Title

Space-Time Series of MODIS Snow Cover Products for Hydrologic Scienc

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Conference themes

- Remote sensing applications to hydrology (snow)
- Remote sensing data infrastructures
- Physical modeling in remote sensing
- Advanced methods for time series analysis in remote sensing
- Data assimilation and integration of remote sensing with dynamic process models

Abstract

The Moderate-Resolution Imaging Spectroradiometer flies on two NASA/EOS satellites, , each imaging most of the Earth every day, Terra in the morning, Aqua in the afternoon. MODIS has 36 spectral bands covering wavelengths from 0.4 to 14.4μm, 2 at 250m spatial resolution, 5 at 500m, and 29 at 1km. Using reflectance values from the 7 "land" bands with 250 or 500m resolution, along with a NASA-identified cloud flag that does not always distinguish cloud from snow, we estimate the fraction of each 500m pixel that snow covers along with the albedo (reflectance) of that snow. The model *MODIS Snow Covered Area, Grain Size, and Albedo (MODSCAG)* is a multiple endmember spectral mixture model coupled with a radiative transfer model of snow directional reflectance. Its products are then used in hydrologic models in several mountainous basins.

The daily products have glitches. Sometimes the sensor cannot view the surface because of cloud cover, and even in the absence of clouds, an off-nadir view in a vegetated area "sees" less ground area than a nadir view. Therefore, we must use the daily time series in an intelligent way to improve the estimate of the measured snow properties for a particular day. We consider two scenarios: one is the "forecast" mode, whereby we use the past, but not the future, to estimate the snow-covered area and albedo on

that day; the other is the "retrospective" mode, whereby in the summer after the snow is gone we reconstruct the history of the snow properties for that water year.

This space-time interpolation presents both scientific and data management challenges. The scientific question is: how do we use our knowledge of viewing geometry, snow accumulation and ablation, along with available ground data, to devise a scheme that is better than generic multidimensional interpolation? The data management involves large three-dimensional objects, identification of erroneous data, and keeping track of the lineage of the way a set of pixel values has been interpreted.