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Interactive comment on "Radar and ground-level measurements of precipitation collected by EPFL during the ICE-POP 2018 campaign in South-Korea" *by* Josué Gehring et al.

Anonymous Referee #1

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This manuscript describes selected snowfall cases from a four-months dataset of precipitation and cloud measurements collected in South Korea in 2018. The dataset includes polarimetric radar data from a scanning dual-pol X-Band Doppler radar and a vertically pointing W-Band FMCW radar/radiometer. Besides hydrometeor classifications from the X-Band polarimetry, the dataset also contains information about PSD and habits from two optical disdrometers (2DVD and MASC). As combined radar+in-situ datasets of snowfall are still rare (especially from this region), I think that this dataset will be valuable for microphysical studies and model evaluation. Overall I find the paper nicely written and it certainly matches the scope of ESSD. I think some more details need to be added and described for some of the instruments and procedures,

which I think could help the future data user to work with this dataset.

Introduction: I understand that the focus of this paper is on Korea but due to rareness of combined in-situ and remote sensing snowfall measurements, the authors might want to think about including a list of available datasets from other regions/campaigns at this point. I think it would put this dataset in a larger perspective and provide the reader some idea what datasets are available. Some examples, which come to my mind would be: Hyytiälä (Finland) dataset (BAECC campaign), Barrow/Oliktok ARM sites, ARM AWARE campaign in Antarctica as well as the Antarctic campaigns of your own group, TOSCA campaign in the German Alps, Olympex campaign in Cascade mountains, Long-term observations ICECAPS at summit station Greenland. (I included some references at the end)

P.2, L.31: For non-radar expert readers: Can you explain whether there are other differences of the radar data obtained by DPP and FFT mode except the different Nyquist range?

P.3, L. 3: add comma before "respectively"

Table 1: The heading "Integration time" is not on top of the right column

P.3 L.12 ff, Description of WProf: I think here you should add much more details and additional information, which can become important once somebody aims to work with the data: a) Does your system provide LDR? b) Unfortunately, several of those new W-band radar systems have issues with "ghost echos" (mirror signals when there are strong reflecting targets). It seems to me from the plots that you are lucky and you don't have those problems? Or did you remove them? If so, how? c) You mention that the calibration was done by the manufacturer. Did that include calibration with external targets (sphere or rainfall and Ze calculated from collocated disdrometer) or was it only the calibration of the internal components? How accurate does RPG estimate the calibration to be? d) How was the radar pointing evaluated? e) Did you calibrate the passive channel with liquid nitrogen before/during the campaign? f) Did you change the radomes between the calibration at RPG and start of your campaign? This might change the calibration. Unfortunately, the radome coating also quickly deteriorates, which can cause several dB of attenuation due imperfect removal of drops. So it would be important to know if they were the same during the entire campaign and in what shape. Did you start the measurements with new or old radomes? Did you run the radar with the strong blower switched on all the time? g) Regarding the LWP: I agree, with the (calibrated!) single passive channel you can infer LWP but only if you can constrain integrated water vapour. How was that done in your case? The liquid water path is actually an interesting variable in order to estimate total path integrated attenuation but also for riming.

Also some technical notes: I suggest to mention the Table 1 already after you mention the chirps (L. 14). Küchler et al., not only describes the passive part but the entire W-Band FMCW system, so you might consider mention it earlier, then you can also avoid to mention it again at the end of the paragraph.

P.6, Gas attenuation correction: This description is not entirely clear to me. I understand that you calculate attenuation due to the main attenuating gases at W-Band, which are water vapour and oxygen. I understand that you use the radio sonde profiles to estimate the gas attenuation profile but are you using a constant profile for all the times between two launches or do you interpolate the RS profiles in between? I didn't check the data files but I suggest to include all correction, such as gas attenuation profiles as additional arrays if the raw reflectivity profiles are not provided. It allows the user to retrieve the radar profiles without any of your corrections applied and so the user can maybe also apply his own corrections. The comparison with Dias Neto et al. makes only sense if the columnar water vapour amounts had similar range for your campaign. Did they?

P.6, L. 16: Correct citation is "Dias Neto et al., 2019"

Fig. 6 and similar figures for the other cases: The choice of color table is certainly

always a matter of taste but I am wondering whether you considered to use a color table for reflectivity and the diameters which contains more than the three colors that you have now. I could image this could show much more structural information. Maybe you can also adjust/reduce the Doppler velocity limits to show better the slight changes from unrimed to rimed snow, which I would guess are often only between 1 and 2.5 m/s. If you extract ZDR from the X-Pol, did you consider to calculate dual-wavelength ratios between X and W-Band? It might be quite noisy due to the strongly different volumes but in stratiform snow it might still provide some useful information.

Caption Fig 4: Full Stop missing at the end of caption.

P.6, L27: Space missing after comma and before "2 km"

Table 3: The ":" separating hours and minutes is missing on several entries.

Fig. 5: Write out that "dam" means decameters, it might not be a familiar "unit" to all readers.

Fig.6: Again, in the current color scale of the W-band, the variations of mean Doppler velocity, which one could expect due to riming are extremely hard to see. I suggest to experiment more with other color scales in order to better visualize those structures.

Fig. 6: It might be worth mentioning in the caption that the 2DVD was measuring at a different location and much lower altitude. This also avoids confusion that the 2DVD was really only measuring rain and not snow (although it could measure snow as well). In this current multi-panel plot it gives the impression all measurements would be from the same location.

P 7, L. 23: Is the degree of riming set to zero for the rain cases in the data? Maybe this would be good to avoid confusion for users. At least it should be mentioned in the meta data if not already included.

P. 8, L.1: Maybe better "At 00:00 UTC on 28 February, the nimbostratus. . ."

P. 8, L. 2: How do you know that this is a fog layer and not for example a thin mixed-phase cloud, or drizzle cloud?

Fig. 6 and following radar multi-panel plots: I would find it interesting to have temperature isotherms overplotted in one of the graphs. If you don't have this information, then maybe juts plot the surface temperature. I find it quite difficult to interpret the data without this essential variable.

Fig. 8: I am surprised that the mean Doppler velocities in the W-Band are so similar during periods when the MXPol classifies predominantly aggregates and rimed particles. Shouldn't the vertically pointing Doppler velocities be much faster if they are really rimed? At which rime mass fraction does the MXPol classification detect them as rimed? Isn't it also surprising that the MASC derived rime mass fraction is not really correlating with the MXPol classification? Are you able to provide an error bar for the rime mass fraction?

Fig. 10: I think you should somehow clearly mark time periods with rain versus others with snow. Especially since the MASC is deriving rime mass fraction for rain drops were it should be set to zero. It would be good if this correction/flagging of the MASC data for rain is done by you in order to avoid somebody is using it in a wrong way.

P. 10, L. 4: Change K-u, K-a into common "Ku" and "Ka"

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