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Global multi-sensor active and passive microwave retrieval of snow parameters

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Remote retrieval of snow parameters is a major issue for hydrological, meteorological, and climatological applications. Seasonal snow is a major source of fresh water for many areas and it also regulates the heat budget of Earth's surface throughout its albedo. Remote sensing represents a very useful tool for studying the state of the cryosphere at different scales and providing information for places where it would be difficult, if not impossible, to collect data in person. Microwaves have the advantage of being independent of solar illumination and cloud cover and therefore provide a high degree of spatial and temporal coverage.

To utilize both the active and passive data, it is important to study the sensitivity of the recorded backscattering coefficients with respect to the evolution of the snowpack along the snow season. The trend of backscattering coefficients recorded by the SeaWinds scatterometer flying onboard the QuikSCAT satellite are studied together with the snow depth measured by the World Meteorological Organization (WMO) stations to look for related changes as snow accumulates and melts. Snow depth measurements from more than 100 stations selected among the 8000 available from the (WMO) for a period of five years, between 1999 and 2004 were used, and examples are reported for several areas and snow classes across the Northern hemisphere.

Microwave brightness temperatures from the SSM/I sensors onboard DMSP satellites and AMSR-E on Terra at 19 and 37 GHz (or similar frequencies) have been used to retrieve snow parameters such as snow water equivalent (SWE) and snow depth. The

combination of active and passive microwave data for remote sensing of snow can be used to improve the retrieval of SWE and snow depth from space and to support the retrieval of other parameters such as mean grain size. An empirical approach is proposed for studying the retrieval of snow parameters by an iterative inversion technique.