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Interactive comment on "Microphysics of Summer Clouds in Central West Antarctica Simulated by Polar WRF and AMPS" *by* Keith M. Hines et al.

Anonymous Referee #2

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General comments

This paper compares radiation measurements with models runs with different microphysical schemes and meteorological fields. The paper has some interesting results and should eventually be suitable for publication, however I do have some concerns that should be addressed first.

I get the impression that the authors want to suggest that certain "advanced" microphysics schemes perform better than older schemes. However they need to be careful to discuss whether there data really support this. Have they fully explored other reasons for model measurement mismatch e.g. model boundary conditions, model physics, model resolution or measurement uncertainty. It seems clear that the differences between AMPS and WRF is predominantly down to the source of the meteoro-

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Discussion paper

logical data (e.g. GFS forecast data vs ERA-interim reanalysis).

The figures showing comparisons between model and measurement need to be significantly improved. Currently agreement cannot be properly assessed from the time series figures.

I really don't understand the section on cloud fractions. The authors calculate the cloud fraction as 0.075LWP + 0.170IWP, but the rest of the section seems to make out that this is a measure of cloud frequency of occurrence. Have I missed something? Even if I have this sections needs to be made clearer.

Specific comments

Page 2, Line 8 (and throughout) –Don't use the word "advanced". This is subjective and depends what you are comparing the scheme to. Try and keep the language as scientific as possible.

Page 3, Line 29 – I don't know what a "robust field program" is? Remove "robust".

Page 3, Line 30 to 10 (and throughout this section) – Most of this would be better in the introduction. This section should be a description of the field program and methods. The motivation for the project should come in the introduction.

Page 4, Line 10 – It is unclear to me what "well-calibrated" means? You don't explain how any of the instruments were calibrated. You should discuss this and also data uncertainty.

Page 4, Line 12- Suggest having a map with the field sites marked.

Page 5, Line 13 – You never explain what WRF stands for.

Page 7 line 18 – Please reword keeping the language as scientific as possible.

Page 8, Line 18 – O'Shea et al measurements were over the Weddell Sea not the Antarctic Peninsula.

Page 11, line 4 – Again stop referring to more "advanced" microphysics schemes, rather give the actual name(s) of the schemes.

Page 11, line 30 to 35 – I don't understand this? What is "observed difference was at the boundary of the 95% confidence level"?

Page 12, line 14 – Saying the microphysics scheme strongly impacts the temperature bias seems like an exaggeration.

Page 12, line 26 – Which schemes are you referring too when you say advanced? Which schemes are you comparing them with? If WSM5C is the less advanced scheme its performance looks comparable with Morrison and P3?

Page 13, line 12- Again this may not be due to the microphysics scheme. It could be related to the met fields, other characteristics of the model or uncertainty in the measurements.

Page 15, line 6 – The LWP retrieval and uncertainty should be discussed in the methods section (section 3).

Page 16, line 4 – I am not sure what the point of this metric is? You've already shown IWP and LWP plots, what is this metric and figures 9/10 really adding to the paper?

Page 16, line 16 – What does "Liquid cloud occurrence fraction" actually mean? Are you just multiplying the LWP by 0.075? This isn't a measure of the frequency that clouds occur. You either need to clarify or remove this analysis.

Page 19 Line 5 to 11 – This paragraph shouldn't be in the conclusions. A discussion of the aims of the project/work should come in the introduction.

Table 1 – Add source of meteorological fields. It would also be useful if you added other key characteristics of the schemes (IN parameterisation, number of habits, PSD parameterisation, etc)

Figure 8 to 12 – These times series plots are not clear, can't make out individual lines.

Suggest you consider other ways to show this data.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-1251, 2019.