A snow extent time series assimilation using MODIS images and temperature data, case study Koohrang, Iran

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A unique advantage of satellite data is the possibility for delineation of snow line and calculation of snow cover area. Recent availability of remote sensing data offers promise for better performance of hydrological models, which contain a snow component. The near-daily coverage of Moderate Resolution Imaging Spectrometer (MODIS) data and its moderate resolution provide a powerful capability for time series analysis of snow cover area. However, because of several reasons like cloud cover, technical problems, etc., images are not available or usable. This paper suggests a regional solution to fill the gap of missing data for purpose of snow cover assessment.

In this study 27 images of MODIS from NASA have been used to calculate basin scale snow cover area by applying NDSI technique. Also a temperature dataset was collected from the Koohrang station, which was measured by the Iranian meteorological organization for the period 2004-2008. The elevation of the Koohrang station is 2285 m above sea level and geographically it is located at latitude 32 26' and longitude 50 07'. The study considered snow cover derived from satellite imagery as dependent variable and temperature as independent variable. To find a relationship between snow extent and temperature we used the CURVEEXPERT 1.4 package. This program uses the Levenberg-Marquardt algorithm to solve nonlinear regressions by combination of steepest-descent method and a Taylor series technique. Our methodology is applied each time when snow extent is not available and it estimates snow extend based on the remaining data. A wide range of built in models were tested for this purpose but finally a Logistic, Exponential, Richards, Gompertz, Linear Fit and Exponential model were adopted because of high correlation relationship and low variance.