The AMSR2 Satellite-Based Microwave Snow Algorithm (SMSA): A Parsimonious Snow Depth and Snow Water Equivalent Approach

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The Satellite-based Microwave Snow Algorithm (SMSA) for estimating snow depth (SD) and snow water equivalent (SWE) is described. The algorithm is developed for use with the Advanced Microwave Scanning Radiometer – 2 (AMSR2) aboard the Global Change Observation Mission – Water, launched by the Japan Aerospace Exploration Agency in 2012. The SMSA standard SD product screens snow from non-snow surface targets (water bodies [including freeze/thaw state], rainfall, high altitude plateau regions [e.g. Tibetan plateau]) before detecting moderate and shallow snow. SMSA then applies the Dense Media Radiative Transfer model (DMRT) originally developed by Tsang et al (2000) and more recently adapted by Picard et al. (2011) to retrieve SWE and SD. The implementation combines a parsimonious snow grain size and density approach originally developed by Kelly et al (2003). Snow grain size is estimated from the tracking of estimated air temperatures that are used to drive an empirical grain growth model. Snow density is estimated from the Sturm et al. (2010) scheme. Results are presented from recent winter seasons since 2012 to illustrate the improved performance of the new approach in comparison with the initial AMSR2 algorithm estimates. Evaluation of the product is achieved using in situ snow depth data from a variety of standard and experiment data sources.