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

Christoph Paulik (1), Vahid Naeimi (1), Annett Bartsch (1), Stefan Schlaffer (1), Wolfgang Wagner (1), Kirsten Elger (2), and Birgit Heim (2)
(1) Institute of Photogrammetry and Remote Sensing, Vienna University of Technology, (2) Alfred Wegener Institute for Polar and Marine Research, Potsdam, Germany

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.