



Cloud removal methodology from MODIS snow cover product

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Snow plays an important role in hydrology, especially in mountain hydrology. Spatially continuous snow cover observation is only possible through airborne or satellite information. Moderate Resolution Imaging Spectroradiometer (MODIS) sensor installed onboard Terra and Aqua satellites provides among other datasets, binary snow cover information globally at 1 km spatial and daily temporal resolution. The main disadvantage of MODIS snow cover product is the cloud covered regions where no information about surface cover can be obtained. This study focuses on eliminating clouds from MODIS snow cover products and preparing cloud free snow maps for mountainous catchments. The MODSNOW algorithm was developed which consists of six subsequent steps where some cloud covered pixels are removed in each cloud elimination step using different temporal and spatial information. Cloud free 1 km spatial and daily temporal resolution snow cover data is the outcome of this algorithm. No clouds remain after application of all steps. A validation study showed that MODSNOW algorithm performed well in estimating surface cover for cloud covered pixels. Step one was not validated since this was based on satellite observations. Steps 2 to 5 resulted in the accuracy of 90-96 %. Step 6 which removes all remaining cloudy pixels performed least with about 80 % accuracy. Cloud free snow cover products can be very usefully applied in hydrological models, especially in mountain areas. Using MODSNOW algorithm, daily snow cover products were prepared for three Central Asian catchments which are located in mountainous areas. Such snow cover data can be used for hydropower operation, agriculture and many other environmental sectors in Central Asia. The MODSNOW algorithm can be used for any other region where snow cover information can be an important factor.