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The Cryosphere Discussions

Interactive comment on "An explanation for the dark region in the western melt zone of the Greenland ice sheet" *by* I. G. M. Wientjes and J. Oerlemans

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Wientjes and Oerlemans (2010) provide a detailed analysis of the mode of formation of a dark region in the ablation zone near the western margin of the Greenland Ice Sheet relying on remote sensing data. The paper provides a compelling case for the source of the dark region being the emergence of older dustier ice at the surface of the ice sheet. The paper is well written and given the importance of albedo in determining surface melt, will warrant further investigation including incorporation field observations. The paper needs additional dark region delineation and description. Differentiation of the reflectance of dusty ice versus water saturated ice can strengthen the argument.

Additional analysis of visible imagery such as the ASTER image would be useful for analysis of dust distribution. Right now one detailed view is relied upon to tell the story, is this representative? Based on the location of the dark region in Figure 1 it would appear the dark region may intersect the albedo measurement sites JAR1, 2 or 3. Does it? If so can anything be learned from any of these sites examined by Stroeve and others (2005). Figure 1 indicates the dark region almost reaches the margin of the ice sheet just north of Jakobshavn. Looking at the debris in this region many of the debris bands in this area are parallel to flow not perpendicular to flow as most annual outcropping layers are (Fig. 1). Any explanation of this?

Specific Comments:

164-3: "...ablation zone is very wide" . Specify the range of ablation zone width. Compare that to dark zone width along a transect at the ASTER image location.

167-12: Elevation and distance from margin of the dark region needs to be reported in more detail, focusing on a few transects to keep it meaningful. Could be a table.

169-8: "...slush line is more to the east of..." To the east of the dark region I assume. What about most years where is the dark region with respect to the slush line? It would be appropriate to locate the dark region with respect to the traditional glacier zones along a transect. Nolin and Payne (2007) have already provided zone determination in the region for such a figure. It would be easiest to display in a figure like that of Figure 7.

169-18: What would the reflectance spectrum be for meltwater saturated ice. A line for this if available should be in Figure 6.

170-2: distance of dark region to margin?

170-7: How abrupt is the transition from the dark region, give as a distance.

170-26: The assertion of the Holocene based age for the dust on an unreported distance to the margin needs additional support or simply remove it. The age of the dust

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is really not a focus of this paper.

Figure 1: Locate Swiss Camp on Figure 1.

Figure 2: A legend is needed for the reflectance colors.

Figure 3: Delineate the primary dark region area on graph.

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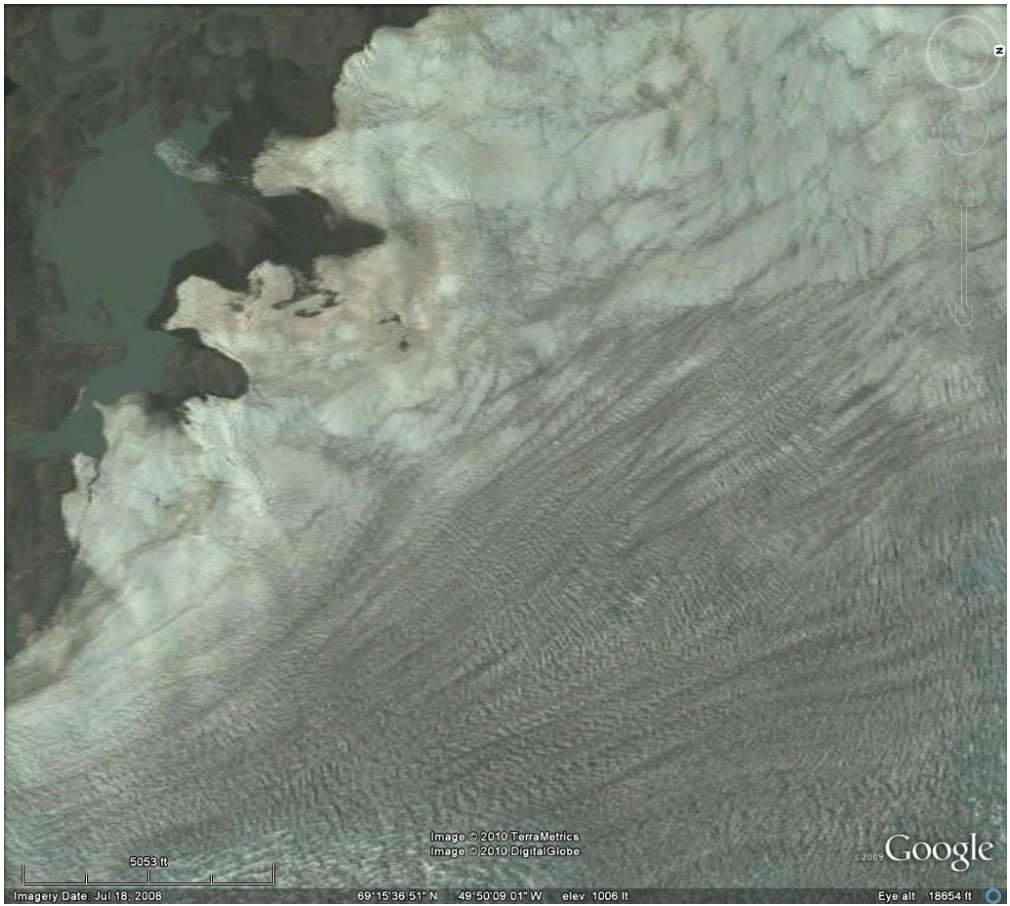
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69°15'36.51" N 49°50'09.01" W elev 1006 ft
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Fig. 1.