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Interannual Patterns of Freeze/Thaw and Soil Moisture Observed by Spaceborne Scatterometers

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Spaceborne scatterometers have originally been built to observe winds over the oceans. Research has however demonstrated that scatterometers can also be used for monitoring freeze/thaw processes and soil moisture over land. Their advantages are: (i) Observations can be made day and night under all-weather conditions; (ii) Measurements are highly sensitive to the dielectric properties of the Earth's surface; and (iii) Scatterometers achieve a high radiometric accuracy. Three scatterometers have so far been providing multi-year observations: the two C-band scatterometers on-board of the European Satellites ERS-1 (1991-2000) and ERS-2 (1995 up to the present), and the Ku-band scatterometer on-board of NASA's QuikScat satellite (1999 up to the present). In October 2006 the next C-band scatterometer will be launched on-board of METOP-A, which is the first of a series of three METOP satellites foreseen to provide weather- and climate relevant data for at least 14 years. Algorithmic advances, together with the increasing availability of long-term data sets, make scatterometers more and more to an attractive source of data for climate-related studies. In this presentation we show how ERS-1 and ERS-2 depict interannual changes of soil moisture for different climatic regions for the period 1991 up to the present. We also present the application of a novel freeze/thaw detection algorithm to QuikScat data over central Siberia for the period 1999-2004. The data are available from http://www.ipf.tuwien.ac.at/radar/.While the data sets are yet too short to make interferences about climate- relevant changes in global phenology and water cycle, they depict year-to-year variations and extreme events, such as drought and flood conditions, well. Thanks to the METOP programme it will be possible to extent the observation period at least up to the year 2020, whereby land-related climate studies will become possible as well.

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