

Examination of snowmelt over Western Himalayas using remote sensing data.

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Abstract

Snowmelt variability in the Western Himalayas has been examined using remotely sensed snow water equivalent (SWE) and snow-covered area (SCA) datasets. It is seen that climatological snowfall and snowmelt amount varies in the Himalayan region from west to east and from month to month. Maximum snowmelt occurs at the elevation zone between 4500 and 5000 m. As the spring and summer approach and snowmelt begins, a large amount of snow melts in May. Strength and weaknesses of temperature-based snowmelt models have been analyzed for this region by computing the snowmelt factor or the degree-day factor (DDF). It is seen that average DDF in the Himalayas is more in April and less in July. During spring and summer months, melting rate is higher in the areas that have height above 2500 m. The region that lies between 4500 and 5000 m elevation zones contributes toward more snowmelt with higher melting rate. Snowmelt models have been developed to estimate interannual variations of monthly snowmelt amount using the DDF, observed SWE, and surface air temperature from reanalysis datasets. In order to further improve the estimate snowmelt, regression between observed and modeled snowmelt has been carried out and revised DDF values have been computed. It is found that both the models do not capture the interannual variability of snowmelt in April. The skill of the model is moderate in May and June, but the skill is relatively better in July. In order to explain this skill, interannual variability (IAV) of surface air temperature has been examined. Compared to July, in April, the IAV of temperature is large indicating that a climatological value of DDF is not sufficient to explain the snowmelt rate in April. Snow area and snow amount depletion curves over Himalayas indicate that in a small area at high altitude, snow is still observed with large SWE whereas over most of the region, all the snow has melted.