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Hydrological Response of the Glacierised Catchment: Himalayan Perspective

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Abstract : Snow and Glaciers are the largest dependable reserved sources of water for the river system originating from the Himalayas so an accurate estimate of the volume of water contained in the snowpack and the rate of release of water from snow and glaciers are, therefore, needed for efficient management of the water resources. This research assess the fusion of energy exchanges between the snowpack, air above and soil below according to mass and energy balance which makes it apposite than the models using simple temperature index for the snow and glacier melt computation. UEBGrid a Distributed energy based model is used to calculate the melt which is then routed by Geo-SFM. The model robustness is maintained by incorporating the albedo generated from the Landsat-7 ETM images on a seasonal basis for the year 2002-2003 and substrate map derived from TM. The Substrate file includes predominantly the 4 major thematic layers viz Snow, clean ice, Glaciers and Barren land. This approach makes use of CPC RFE-2 and MERRA gridded data sets as the source of precipitation and climatic variables. The subsequent model run for the year between 2002-2008 shows a total annual melt of 17.15 meter is generate from the Marshyangdi Basin of which 71% is contributed by the glaciers , 18% by the rain and rest being from the snow melt. The albedo file is decisive in governing the melt dynamics as 30% increase in the generated surface albedo results in the 10% decrease in the simulated discharge. The melt routed with the land cover and soil variables using Geo-SFM shows Nash-Sutcliffe Efficiency of 0.60 with observed discharge for the study period.

Keywords : Glacier, Glacier melt, Snowmelt, Energy balance
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