

PIERCING THE SECRETS OF THE JAKOBSHAVN ISBRAE GLACIER

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The ice tongue of the Jakobshavn glacier on Greenland's west coast has retreated significantly in the last five years. At the same time, it has thinned and started to flow faster. These changes have been confirmed in processed SPOT 5 HRS imagery.

Outlet glacier in Greenland

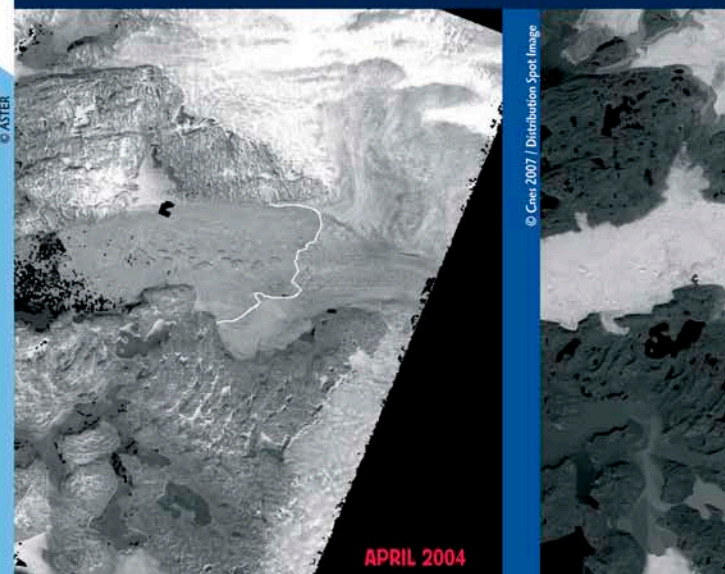
The town of Jakobshavn (Ilulissat in Greenlandic) lies near the mouth of the eponymous fjord from where icebergs calve off the Jakobshavn Isbrae glacier into Disko Bay. A UNESCO world heritage site, this glacier is one of the largest on the Arctic ice sheet, discharging some 35 billion tonnes of ice into the sea every year, that is, 6 to 10 percent of the total mass of ice discharged into the Northern Hemisphere oceans. Jakobshavn Isbrae is now the world's fastest-flowing glacier and is estimated to be responsible for 4 percent (0.06 mm) of the recent rise in sea level across the globe.

SPOT 5'S HRS INSTRUMENT SERVING GLACIOLOGISTS

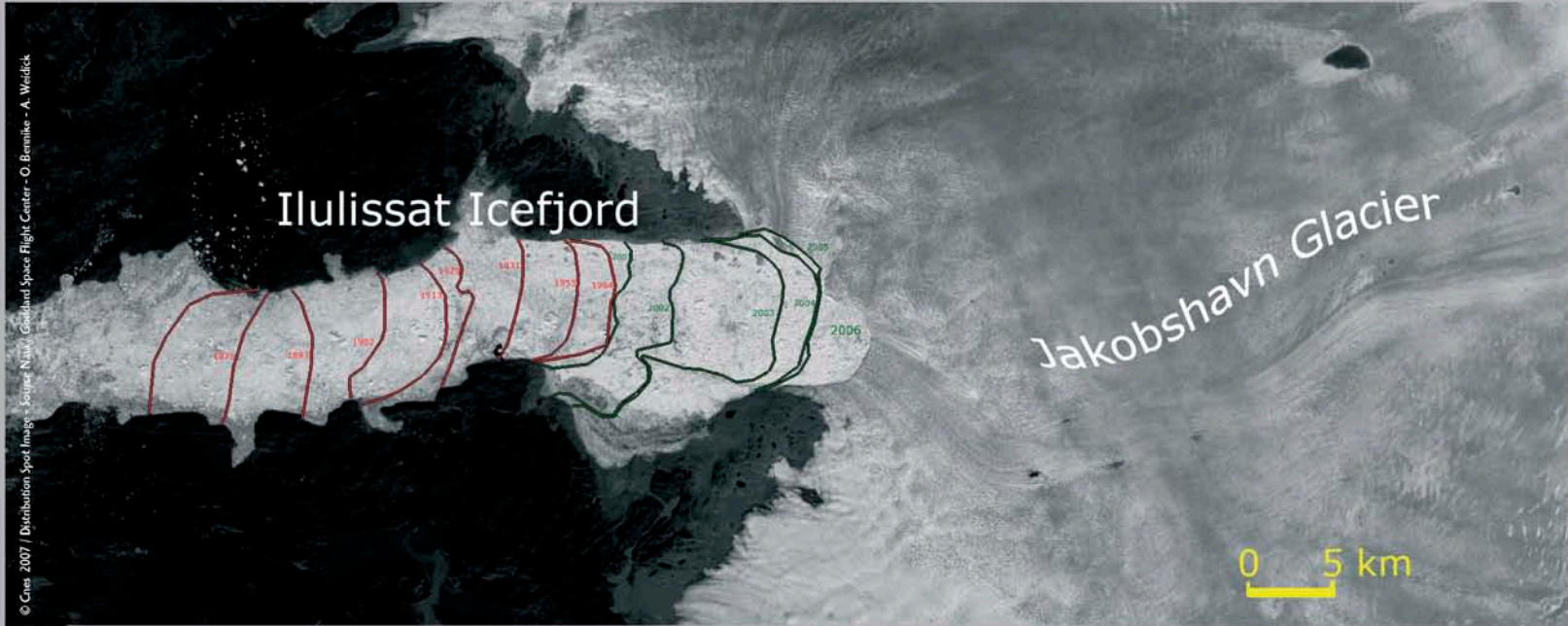
CNES and Spot Image are currently building up a large archive of SPOT HRS imagery for the International Polar Year. An initial campaign in the Northern Hemisphere covered some 830,000 sq.km. of the polar regions. This project is funding production and distribution of DEMs to the international scientific community to support the study of changes in the polar ice sheets.

The Antarctic campaign now underway is pursuing the ambitious objective of covering two million sq.km. of the ice sheet in an effort to give scientists a clearer picture of our changing planet.

HRS GLACIOLOGY: A NEW TOOL FOR DETECTING ICE THICKNESS



This change-detection map was generated by correlating a DEM from April 2004 with a SPOT 5 HRS DEM from July 2007.



The main front, or ice tongue, where icebergs calve from the glacier has retreated 40 kilometres since 1850. But this process has not been constant. From 1850 to 1964, the tongue retreated about 0.3 km a year, speeding up slightly in 1929-1930. The front remained somewhat constant from 1964 to 2001 and then accelerated significantly, reaching a speed of 3 km per year from 2001 onwards.

Since 2004, new ASTER and Landsat satellite data have revealed a clear break in the glacier's advance. Its northern and southern sections are exhibiting different behaviour, with the ice

streams driving the flow of ice to the calving front moving at different speeds. The rate of ice flow doubled between 1985 and 2006, from 17 metres to 35 metres per day.

Details in the DEM

SPOT 5's HRS instrument has been used to map the Jakobshavn glacier precisely in three dimensions. Comparing a digital elevation model (DEM) generated by IGN, France's survey and mapping agency, from SPOT 5 HRS imagery acquired in 2007 with a DEM from April 2003, the LEGOS space geophysics and oceanography research laboratory found that the glacier had thinned rapidly. The glacier's speed was also measured by comparing two HRS orthoimages acquired 10 days apart. The main ice stream peaked at 42.5 metres per day (15.5 kilometres per year), making Jakobshavn Isbrae well and truly the world's fastest glacier. ■

