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Interactive comment on "A Lagrangian Analysis of the Dynamical and Thermodynamic Drivers of Greenland Melt Events during 1979–2017" *by* Mauro Hermann et al.

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This paper discusses the origin of air masses generating melt events over the ice sheet by focusing first on July 2012 as example and after to the 1979-2017 climatological mean. While this paper is quite complex (high scientific level) and not easy to understand after a quick first reading, it is very original, with a clear aim and certainly deserves to be accepted for publication. I have however several (minor) remarks:

- When the author are discussing the origin of air masses, it is not clear which vertical level is considered? A height of 20, 40, 60 hPa above the Greenland ice sheet surface is mentioned. Which one is used? How are the authors sure that the considered level

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is not in the boundary layer and then, impacted by the katabatic winds for example?

- When the impact on the net surface solar radiation is discussed (eg: Figs 7 and 13), the presented results are depend of the ERA-Int resolution (100km) which is not enough to represent the ablation zone (with a lot of lower surface albedo than snow and a width typically lower than 100km). Moreover, I'm not sure that ERA-Int is able to represent the bare ice albedo (0.3-0.5) when the ablation zone is larger than 100km. Therefore, this issue should be absolutely discussed in the manuscript and the conclusions discussed in Section 4.3 (lines 452-465) are in fact only valid in the accumulation zone as the ablation zone is not really represented here by ERA-Interim. In the ablation zone, as discussed in Hofer et al. (2017), the shortwave anomalies drive the melt and clouds have a cooling effect.

- While Summer 2019 is not studied here, I would like to mention that the 01-AUG-2019 big melt event was generated by air masses coming from Europe and having crossed North-Atlantic (Tedesco and Fettweis, 2020). Such an origin in a melt event is not mentioned here suggesting that such origin is very exceptional and such a event deserves to be studied in further studies.

- The results presented here are based on ERA-Interim. I don't ask to redo this study using the new generation ERA5 reanalysis, but the use of ERA5, improving a bit the representation of the near surface condition over the ice sheet (Delhasse et al., 2020) and available at a higher resolution (30km) more suitable to represent the ablation zone, could be also mentioned in the perspective.

Reference:

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