Review of manuscript: “acp-2015-661”

The paper isolates and quantifies the scattering effect of ice hydrometeors in predominantly ice clouds on measured microwave brightness temperatures at the Summit station in Greenland. The scattering signatures are are also compared with those obtained from a radiative transfer model.
I found the paper very interesting and well written. Here are a few minor points that in my opinion necessitate more discussion.

1) In Fig. 2, 4, and 5 the plot bar with the number of counts is missing. It could also be expressed as a percentage of the total number of observations. I think it will show that the number of cases where the ice signature is detectable in the 90 GHz channel are very limited. Therefore I don’t think the ice effect will alter the overall statistics of the retrieval performance. Of course if one is analyzing specific cases it is important to correctly model the propagation by including the effect of ice.

2) Was the same dataset used In Fig. 2 (a,b) and Fig. 4 (c,d)? Fig. 2 shows a maximum Zpath ~ 10^5 while in Fig. 4 is $6x10^4$. Or may be it was just truncated in Fig. 4?

3) In my personal opinion Fig. 3 is not really necessary for the understanding of the effect of ice in the retrieval. However I’ll leave this to the author to decide.

4) In Fig. 5 what is the range of brightness temperatures for these cases where Zpath > ~10^4?

5) In Fig. 5 it seems that all measured BT’s have a positive bias with the model, which is independent of the presence of ice and may be due to (may be?) calibration. Is this a clear-sky bias? For example if I look at the 150 GHz frequency it seems that until Zpath < ~ 10^4 all observations lay around ΔTb ~+2 K +/- 2 K. It may be visually helpful to subtract this bias so that the plots are centered around zero when there is no ice effect.

6) Referring to my previous comments, in Fig. 6 however the ΔTbs appear unbiased. Is this just a visual effect?

7) In Fig. 5 It appears that there is a non-linear increase of ΔTb when Zpath > 10^4. In other words Zpath saturates around 10^5 but ΔTbs keep increasing. For example at 90 GHz when Zpath is near its maximum ΔTb can be anywhere between 5 and 15 K. Is this effect due to differences in the vertical distribution of the hydrometeors?

8) The author identifies the selected clouds as precipitating, however it is not clear how the hydrometeors are modeled in the radiative transfer model in section 5.4. It seems that in the model the hydrometeors are located in the cloud and the ice is assumed to be cloud ice content with no precipitating ice content. In other words

how is the profile of ice mixing ratio defined? Could it be that if the hydrometeors are entirely located in the cloud it may take a higher IWP to produce the same brightness temperature of a precipitating cloud? I think that the vertical distribution of the scattering hydrometeors will have a major effect on the model result as it appears to be based on Fig. 5 (see comment #7).