General comment:

This study presents a statistical analysis of cloud types, their occurrence and macrophysical properties over a Southern Ocean region (and separately its northern and southern parts), based on measurements from the MARCUS campaign. In most cases, presentation of results, discussion and comparison with other studies is adequate. The results are relevant for AMT and can be useful for evaluation studies of satellite retrievals and model simulations. For these reasons, I recommend that this manuscript is accepted for publication after major revisions. These regard mainly structural issues (particularly in Section 2) and several points throughout the text that need to be clarified.

Specific comments:

Section 1:

Lines 97-98: "which in-situ … this analysis". This part of the sentence is not clear. Do you mean that in-situ measurements from SOCRATES were used here as reference? Please clarify and rephrase.

Lines 99-102: while the objectives of the MARCUS campaign are clearly stated in this sentence, it is not clear what the focus of this study is. While it is described in the next paragraph, this sentence needs rephrasing.

Section 2 general comment: It was difficult for me to follow the text in Section 2. The authors describe data sets, algorithms and methods in an unclear and mixed way. Please provide a more concise description of data sets and methods by considering the following suggestions:

- It would be helpful for the reader if you provide a table with all the cloud parameters measured and analyzed in this study.

- For each cloud parameter, please provide a short description of the instrument and method used for its measurement or retrieval.

Line 118: please provide a reference or short description for the AMF2 instruments suite.

Lines 135-136: the occurrence frequency estimation, as you describe it here, should refer to all clouds, instead of each type of cloud separately. Please clarify.

Lines 140-142: what are these "brightness temperature biases"? What is the reference value? And what is the extra step to determine the uncertainties that you propose?

Lines 150-151: how did you calculate LTS and EIS? How did you use them in your analysis?

Lines 152-154: Wasn't the occurrence frequency estimated as described in lines 135-136? Please provide a short description of the method mentioned here.

Section 3 general comment: Results are described consistently and are adequately compared with the literature.

Line 163: the cloud categorization appears for the first time in Fig. 3. I suggest to move the categories explanation from the caption of Fig. 3 to a separate table, and present it earlier in the paper.

Lines 188-191: it is a common approach in such cases to use spatial and temporal averaging for a more reasonable comparison. Did the authors try such an approach?

Lines 204-212: Please consider moving this description to Section 2, and adding a table to show this categorization more clearly (see also my comment on line 163).

Line 215: "all types of clouds in SSO are higher…": do you mean that they occur more frequently?

Line 248: The information in Table 1 and Figs. 3b, 4a could also be nicely combined in box plots.

Section 4:

Line 283: In Fig. 5 a LWP threshold of 20 g m^{-2} appears, contrary to the text where a 10 g m^{-2} threshold is mentioned. Please clarify.

Line 292: "… WID is greater than 0.1 m s^{-1} and V_d is greater than 0.0 m s^{-1}…". This "and" is an "or" in the diagram of Fig. 5. Please clarify.

Line 307: "By changing … for each range volume". This sentence is not clear, please rephrase.

Line 308: "statistics of the possibility of the cloud phase that may be detected by cloud radar". Please consider replacing with "the possible cloud phase partitioning that may be detected by cloud radar".

Line 347: please replace "e.g." by "i.e.".

Line 358: please replace "least" by "lowest".

Line 385: "mimics" should be replaced by "follows".

Line 419: Is 73% the percentage of all cloud samples available with a threshold of -50 dBZ? Please clarify.

Line 460: please replace "indicating" with "indicative".

Line 483: the term "such as" should be replaced by "i.e.". Also, isn't the LWP for MOL and HOL a full column retrieval? If so, the term "low clouds" should be replaced by "low clouds, including middle and high clouds overlapping cases". Please clarify.

Section 5:

Line 465: please replace "the northern" with "its northern".

Figures:

Figure 1 caption: "Some of the dates have labeled along the shiptracks, which can indicate the direction of the ship traveled". Suggested rephrasing: "Some of the dates are labeled along the shiptracks, indicating the direction of the ship".

Figure 6 caption: please replace "shows" with "is shown" or "appears".

Figure 11 caption: what is the meaning of IOP (also mentioned in line 465)?