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Surface status information from scatterometer data for improved climate modelling at high latitudes

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Boreal soils with underlying permafrost are expected to increasingly contribute to global greenhouse gas emissions under warmer climatic conditions. The ESA STSE funded project ALANIS-Methane (www.alanis-methane.info) aims to assess the potential of a combined land surface modelling and earth observation approach to quantify methane emissions in Northern Eurasia. Necessary model inputs/constraints like freeze-thaw and wetlands dynamics are derived from a variety of sensors. The objective the ESA DUE project Permafrost (www.ipf.tuwien.ac.at/permafrost) is to establish a monitoring system based on satellite data. Remotely sensed products are especially adapted and/or developed for use by climate modelers who address permafrost issues.

The purpose of this study which contributes to ALANIS-Methane as well as DUE Permafrost is to demonstrate the potential of C-Band scatterometer data (ASCAT onboard MetOp A) for the detection of Freeze/Thaw conditions on a global scale. An empirical threshold-analysis algorithm is used to produce a product which differentiates between frozen, unfrozen and melting conditions.

The Freeze/Thaw product has been validated with different global and regional temperature datasets ranging from model data (ERA-INTERIM, GLDAS-NOAH) to in-situ measurements (WMO-METEO stations, CALM Borehole data) for the years 2007 and 2008. This validation shows good agreement between the extracted frozen/unfrozen flag and the various temperature datasets.