Exploration into the Potential Linkage between Local Fluctuations in Passive Microwave Snow Water Equivalent (SWE) Retrieval and Various Characteristics of a Rain-on-Snow (ROS) Event

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ABSTRACT

Wintertime rain-on-snow (ROS) events can impact snow stratigraphy via generation of wet snow and ice crust(s) either on or within the snowpack. Considering the assumptions of most passive microwave-based snow water equivalent (SWE) retrievals, which include a dry and homogenous snowpack, ROS events could significantly impact the accuracy of said SWE retrievals. Relatively little is known about the location and occurrence of most high-latitude ROS events. Consequently, in the absence of ground-based observations, it is difficult to discern if satellite-based SWE retrievals are doing an adequate job characterizing ROS-impacted snow packs. This study investigated potential linkages between local SWE fluctuations and the particular characteristics of an ROS event to further explore the efficacy of SWE retrievals at locations where an ROS event may have occurred.

ROS event characteristics explored include daily-averaged snow depth, precipitation, and near-surface air temperature. ROS events were also examined in terms of their timing in the winter season and spatial location. ROS events studied were detected using spectral and temporal criteria on variables calculated from the Advanced Microwave Scanning Radiometer – Earth Observing System (AMSR-E) observed brightness temperatures. Using the NSIDC AMSR-E/Aqua L3 Global SWE product, daily changes in SWE before, during, and after detected ROS events were collected and subsequently compared to those of ROS events with similar characteristics. This research has the potential to inform passive microwave SWE retrievals about snow pack conditions that violate the inherent retrieval assumptions, and hence, may require additional modification or flagging at a specific location in space and time.

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