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Interactive comment on "Impacts of topographic shading on direct solar radiation for valley glaciers in complex topography" *by* Matthew H. Olson and Summer B. Rupper

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This paper presents a reminder to people conducting glacier energy balance models, about the impact topographic shading (from both the surrounding terrains and self-shadowing) has upon SW energy receipts. By using a computer program coupled with elevation data, they calculate the degree to which topographic shading effects two distinct glaciers. The paper is generally well written and presents an interesting flag of how important topographic shading is. My main concern is that this point is reasonably well known, and even if it were not, the methodology presented here does not present an easily replicable rectification. And as the authors say at the end of the manuscript,

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future work should consider terrain-emitted/reflected energy; in my view this paper should also have considered this, for the decrease in SW energy from shading is partly offset by the increase in topographic reflectance/LW energy emittance, and thus the degree to which shading effects the surface energy balance is not established.

Main points:

Novelty: Whilst true that people have overlooked the precise role topographic information has on SW fluxes, most of the work I am familiar with uses field data for calibrating SW fluxes. In so doing, this already has the topographic information built in. This is less the case if one is purely using a computational approach with no in-situ field data. But if one is doing that, then one certainly also needs to worry the size of offset from SW reflection from terrain and the associated LW fluxes, which this paper does not.

Replication/utility: Equations 3-6 need much more explanation and certainly a diagram, showing where all the angles/fluxes are acting. In terms of replication, it would have be very useful to see how these quantities (or the fluxes they they then produce) compare when one using mean topographic information. Mean topographic information is much easier to estimate/use than using exact elevation data. A comparison between the exact and mean fluxes would then be very useful: if close, then that gives people an easy fix; if quite different, then it shows a fine grained approach, as advocated by this paper, is required.

Minor points:

-P3 l 10. Here, and elsewhere in the paper, the use of 'slope and aspect' is a little confusing. As the authors say, cast shadows contain both slope and aspect already, so what exactly does the different 'slope and aspect' refer to? A diagram would be nice, for these distinctions need to be effortlessly clear.

Eqn 4, missing a dt?

p9, l5, change 'won't' to 'will not'.

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