

Interactive comment on “Modeling energy and mass balance of Shallap Glacier, Peru” by W. Gurgiser et al.

Anonymous Referee #4

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Gurgiser et al. present an interesting and detailed study on the energy balance of a glacier in the Cordillera Blanca, Peru. They make a valid argument that the energy balance in the central Peruvian Andes is much less understood than further north in the inner tropics (Ecuador) or further south in the outer tropics (Bolivia). Given that the glaciers have been in a general state of retreat over the past decades and since glacier melt water is an important socio-economic factor in the region during the prolonged dry season, I consider this study to be very timely and relevant.

The energy and mass balance model has a few weak points, for example where assumptions from other tropical glaciers (Zongo) are transferred one to one (e.g. the lapse rate or the assumption that precipitation does not change with elevation; an assumption which is almost certainly incorrect). The model is trained (tuned) with data

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from stake measurements in the ablation zone, but there is no additional validation of the model. This is not a criticism, since such data is hard to come by, but it leaves room for improvement during future studies, which will have to independently assess the accuracy of this model from an observational perspective. Overall however, the authors are to be commended for trying to develop the best possible model, in the absence of better available observations.

The paper is very long and the discussion often dwells on very specific and minor details. As a reader it is not easy to follow along and filter out the main thrust of the paper from the many technical details. I think shortening the paper with a more focused description of methods, results and discussion would help to make it much more attractive.

My only other suggestions concern editing of a few errors interspersed in the paper, some related to grammar, and some to nomenclature, while others are simply spelling errors:

Page 4020, line 5: ‘Unidad’

Page 4020, line 6: ‘Autoridad Nacional de Agua’

Page 4025: lines 13 (equation (4)) and 15: the letter p should be a subscript in the term ‘np’ otherwise it might be mistaken as the product of ‘n’ times ‘p’. The same comment also applies for the terms ‘ni’ and ‘ny’ in equations (5) and (6) and the subsequent discussion in the text (page 4026).

Page 4025, line 14: ‘the number of model runs’

Page 4025, line 16 and page 4026, line 5: if ‘n’ is the number of runs, then a specific run should not be named ‘n’

Page 4033, line 17: ‘resultant’

Page 4034, lines 1-6: This sentence is too long. Break it up into two.

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Page 4035, line22: 'spatially'

Page 4036, line 22: 'horizontal'

Page 4040, line 4: 'McKenzie'

Page 4041, line 1: 'Caceres'

Page 4043, line 14: The title of the reference Porter (1975) is incorrect

Page 4043, line 30: 'Ribstein'

Figure caption 2: R² is commonly referred to as 'coefficient of determination', not 'squared coefficient of correlation'

Interactive comment on The Cryosphere Discuss., 7, 4015, 2013.