

Comparing Active and Passive Observations of Snowmelt Refreeze in the Sierra Nevada

GEORGE DUFFY¹, SAM TUTTLE¹, CARRIE VUYOVICH², ELIAS DEEB³, AND ANGELA
RIENZO¹

ABSTRACT

The diurnal snowmelt refreeze cycle is the earliest detectable signal of melting snowpack, and therefore a valuable forecast tool for freshwater resources. There are two methods for detecting snowmelt refreeze cycles from space. Synthetic aperture radar (SAR) from the sentinel 1A and 1B satellites can provide occasional diurnal observations in certain regions of the planet. Brightness temperature measurements at 37V GHz from satellites such as the Special Sensor Microwave Imager / Sounder (SSMIS) fleet can be used to retrieve snowmelt refreeze signals with broader coverage and higher repeat frequency, but at a lower resolution. We have proposed a way to increase the resolution of near-daily brightness temperature snowmelt refreeze cycle observations by combining the two satellite methods when there are simultaneous observations. Towards this end, we provide the first direct comparison of SAR and brightness temperature snowmelt refreeze in the Sierra Nevada and the Yosemite area.

¹ Department of Earth and Environmental Sciences, Syracuse University, Syracuse, NY, USA

² NASA Goddard Space Flight Center, Greenbelt, MD, USA

³ Cold Regions Research and Engineering Laboratory, Hanover, NH, USA

Corresponding author: george.a.duffy@gmail.com