This paper deals with improving how surface albedo is represented in land surface models by data assimilation of satellite-derived albedo. I will note that I am not an expert on data assimilation and thus, cannot really comment on the applicability of the DA approach used here. The only comment I have about the DA is I'm not sure how all the parameters in Table 1 are tuned to fit the albedo, and maybe some more explanation as to how that is done is warranted. I find the sensitivity analysis ok so no strong comments there. My comments mostly pertain to the MODIS data and result of clarify in the manuscript.

One general comment, it is true that under low sun angles, the albedo retrieved from satellite is less accurate, yet I find it strange to have a discussion on winter months when the sun is below the horizon. I realize that there is a need to spin the model up over full annual cycles to accumulate snow, but I found it confusing to read that Nov-Feb were omitted in paragraph starting around line 160, but previously in the manuscript it was said the albedo would be set to April values during the winter period. So what exactly is being done here?

I also think more description of the MOD10A1 product is needed here. Is it a true daily albedo integrated over a full 24 hour period based on several overpasses of the MODIS instrument, or is there a certain swath that is used for a specific local time? It is unclear what time of day is being used for the optimization. The solar zenith angle varies of course with the day of the year as well as the time of day and thus there is likely a solar zenith angle dependence still in the MODIS albedo product. It is also mentioned that VIS and NIR albedo are used (e.g. Line 70), but my understanding is that the MOD10A1 is a broadband albedo product. Further there are no figures showing VIS and NIR albedo. Since the MOD10A1 data set is being used for the DA, much more information about this data set is required and a discussion of its accuracy. I'm particularly not convinced that there exists a true north/south gradient in the albedo. That doesn't fit with the known pattern of precipitation that brings fresh snow to the ice sheet. The tuned model actually seems to do a better job of expected albedo pattern (e.g. Figure 1). The MODIS pattern looks to be a solar zenith angle dependence. Is the albedo normalized by the Solar Zenith Angle? I also find the MODIS albedo product to show too high of albedos (i.e. Figure 1, Figure 4).

More specific comments.

1. Line 68, do you have a reference to support the statement that Greenland soil type is loam?
2. Lines 90-97 – yes the MODIS retrieval has larger errors under high solar zenith angles (SZA), but most of the ice sheet is dark in winter and thus, there is not albedo retrieved. It's not necessarily that MODIS retrievals are inaccurate, the ice sheet has no sun. Thus, this section needs to be rewritten to be more exact, and also some value of SZA for which you think the MODIS data are inaccurate needs to be stated (along with the appropriate reference).
3. Figure 1. Over which months is the albedo shown? Also, if Figure 1 is averaged from March to October like the other figures are, then the spatial pattern doesn't really make sense to me for the observations which makes me think there is a bias in the

observations. You would expect higher albedo values over the high elevation regions, not a north to south gradient as precipitation patterns do not show this north-south gradient. Future, the albedo values are too high from the observations considering this is summer albedo and the surface is melting over large parts of the ice sheet (see for example melt patterns from passive microwave https://nsidc.org/greenland-today/. For example, I'm including a figure here of the melt in 2022 and thus, you would expect an albedo pattern that loosely follows the microwave melt detection.
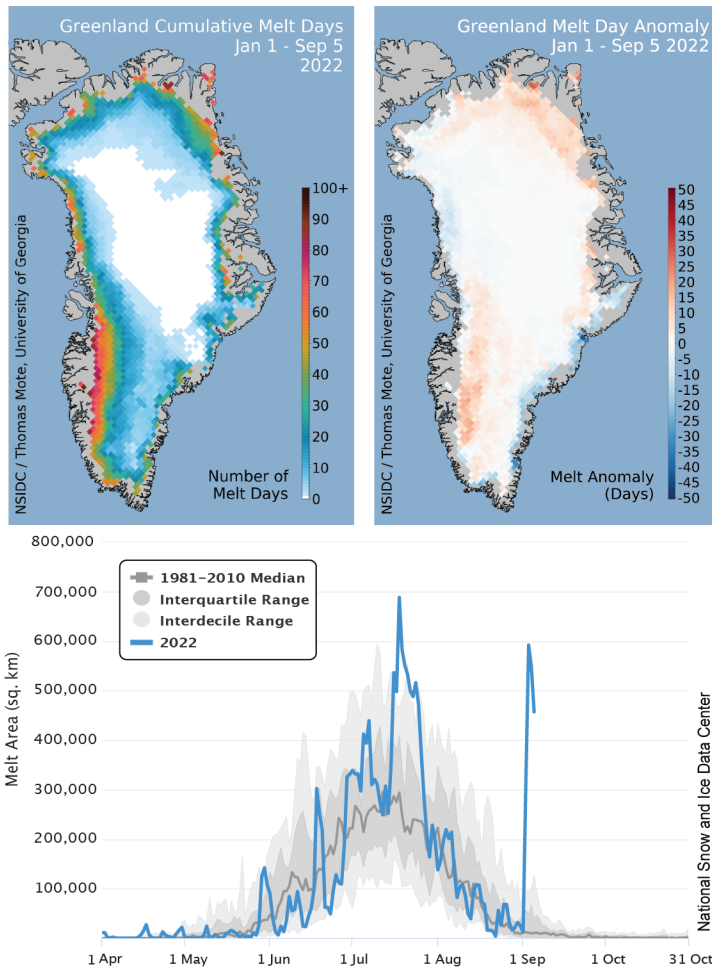
4. Figure 2 and its discussion on lines 180-185, I don't follow how you can say you see a degradation in model-data for March to October and that the improvement was only in the winter month. How is that shown? All the images in that figure are stated to be averaged from March to October, so where does one see that there was an improvement only in winter (and at a time when the satellite is not even recording albedo?)
5. Line 185-186, I'm not sure what is meant by that statement. I also do not know which figure the paragraph that follows refers to.

6. Line 212-214, there is no observed albedo in the winter months, so how can you talk about fitting to observed values during winter? Even in mid-January very little of the ice sheet is illuminated. Thus, much more discussion on what is meant by winter and the fitting is needed. I do not necessarily believe that filling in winter values with April values is accurate as the albedo will vary strongly as a function of precipitation and this is completely neglected if you are replacing winter albedo values with those in April.

7. Figure 4, generally new snow has an albedo around 0.85 and thus it is clear that the MOD10A1 values are too high. How does this impact your results and should you really be fitting to something that is unrealistically high?

8. Figure 7. I'm not sure which refer to edge vs. middle as there is no hatching shown in the actual figure.