Geophysical Research Abstracts, Vol. 8, 09573, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09573

Sensitivity of passive microwave snow depth retrievals to weather effects and snow evolution

T. Markus (1), D. Powell (2), J.R. Wang(1)

(1) NASA Goddard Space Flight Center, Code 614.6, Greenbelt, MD, 20771 (Thorsten.Markus@nasa.gov), (2) University of Maryland Baltimore County, Joint Center for Earth Systems Technology, Baltimore, MD

Snow fall and snow accumulation are key climate parameters due to the snow's high albedo, its thermal insulation, and its importance to the global water cycle. Satellite passive microwave radiometers currently provide the only means for the retrieval of snow depth and/or snow water equivalent over land as well as over sea ice from space. All algorithms make use of the frequency-dependent amount of scattering of snow over a high-emissivity surface. Specifically, the difference between 37 GHz and 19 GHz brightness temperatures is used to determine the depth of the snow or the snow water equivalent. With the availability of the Advanced Microwave Scanning Radiometer (AMSR-E) on NASA's EOS Aqua satellite (launched in May 2002) a wider range of frequencies can be utilized. In this study we investigate, using model simulations, how snow depth retrievals are affected by the evolution of the physical properties of the snow (mainly grain size growth and densification), how they are affected by variations in atmospheric conditions and, finally, how the additional channels may help to reduce errors in passive microwave snow retrievals. The sensitivity of snow depth retrievals to atmospheric water vapor is confirmed through the comparison with precipitable water retrievals from NOAA's Advanced Microwave Sounding Unit (AMSU-B). The results suggest that a combination of the 10, 19, 37, and 89 GHz channels may significantly improve retrieval accuracy. Additionally, the development of a multi-sensor algorithm utilizing AMSR-E and AMSU-B data may help to obtain weather-corrected snow retrievals.