

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

**M. Winkler et al.**

Received and published: 1 December 2008

Thanks to Jean Emanuel Sicart for his critics. We think that there are some misunderstandings, so tried to improve the clarity of the issues discussed below in the revised paper.

First we want to emphasise that the first sentence "Sublimation plays a decisive role in the surface energy balance of tropical glaciers." is an introductory statement, and not a concluding one. In the introduction section we make clear that this knowledge already exists, and that our goal is to improve the representation of sublimation in mass balance models! If there was no sublimation with negative  $Q_L$ , much more energy could be used to warm the surface and to melt the ice. This way sublimation also influences the surface mass balance. We thus added "...and mass balance..." in the first sentence of the revised manuscript.

It is right that the total amount of energy available changes throughout the year, but it is not the goal of this paper to show this in detail (see above), since many other energy balance studies of tropical glaciers (from the Andes and East Africa) elaborate on this issue. We measured sublimation during 15 days in the dry season and show the results in this paper. We also used a process-based mass balance model to assess sublimation rates over a longer time period and derived monthly values of  $f$ .

Regarding Mr. Sicart's statement "As the melting energy is very low during the dry season, it is not surprising that sublimation represents the main proportion of energy used for ablation (!)": We do not claim that this is surprising. We know that French studies as well as our own studies (e.g., Figure 6 in the recent paper of Mölg et al., 2008, Int. J. Climatol. 28, 881-892) have looked into the causal factors of this large fraction in detail. We agree that longwave losses can be more significant, so changed in the introduction "the main sink" to "a major sink" to characterise  $Q_L$ .

We do not entirely agree to the last part of the comment starting with "Does sublimation control the inter-annual variation of mass balance on tropical glaciers? Certainly not ..." - Your studies on Zongo Glacier have demonstrated that this is true. However, it does not apply to all tropical glaciers. On Kilimanjaro, for instance, where sublimation is greater than melting (see again the study of Mölg et al. cited above), the former does control inter-annual variations to a large extent. This statement is thus not valid throughout the tropics.

Finally, we think that a direct comparison of studies on Glaciar Zongo (Bolivia) with studies in the Cordillera Blanca (Perú) is problematic. As stated on page 740, lines 21f, climatic conditions are different.

---

Interactive comment on The Cryosphere Discuss., 2, 737, 2008.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)