



Validating improved-MODIS products from spectral mixture-Landsat snow cover maps in a mountain region in southern Spain

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Remote sensing is the only feasible data source for distributed modelling of snow in mountain regions on medium to large scales, due to the limited access to these areas together with the lack of dense ground monitoring stations for snow variables. Observations worldwide identify snow cover persistence together with snowfall occurrence as the most affected variables by global warming. In Mediterranean regions, the spatiotemporal evolution of the snow cover can experiment quick changes that result in different accumulation-ablation cycles during the cold season. High frequency sensors are required to adequately monitor such shifts; however, for trend analyses, the Landsat time series constitute the only available source of data, being their frequency low for this regime, especially when cloudy conditions limit the available images. On the other hand, the MODIS daily series provide more than 15 years of continuous snow maps, despite the spatial resolution may pose a constraint in areas with abrupt topography; several approaches have been done to improve their spatial resolution from combining different information.

This work presents a methodological approach to validate the improved MODIS daily snow cover maps from Notarnicola et al. (2013), with 250-m spatial resolution, in Sierra Nevada (southern Spain), from a reference data set obtained by spectral mixture analyses of Landsat TM data by Pimentel et al (2017). This reference time series of fractional snow maps, with 30-m spatial resolution, were validated from high resolution local time series of snow maps obtained by terrestrial time-lapse cameras.

The results show a significantly high correlation between the two snow map products both on a global and basin scales in the Sierra Nevada area. Selected areas and time periods are shown to address the convergence and divergence between both products and assess the development of a fusion algorithm to retrieve daily Landsat-resolution snow maps on a long term basis.