Review of 'Unmanned Aerial System nadir reflectance and MODIS Nadir BRDF-Adjusted surface Reflectances intercompared over Greenland' by Burkhart et al, submitted to The Cryosphere.

The authors present observations of narrowband reflectance corresponding to blue, green and red wavelengths made by UAS on two consecutive days at Summit, Greenland. They compare these observations to the MCD43 product produced from spatio-temporally coincident MODIS overpasses. The paper essentially outlines proof-of-concept in acquisition of narrow-band reflectance from UAS and comparison to a satellite-borne sensor. Overall they find that (a) there is very good agreement between the reflectance observations captured by the two techniques, but with large sub-MODIS pixel variability; and (b) that while UAS platforms are very promising in terms of their ability to acquire data, they require a significant amount of post-processing and quality-filtering to deliver reliable results.

In this review I write as an end-user of several MODIS reflectance and albedo products and with some secondary involvement in the use of UAS for understanding sub-pixel variability, but with the caveat that I am not an expert in the radiative transfer physics or remote sensing optics.

To my knowledge this is the first direct comparison of MODIS vs UAS narrowband reflectances, as opposed to attempts to convert UAS-acquired data to satellite-derived broadband albedo (e.g. Ryan et al., 2016). The paper is therefore an original and novel contribution in what is still a relatively immature research area. As such, a key strength of the paper is the relatively exhaustive level of methodological detail. Coverage of post-acquisition processing and quality control is seems excellent, especially the range of modelling experiments carried out to establish UAS sensitivities. I welcomed the comparison to both collections 5 and 6 of the MCD43 product – the results here provide a clear independent estimate of how much the re-processing has improved in collection 6 data. I cannot think of any other sensitivities or methodological issues which the authors should have accounted for.

I see no substantive omissions, mistakes or assumptions in this manuscript. However, there are several problems with the presentation and the fluency of the language which hinder readability of the manuscript. I got the sense that some methodological details were quite repetitive through the manuscript so it would be worth checking if clarity could be improved here.

Detailed comments:

P3, L8-34: structure confused in places, e.g. on L12-13 you introduce the 210 km track at the end of a paragraph about the novelty of the technique you are using. Move to the following paragraph to given a 1-para summary of your methods. Last para on this page – very wordy, do you need link to the overall project you are part of?

General observation: 'complex' appears often, this isn't a very precise word and so should be removed where possible. P2, L19-25. You mention ground-based measurements – what is being compared to what?

P8, Radiative transfer simulations: I'm unclear what these simulations are actually used for?

P10, L12-19 – discussion about blue-sky albedos needs to be rephrased for clarity, I'm not exactly sure what point you are making here.

P11, L4-11 – ‘given this consideration, the correspondence is impressive’ – not entirely sure how the consideration (presumably about MODIS but this isn’t clear) maps onto the UAS data?

P11, L25-27 – this is essentially the figure caption, remove.

There are too many examples of bad grammar and typesetting for me to list here. I recommend proof-reading by a fluent English speaker. In terms of typesetting, the most glaring problem is that often the references appear as “statement about x Burkhart et al (2016)” when they should appear as “statement about x (Burkhart et al, 2016).

The figures are generally of good quality.

Fig 1: move away from rainbow colour palette for the different snow grain sizes, this is especially confusing on a plot with wavelength as the x axis. Suggest move to monotone colour palette.

Fig 2: change colourmap of images to something meaningful, i.e. a monotone linear colour ramp. In addition rainbow colourmaps present colourblind readers with significant difficulties and for this reason alone should not be used.

Figs 5 and 6: the transect direction labels are rather unclear. Can you add section dividers or equivalent to segment the different portions of the flight?

Figs 5 and 6: There is insufficient difference in colour between the UAV measurements for band 3 versus MODIS QA=0. Please change.

Figs 5 and 6: would suggest labelling MODIS QA as ‘good’ and ‘bad’, so the reader doesn’t have to remember what 0 and 1 are – to me they are arguably the ‘wrong’ way around!

Fig 7: the labelling here needs improvement. Label each row with exactly what it is showing (i.e. date, MODIS collection) rather than leaving it to the reader to work out from the caption.

Table 1: the contents of this is essentially shown in Figure 1 and I therefore suggest that this could be dropped to save space.