EGUsphere, referee comment RC1
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Comment on egusphere-2022-1088

Anonymous Referee #1

Referee comment on "Modeling of surface energy balance for Icelandic glaciers using remote-sensing albedo" by Andri Gunnarsson et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-1088-RC1, 2022

The study provides a detailed look at the energy balance of Icelandic glaciers, with a particular focus on the effect of albedo during LAP events. The authors use an energy balance model and a high-resolution forcing dataset to simulate the melt energy of 6 Icelandic ice caps over the summer. Albedo observations from MODIS were used as model input to decrease the uncertainties associated with this important energy balance variable. The study is generally clear, and the results are described in detail, but could benefit from some minor additions/changes, as outlined below.

Specific comments:

L 2-3: It is a bit misleading to write you “developed” an energy balance model, when you use an already existing the wording to “used” or “applied”.

L 30-43: this section mostly describes the study area, so consider moving this part to the “Study area” section

L103-108: I would try to stress the novelty of your work more in this section and the reason for your study. As I understand it, the two major novelties are:

a. other studies have investigated the energy balance of Icelandic glaciers, but these normally only focus on one ice cap or glacier. In this study, you provide a larger context on how the energy balance of Icelandic glaciers have changed. You do mention this in your introduction, but I would stress more that this is often not done.

b. You use remote sensing albedo, which removes one of the major uncertainties that have previously persisted in distributed energy balance studies, as albedo is a hugely important factor for the energy balance in Iceland. Particularly that you can include the lower albedo after dust storms and eruptions is a major plus here. I would stress this more as a purpose of the study.

L178-200: Why did you not calculate the local lapse rate from the forcing data? If you have the elevation in each grid point, you could probably calculate monthly lapse rates for each ice cap for all used forcing variables.

L 208: I am missing some discussion later in the text about the uncertainty of setting the ground heat flux to 0. I know that Icelandic glaciers are temperate, but surely there is a seasonal cold wave that needs to be heated to melting temperature in spring, and thus not all energy can be assumed to be melt energy?

Section 4: In this section, you only validate the forcing data against observations, but not the results of the model. Could you add a validation of the outgoing longwave and shortwave radiation (which should be available from some of the AWSs) and perhaps also the turbulent fluxes?

L384-394: consider moving the info about the different eruptions that occurred during the study period to either the introduction or study areas section, as I think the paper would be clearer if this is presented early on (since you mention the eruptions in earlier sections too).

L488: Could you add an “uncertainties” section where you discuss your results? What simplifications have been made, how can other energy balance components be affected by LAP events (both the turbulent and longwave heat flux must change somewhat) etc.

L497: change “eeither” to “either”

Figure 3: you write in the caption that the color scale varies between months, but would it not be possible to use the same scale? It would make comparison much easier between the months.

Figure 4: Could you make the vertical scale the same for all columns? Then it would be easier to compare the different glaciers.

Figure 5: change “Vatnajokull” to “Vatnajökull” in figure titles

Figure 7: could you make the y-axis the same for all figures, so it is easier to compare?

Figure 8: The text on the figure is too small, particularly on the color bar.

Figure 8: I find this figure interesting, as the different ice caps mostly follow a similar trend (years with high EB is the same for all ice caps, and vice versa) but there are some noticeable exceptions. Some of this is probably due to ash deposits from eruptions, but e.g. in 2002 and 2003, Mýrdalsjökull and Eyjafjallajökull seem to behave differently that the others ice caps, with a high energy balance in 2002 while the other ice caps have a low energy balance, and the other way around in 2003. 2014 and 2016 also seem to have

some ice caps with general high energy balance while others have lower than usual. Is this difference due to dust storms or something else?

Figure B1-B5: change “jokull” to “jökull” and “Myrdals” to “”Mýrdals”.