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Impact of monsoonal rainfall on specific mass balance in ablation zone of Chhota Shigri Glacier in 2008, Himachal Pradesh, India

P. Sharma, A. Ramanathan, A. Linda, P. Wagnon, Y. Arnod, P.G. Jose, and P. Chevallier

School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, India (alrjnu@gmail.com); IRD-LTHE, LGGE BP 96 38402 St Martin d'Hères Cédex, France

The Mass Balance of the Chhota Shigri glacier (32.2°N, 77.5°E; 15.7 km2, 4050 to 6263m a.m.s.l., 9 km long) located in Lahaul and Spiti valley, Himachal Pradesh, India has been monitored from 2002 to 2008 using glaciological method. In 2008, an additional field survey during 3- 10th August was undertaken to understand the impact of monsoonal rainfall on specific mass balance at various points on the ablation zone of this glacier that is alternatively influenced by the Indian monsoon and the mid-latitude westerlies. Specific Annual Mass Balance is negative (0.93 mweq), Equilibrium Line Altitude (ELA) is 5120m and Accumulation Area Ratio (AAR) is 38% in the 2007-08 hydrological year. In 2008 data obtained from nearest Weather station at Keylong show that the monsoon hit the Spiti valley in the middle of June (15 days earlier than normal date) .The results reveal that 70% of total specific mass balance occurred by the first week of August indicating that most of the melting occurred in the first half of ablation season, dominated by monsoonal rainfall. The rainfall may accelerate ablation rate by supplying (heat) energy even it is very low and exposing bare dirty ice thereby decreasing albedo. In part A of the glacier, the mean vertical gradient of ablation up to August 08 is 0.67 m w.e. 100 m-1 between 4350 and 4850 m a.s.l., (area free of debris) and for part B, it is 0.41 m w.e. 100 m-1 between 4600m a.s.l. and 5000m a.s.l. From August 08 up to 1st week of October, mean vertical gradient of the ablation for part A is 0.54m w.e. 100 m-1 and it is 0.61 m w.e. 100 m-1 in part B for the same altitude ranges. Below 4350m a.s.l. the whole glacier is covered by debris and the melting rate is significantly reduced. Overall, ablation rate is influenced by rainfall, incoming solar radiation and debris cover.