

Interactive comment on “Seasonal and annual mass balances of Mera and Pokalde glaciers (Nepal Himalaya) since 2007” by P. Wagnon et al.

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Wagnon et al (2013) provide an excellent summation of mass balance work in the region and of the detailed mass balance and volume flux work on Mera Glacier and mass balance work on Pokalde Glacier. This paper will make a valuable contribution to our understanding of mass balance in the region, particularly since the work on Mera Glacier is expected to continue. Mera Glacier does provide an excellent opportunity for flux studies and also transects a larger altitude range, and due to its slope and lack of debris cover, makes it an ideal glacier to focus upon. Below are a few minor suggestions and two recommendations. The first recommendation is that the 2011-12 Ba be reevaluated. The second is for a better error analysis for Mera Glacier, given the number of measurements actually made, this should provide a lower error than stated.

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3340-23: Why mention Kadota et al (2000) when this is not an actual glacier mass balance?

3343-23: Redundant wetter climate statement unless you add quantities.

3345-15: How patchy is the transient snow line-ELA? This is an indicator of how consistent mass balance change is with elevation across the glacier.

3345-25: Zemp et al (2009) have a good discussion with references to a number of other studies examining mass balance error, given the number of measurement sites used Mera Glacier could have a lower error.

3348-15: 2011-12 the Mera Glacier has an AAR of 0.10. The resulting mass balance -0.77 m is higher than any I have noticed for a non-arctic alpine glacier at that AAR value. A quick look through the AAR-Ba relationships in the MBB of WGMS confirms this. I suggest that the 2011-2012 Ba be reevaluated. For the other four years the transition between the two linear segments of the balance gradient occurs well above the ELA. In 2011-2012 the balance gradient transition is at \sim -1 m. The upper balance gradient line in 2011-12 also has a much shallower slope than for the other four years. Typically the balance gradient does not change that dramatically from year to year in its shape. In fact that argument is stated to be the case for Mera Glacier later in this paper. In this case the fit to just three data points does not provide a robust reason for altering the gradient dramatically from the other years. The slope of the balance gradient is likely a more robust measure than the actual elevation of the transition point.

What this argues for going forward on Mera Glacier is at least in a few years much more detailed accumulation zone observations to better constrain the actual slope and its inter annual variability and identify the representativeness of the network. This is likely not sustainable, but as Fountain and Vecchia(1999) noted a few detailed measurement years better defining the overall pattern reduces the errors. Pelto (2000) noted that Ba errors improved moving from 10 to 20 measurements but not that much above 20 points. Pokalde Glacier also needs a more detailed survey in at least two years, to

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verify the representativeness of the network.

3350-26: That the mass balance gradient is consistent is not borne out by the upper gradient line on Mera Glacier in 2011-12.

Figure 1: The images of the glaciers should be their own figure, this will allow better resolution. The Pokalde image needs to be brightened.

Fountain, A.G. and Vecchia, A.: How many stakes are required to measure the mass balance of a glacier? *Geogr. Ann.*,81A(4), 563–573, 1999.

Pelto, M. S: The impact of sampling density on glacier mass balance determination. *Hydrol. Process.*, 14: 3215–3225. doi: 10.1002/1099-1085(20001230)14:18, 2000.

Zemp, M., Hoelzle, M. and Haeberli, W. 2009. Six decades of glacier mass-balance observations: A review of the worldwide monitoring network. *Annals of Glaciology* 50: 101-111.

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