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Towards operational monitoring of lakes in permafrost environments

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Changes in Permafrost have major implications for greenhouse gas emissions. In particular thermokarst lakes are associated with atmospheric methane exchange. Therefore, monitoring and recording their dynamics play an important role in future climate predictions.

The necessity of implementing an appropriate operational monitoring system is considered by analysing time series of microwave images from these environments. Thermokarst lakes in Yakutsk, Siberia and the Mackenzie Delta, Canada are examined using microwave data from the European ENVISAT and the Japanese ALOS satellites. ENVISAT ASAR Wide Swath (WS) is compared to ALOS PALSAR data, in particular focusing on the different spatial resolution. ASAR operates in the C-band. Its WS mode has a pixel spacing of 75 m. PALSAR is a L-band instrument with a spatial resolution of 12.5 m.

Many thermokarst ponds are below the resolution, especially the ASAR WS data. However, this kind of data allows for frequent, operational monitoring of the lake regions. Data from the years 2006 to 2009 are analysed and compared with PALSAR data. This study contributes to the ESA DUE Premafrost project (www.ipf.tuwien.ac.at/permafrost/).

Evaluating the discrepancies in microwave data that arise due to the different sensors will allow for adequate monitoring of thermokarst lakes; an issue that needs addressing in an increasingly changing environment.