Review report of "Modeling energy and mass balance of Shallap Glacier, Peru" by Gurgiser et al. submitted to TC

Overall evaluation:

Based on two-year glaciometeorological measurements, Gurgiser et al., apply a distributed energy-mass balance to simulate the energy/mass balance of Shallap Glacier in Peru. The Monte-Carlo method is used to optimize the parameter combination. The spatial and temporal uncertainties were greatly evaluated by using a leave-one-out cross-validation approach and the matrix ablation stake data. The authors provided some important insights on energy/mass balance characteristics in the data-poor region of Peru. The possible topographic influence and energetic driver of ablation were also discussed from the physical energy-mass perspective. In addition, the possible explanation for two contrasting mass balance years was concerned with the surface albedo change. Overall, this study is generally well-done and the paper is concisely written. I point out some following minor comments to be considered before publication.

General comments:

1． **Page 4016 Line 19-20**.：The authors stated that lower surface albedo was caused by higher snow line. However, in Page 4034 Line 19-28 and Page 4035 Line 1-10, much attention is paid to the discrepancy of precipitation amount、snow cover and fraction of rain/snow in these two years. Actually, the higher snow line was the consequence of energy-mass balance and can not be used to explain the albedo variation. The reasons of lower surface albedo should be rephrased in the Abstract.

2． **Model description and parameters**: Two threshold temperatures (Table A1) are used to calculate solid and liquid precipitation. My first question is how to calculate the percent of rain/snow between this two threshold values (1.1 and 2.6 ^{o}C). Linear interpolation or some other methods? In addition, these two thresholds are critical to albedo parameterization and accumulation calculation. The authors used a narrow rang (1.0-2.5±0.5 ^{o}C) to optimize these two important parameters. I wonder whether such narrow precipitation range from Rohrer(1989) is appropriate for Peru glacier in tropic region. The discussion of modeling uncertainty from these narrow rang of precipitation phase is welcomed in the revised paper.

3． **Air temperature:** The performance of air temperature interpolated from lateral moraine is linking to the modeled albedo, incoming longwave radiation and turbulent heat flux. The author developed a good temperature transfer function. The reader would like to check the performance of this function. One figure showing the diurnal variation of transferred temperature and measured temperature in ablation season is necessary to evaluate the robust ability. In addition, the vertical air temperature gradient (-0.55 ^{o}C/100m) is from the Zongo glacier in the outer tropics. The possible uncertainty by this gradient should be briefly discussed since the meteorological condition is different with your glacier as your statements in Page 4017 Line 28-29.

4. **Discussion**: A short comparison of energy/mass balance characteristics for three glaciers: Zongo glacier, Antisana glacier and Shallap glacier will strength the scientific significance of this paper.

Specific comments:

Page 4019 Line 7: Provide the satellite information.
Page 4023 Line 16-17. Why *d** is a fixed value of 1 cm? It is different with the constant in Gurgiser et al. (2013) in *Journal of Glaciology*.
Figure 1： Add the location of Zongo glacier and Antisana glacier in the inset box.
Figure
Table 2: Please list the wind speed and relative humidity.

Technical corrections:
Equation 2: Please check this equation again. I think the parenthesis is missing.
Page 4034 Line 15-16: the sign of net shortwave radiation should be positive.
Figure 8's Caption: No Section 2.3 in manuscript.
Structure: There are two **Model evaluation** in Section 2.2.3 and Section 3.1. Maybe Section 2.2.3 can be changed to model uncertainty evaluation?

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