Influence of a Debris Layer on the Melting of Ice on Lirung Glacier, Langtang Valley, Rasuwa, Nepal

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ABSTRACT

This paper provides information about the variation of ice ablation rate underneath the highly heterogeneous debris layer on Lirung Glacier in Langtang Valley, Rasuwa district, Nepal. Ice melt under a debris cover has been commonly modelled using two approaches: physically-based energy-balance models and more empirical temperature-index models. Energy Balance Model (EMB) was used at the point scale to calculate melt under a debris-covered glacier. Because of the high heterogeneity of the surface layer, the ablation rate varies throughout the glacier. The average value of thermal resistance (R) in association with the meteorological variables is found to be sufficient enough to give the consistent value of ablation of glacier ice underneath the debris layer. Solar radiation is the only dominant heat flux which contributes to melting of ice under the debris cover with a little contribution of sensible heat flux in dawn because of the heat storage phenomenon of the debris. In spite of several simplifications, the model performs well and modelled melt rates give a good match to observed melt rates. Thus for accurate distributed melt modelling at different locations of the debris covered glacier it is important to considered the effects of both the external variables and the physical properties of the debris material, which in turn gives estimates of the amount of discharge from the glacier, an important component of the local water resources.

Keywords: *Debris cover, Himalayan glacier, Lirung Glacier, ice melt, Energy flux*