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Mölg, T.and D.R. Hardy (2004): Ablation and associated energy balance of a horizontal glacier surface on Kilimanjaro. Journal of Geophysical Research, 109, D16104, doi:10.1029/2003JD004338.

Abstract

The surface energy balance of a glacier describes the physical connection between ice/snow ablation and climatic forcing. To expand knowledge on the response of Kilimanjaro's glaciers to climate variations, this study estimates the energy balance on a horizontal glacier surface at the summit for the periods March 2000 to September 2000, and March 2001 to February 2002. An automatic weather station (AWS) operating at 5,794 m a.s.l. is providing the data input, and ablation at the AWS site differed considerably between the two periods. The energy balance model employed incorporates radiative fluxes, turbulent heat fluxes, and the energy flux in the subsurface. On a monthly basis, results show that radiative energy dominates energy exchanges at the glacier-atmosphere interface, governed by the variation in net shortwave radiation. The turbulent latent heat flux, which is always negative (i.e. continuous mass loss due to sublimation), is the second important energy flux. In contrast, turbulent exchange of sensible heat remains of minor importance. The marked difference in ablation between the two periods can largely be explained by a difference in surface albedo. Albedo depends on precipitation amount and frequency, and directly controls net shortwave radiation receipt. In the context of modern glacier retreat on Kilimanjaro, the results support other evidence that Kilimanjaro's glaciers are extremely sensitive to precipitation variability.