

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

### **Anonymous Referee #2**

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General comments: This paper presents direct measurements and model estimates of sublimation on a tropical glacier. The main focus of the paper is on the quantification of the sublimation rates in relation to the total mass budget and surface roughness, and on comparison with model estimates of the total ablation and sublimation rate. The subject is well presented and very suitable for publication in The Cryosphere. However, I do have a few questions and remarks, which are given below.

Specific comments: 438-1: In the statement: sublimation plays a decisive role in the surface energy balance...’, isn’t it more decisive in the mass budget? Illustrate this importance by presenting e.g. the estimated fraction of ablation resulting from sublimation.

439-1: I suspect that not only long-term climate data but also mass balance data is scarce in tropical mountain regions. How can you use the present observed mass budget in order to gain knowledge about past climate?

740-19: To what period does 'long-term' refer for the mean sublimation rate on Kilimanjaro, months, years?

741-1,5: I suggest to remove aims 2 and 4. They are not or only briefly presented in the manuscript. Optimisation of the mass balance model is only in terms of roughness length and emissivity. No parameterisation of roughness length is presented. The main focus in this paper is on aims 1,3 and 5.

741-15: Add comment on how sublimation rate is responsible for a high surface albedo.

742-27: Is it possible for melt water to enter the pots?

743-21: Stress that the measurements with and without penitentes represent an upper and lower limit of roughness conditions and thus sublimation estimates.

744-5,10: Why do the LW sensors at RBS not suffer from window heating? For the period that at both locations (at SEBS and RBS) LW sensors are operating fine, can you give a correlation coefficient in order to show that using RBS to calculate fluxes at SEBS is ok.

746-17: What in FITGG is specific for Zongo in this equation. The only thing that this parameterisation does is to link dry periods to high contribution of sublimation and wet periods to low contributions. I suggest that it is not the parameterisation that is specific for Zongo but that conditions on Zongo are better suitable to use a parameterisation such as this.

747-14: How does the use of pots affect the ground heat flux in case  $Q_g$  is not 0 and thus the surface energy budget and also the measured sublimation? Is it possible for meltwater to enter the pots? What other errors are looked at in the 'extensive error estimate'?

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748-20: Make more clear that with 'model results' you refer to results from the mass balance model, not the ITGG model.

749-15: I do not understand why it is not reasonable to calculate  $f$  for shorter periods than a few days. Please explain (better).

750-4: Which 'limits' are referred to? The values of 0.1 and 0.9 for very wet and dry conditions?

750-10: See comment 746-17. If you derive limits for this glacier, does the parameterization perform better?

751-16: In this manuscript there was no reassessment of parameterisations of surface roughness on tropical glaciers. The surface roughness was tuned in order to give best results for sublimation for reasonably smooth surfaces and a rough surface.

Add figure with map of the location of the glacier, and main topographic features, and stations on and near the glacier.

Figure 2. Explain difference rough and smooth in caption.

Technical corrections: 740-24: replace 'missing' with 'lack of' 741-4,5: parameterisation, not parametrisation 750-6: Remove 'supposed to be'. 752-24: Peru, not Per.

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

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