An Accurate Global Daily Snow Cover and Albedo Product from MODIS and VIIRS

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ABSTRACT

Water managers need accurate observations of snow cover and albedo to make decisions for a diverse set of applications. Remotely sensed snow cover and albedo products that are currently available do not meet operational requirements for several reasons. We have partnered with snow remote sensing end users who serve diverse needs of national and international water resource decision makers. With their guidance, we create and provide daily gap-filled snow cover and albedo, including impacts of light absorbing particles. The products account for off-nadir views, snow under the forest canopy, and use cloud filtering techniques not employed in existing products. Using algorithms shown to perform consistently across sensors—specifically MODIS and VIIRS—we will process the historical daily record and produce data in near real-time with a sub-daily latency period. This project will complete the transition of the data processing, archiving, and distribution to the National Snow and Ice Data Center. The transition will ensure the continued production of snow cover and snow albedo products for the lifetime of these sensors.

While expanding these products to global coverage, we recognize that snow surface properties vary at a much finer scale than the resolution of MODIS and VIIRS. While the combination of Landsat 8 & 9 and Sentinel 2a&b approach near-daily resolution, they will need to operate for several years together to create a long-term record. To create a daily Landsat resolution dataset for previous periods we fuse the snow and albedo products using a random forest model trained on MODIS, Landsat 8, and a suite of geophysical predictor variables. We develop separate models to address the issue of missing data within the MODIS product caused by its coarse spatial resolution, allowing for more complete spatial fusion coverage, especially near the snow line where snowmelt is prominent.

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