products of research in such disciplines as cognitive science, chemistry, medicine, engineering, physics, neurobiology, psychology and ophthalmology, which reveal aspects of the "hidden worlds" unique to each discipline.

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**IMAGE LOCATION:**

Jakobshavn Isbræ glacier, West Central Greenland, Lat 69.25°S, 310°E (250 km north of the Arctic Circle)

The calving front of the Jakobshavn Isbræ and the Ilulissat ice fjord are shown in the lower part of the image. Jakobshavn Isbræ, Greenland's largest and most active outlet glacier has recently been inscribed on the World Heritage list. The glacier moves at a speed of 19 m per day and calves more than 35 cubic km of ice per year. Nevertheless, there is abundant life on the neighboring land that has emerged from under the ice. Lichen and tundra vegetation, in particular, are widespread, as this image shows. Recent observations show that the glacier, which was stable for more than half a century, is speeding up and rapidly retreating. The observations of these dramatic changes inject a compelling sense of urgency into gaining a better understanding of the evolution of Jakobshavn Isbræ.

**IMAGE REVEALS:**

The use of satellite and airborne remote sensing enables precise mapping on a regional scale, providing clues for reconstructing the history of the Greenland ice sheet from geological, geomorphological and geobotanical information. This image, presenting the supervised classification of a Landsat Enhanced Thematic Mapper (ETM+) multispectral satellite image, reveals the distribution of different landcover types in the ice marginal region. In particular, the triline indicates retreat of the ice margin since the maximum stand attained during the Little Ice Age.

Landcover features of note: separation of land areas according to plant type—areas dominated by lichen-covered rocks or existence of some tundra vegetation; rock without plant cover; clear seawater and lakes; water in lakes and fjords containing sediment; lakes with or without drainage; ice sheet and glacier surface covered by sediments, and even a hint of the steep topography in a few areas that were deeply shadowed in the original satellite image.

Geomorphological features to note: Trimzones, unvegetated rock showing places where the glacier ice has recently retreated; crevasses and flowlines are visible on the ice surface, especially near the calving fronts of outlet glaciers; sediment plumes in seawater where glacial meltwater streams enter to fjords; lakes on the glacier surface and at the glacier edge; upland lakes with ice and/or sediment and valleys with glacial outwash and braided streams.

**THE IMAGE AND THE ADVANCED PROCESSING:**

The image was obtained by supervised classification of the orthorectified and atmospherically corrected Landsat ETM+ imagery. Ground truth data were collected by field spectral measurements in 2003, by a Fieldspec FR spectrometer from Analytical Spectral Devices, Inc.

**CREDITS:**

The orthorectified Landsat ETM+ imagery, acquired on July 1, 2001 was provided by the Global Land Cover Facility, University of Maryland, MD. Image processing was performed by ENVI from Research Systems, Inc. at the Byrd Polar Research Center's International Cryospheric Assessment Program laboratory. The research was funded by NASA's Polar Program.