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Abstract

Because of the heterogeneity of mountain snowpacks, there is a need for daily snow cover mapping at the slope scale (≤ 30 m) that is unmet for a variety of scientific users, ranging from: hydrologists, to the military, to wildlife biologists. One reason this goal is challenging is because it cannot be fulfilled by any single sensor. Recently, constellations of satellites and fusion techniques have made noteworthy progress. Here, two such recent advances are examined: 1) a fused MODIS - Landsat 8 OLI product with daily 30 m spatial resolution; and 2) a harmonized Landsat 8 - Sentinel 2A/B product with 2-3 day temporal and 30 m spatial resolution. State-of-art spectral unmixing techniques are applied to surface reflectance products from 1 & 2 to create snow cover and albedo maps. Then an energy balance model is run to reconstruct snow water equivalent (SWE). As a baseline for comparison, previous SWE reconstructions using snow cover from MODIS at 463 m daily resolution are used. For validation, lidar-based Airborne Snow Observatory SWE estimates are used. This work addresses questions about whether increasing resolution yields worthwhile increases in accuracy, or just adds more pixels and computing time. Such questions and answers are fundamental to the study of snow in mountains worldwide, and will inform future scientific priorities and mission specifications.