



Enhanced snow cover products from MODIS for the hydrologic and cryospheric sciences

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Melt of seasonal snow cover in mountain ranges of the globe provides the dominant source of water resources to over a billion people. These regions are increasingly experiencing the pressing, coupled implications of climate change, drought, and population/demand increase. We have developed enhanced snow cover products using a multiple endmember spectral mixture analysis model that inverts MODIS surface reflectance products (MOD09) for fractional snow cover, plus the grain size and albedo of the fractional snow cover, to more accurately characterize global water resources. The MODIS Snow Covered Area and Grain Size/Albedo (MODSCAG) model is specifically aimed at providing an accurate estimate of snowcover for regional studies in mountainous areas across the globe but also applicable to polar and grassland regions. The model uses spectral libraries generated with a radiative transfer model for varying grain size snow, adapting the spectral library according to the specific scene solar geometry. As an extension of the MODSCAG algorithm we use Monte Carlo methods to provide spatially explicit time varying error estimates. This new algorithm is called the Ensemble Snow Covered Area from MODIS (E-SCAM). In this work, we present the error assessment and model internal uncertainty, limitations of polar-orbiting scanning radiometers for daily snow cover mapping, and implementation in hydrologic modeling. Both the albedo and snow-covered area products stimulate advances in stream forecasting by providing more accurate, spatially distributed data than are currently available for assimilation and model evaluation. The model is also enveloped with a metadata and lineage tracking system (the Earth System Science Server - ES³) to rigorously track the complete processing history of all these products.