SWE Retrieval Algorithm Advances using X- and Ku-band Radar

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ABSTRACT

Snow water equivalent (SWE) retrieval via radar volume scattering at X and Ku bands (10 and 17 GHz) has been the basis of snow satellite concepts such as the European CoReH2O concept. In the decade since then, significant advances have been made in our understanding of the physics of the radar signature. And, critically, the retrieval approach has been validated through multiple airborne and tower-based field campaigns in several countries. This X/Ku algorithm now forms the basis of a new NASA snow mission concept that has put the snow community within grasp of achieving the long-desired goal of global SWE at high resolution for the first time.

At the core of the algorithm is a dense media radiative transfer (DMRT) model. A parameterization study demonstrated that the problem can be simplified to one of solving for just two unknowns—SWE and the microwave scattering albedo—removing the need for high-precision snowpack modeling. The retrieval solution is determined through a cost function minimization approach after accounting for surface scattering from the snow-soil interface, low vegetation, and the scattering albedo. We will show validation results using both tower and airborne data up to 750mm of SWE and discuss the options for obtaining the necessary input parameters.

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