Evaluating Passive Microwave Snowmelt Detection Methods with Ground Snow Observations

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ABSTRACT

Snowmelt is an important hydrological factor in many areas in North America, especially in regions that rely on seasonal snowmelt to replenish water supply. Rapid spring melt can also lead to destructive river flooding. Because snowpack characteristics can vary significantly in different regions and climates, accurate global snowmelt modeling may require assimilation of both remote sensing and ground observations. The purpose of this investigation is to determine the level of insight that passive microwave remote sensing techniques can provide into complex snowmelt processes. We compare snowmelt events detected from passive microwave brightness temperatures (Tuttle & Jacobs, 2019, Water Resources Research) to daily observed snow water equivalent (SWE) and snow depth data from over 600 SNOTEL stations to determine how much information satellite data can provide about snowmelt processes. Specifically, we evaluate whether the satellite-detected melt events align with SWE decreases (water loss from the snowpack), or snow depth decreases without decreases in SWE (possible midseason melt events in which the melt is refrozen in the snowpack). Comparisons from regional subsets of SNOTEL stations are further analyzed to determine if the satellite snowmelt detection method has a higher accuracy in certain snowpack conditions and climates.

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