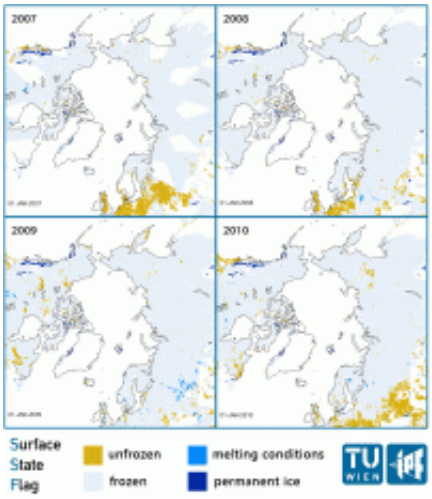
Signs of thawing permafrost revealed from space

March 27 2012



Seasonal freezing patterns on land surfaces in the northern hemisphere have varied over recent years. This animation was created using data from the scatterometer aboard the MetOp weather satellite. Credits: Vienna University of Technology

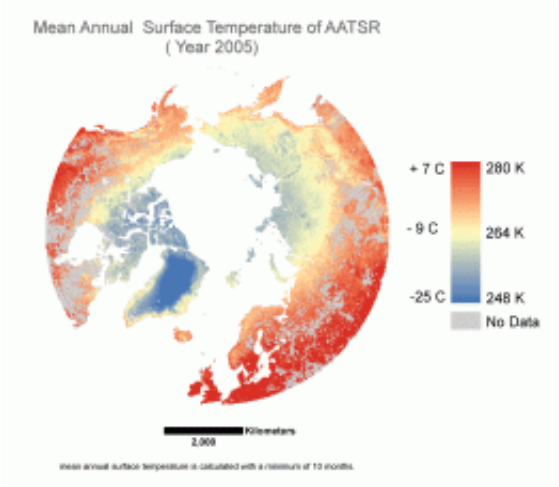
(PhysOrg.com) -- Satellite are seeing changes in land surfaces in high detail at northern latitudes, indicating thawing permafrost. This releases greenhouse gases into parts of the Arctic, exacerbating the effects of climate change.

Permafrost is ground that remains at or below 0°C for at least two consecutive years and usually appears in areas at high latitudes such as Alaska, Siberia and Northern Scandinavia, or at high altitudes like the

Andes, Himalayas and the Alps.

About half of the world's underground organic carbon is found in northern permafrost regions. This is more than double the amount of carbon in the atmosphere in the form of the greenhouse gases carbon dioxide and methane.

The effects of climate change are most severe and rapid in the Arctic, causing the permafrost to thaw. When it does, it releases greenhouse gases into the atmosphere, exacerbating the effects of climate change.



Mean annual surface temperature based on data from Envisat's Advanced Along Track Scanning Radiometer from 2005 to 2009. The rate at which permafrost evolves can be determined by studying its thermal regime, which is dependent on surface temperature. Surface temperature is a key parameter because it governs the surface energy budget and the thickness of the permafrost active layer. Credits: University of Waterloo

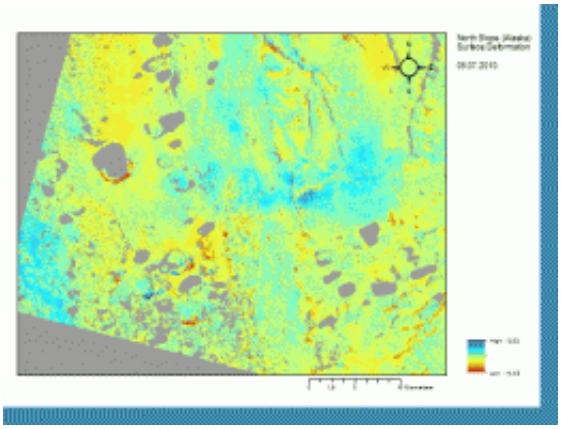
Although permafrost cannot be directly measured from space, factors such as surface temperature, land cover and snow parameters, soil

moisture and terrain changes can be captured by satellites.

The use of satellite data like from ESA's Envisat, along with other Earth-observing satellites and intensive field measurements, allows the permafrost research community to get a panoptic view of permafrost phenomena from a local to a Circum-Arctic dimension.

"Combining field measurements with remote sensing and climate models can advance our understanding of the complex processes in the permafrost region and improve projections of the future climate," said Dr Hans-Wolfgang Hubberten, head of the Alfred Wegner Institute Research Unit (Germany) and President of the International Permafrost Association.

Last month, more than 60 permafrost scientists and Earth observation specialists came together for the Third Permafrost User Workshop at the Alfred Wegener Institute in Potsdam, Germany, to discuss their latest findings.



Seasonal subsidence due to active layer dynamics on top of permafrost on the North Slope, Alaska. The animation was created using data from the German TerraSAR-X satellite during the summers of 2010 and 2011. Credits: Gamma Remote Sensing

"The already available Permafrost products provide researchers with valuable datasets which can be used in addition to other observational data for climate and hydrological modelling," said Dr. Leonid Bobylev, the director of the Nansen Centre in St. Petersburg.

"However, for climate change studies – and in particular for evaluation of the climate models' performance – it is essential to get a longer time series of satellite observational data.

"Therefore, the Permafrost related measurements should be continued in the future and extended consistently in the past."

ESA will continue to monitor the permafrost region with its Envisat satellite and the upcoming Sentinel satellite series for Europe's Global Monitoring for Environment and Security (GMES) program.

Provided by European Space Agency

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