

Interactive comment on “Measured and modelled sublimation on the tropical Glaciar Artesonraju, Perú” by M. Winkler et al.

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The objective of this paper is to demonstrate that sublimation 'plays a decisive role in the surface energy balance of tropical glaciers'. The authors use a parameter f which represents 'the proportion of energy used for sublimation of the whole energy used for ablation (melting + sublimation)'. According to their observations on the Glacier Artesonraju, f is very low (10-15%) during the wet (and melting) season but f is high (60-90%) during the dry season. The high value of f in dry season is the main argument to conclude that sublimation is important 'for the surface energy and mass balance on tropical glaciers during dry seasons'. However, the total energy used for ablation change a lot throughout the year and these variations must be discussed. As the melting energy is very low during the dry season, it is not surprising that sublimation

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represents the main proportion of energy used for ablation (!). Thus, the demonstration of the paper is not very convincing. The question should be: why the melting energy is low during the dry season? The energy used for sublimation should be compared to the other energy fluxes: the radiation and the turbulent sensible heat fluxes. But what for sublimation would be important? Are tropical glaciers disappearing by evaporation / sublimation? Does sublimation control the seasonal variations of the melting discharge from (outer) tropical glaciers: strong discharge in wet season contrasting with low discharge in dry season? Our observations on the Bolivian Zongo Glacier (16°S) show that the energy lost in long-wave radiation is higher than the energy lost by sublimation in the dry season (Sicart et al. 2005). Indeed, the deficit in long-wave radiation is maximal during the clear sky and cold periods of the dry season, due to the thin atmosphere at the very high elevations of the tropical glaciers. Melting energy is small in dry season because of the energy losses in long-wave radiation and in sublimation. The relative importance of each of these fluxes can be discussed and more studies are required (to better quantify the turbulent fluxes for instance). Does sublimation controls the inter-annual variations of the mass balance of tropical glaciers? Certainly not: in the dry season, when sublimation is important, the mass balance is always very close to nil (no much ablation, no much accumulation). The annual mass balance strongly depends on what happens during the wet season which is the period of largest variability in precipitations and in melting rate (e.g. Francou et al. 2003).

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Sicart, J. E., P. Wagon, and P. Ribstein (2005), Atmospheric controls of the heat balance of Zongo Glacier (16°S, Bolivia), *Journal of Geophysical Research*, 110(D12106), doi:10.1029/2004JD005732.

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