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
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:

- Delhasse, A., Kittel, C., Amory, C., Hofer, S., van As, D., S. Fausto, R., and Fett-