Comparing Passive Microwave Snowmelt Detection Methods using Ground-Based Snowmelt Observations

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ABSTRACT

Melting snow is an integral factor in understanding both the hydrologic cycle and energy budget of many regions. Monitoring wet or melting snowpacks is vital for river flood predictions, water resource management, monitoring climatic trends and changes, and avalanche risk forecasting. It is also important for researchers and government agencies monitoring snow depth and snow cover using passive microwave satellites, as liquid water in snow can cause high brightness temperatures due to differences in dielectric properties between wet and dry snow. Sites that collect continuous ground measurements of snow liquid water content are rare, while satellite observations are easily accessible and have the potential for snowmelt monitoring on a global scale. The goal of this study is to compare and evaluate the information provided by different snowmelt detection methods that use passive microwave satellite observations. Certain algorithms may be more sensitive to certain types of melt events, such as midwinter melt/refreeze events or spring melt onset/duration. For example, previous work has shown that the DAV (diurnal amplitude variation) method is best at showing mid-winter and melt onset events, while it is less useful for detecting late-stage spring melting. This study extends that research by applying similar analysis methods to different snowmelt detection algorithms. Snowmelt events detected using various algorithms applied to AMSR2 passive microwave brightness temperature data are compared to ground-based snowmelt observations, including continuous liquid water content measured by a Snow Pack Analyzer-2 located within the Sleeper's River Research Watershed in Vermont.

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