DeWitt et al. discuss here the relevance of fitting cloud size distributions, and more specifically their perimeters, by testing a power-law formula based on various satellite observations and a numerical simulation of the SAM model. They find that this power-law provides a good representation of perimeter distributions, being almost invariant across different atmospheric states. They also describe differences between satellite and model observations, probably due to the way in which clouds and their boundaries are characterized.

General comments :

I enjoyed reading this work by DeWitt et al., 'Observations of climatologically invariant scale-invariance describing cloud horizontal sizes ; however, I find that the study issue and the problematic of the article are not clear enough in the first three parts. I'd recommend revising the structure, especially parts 2 and 3, in order to better define the publication's issues.

My first comment concerns the introduction of the paper. While the state of the art is consequential, the motivations for cloud size analysis are missing, in particular the problems encountered by GCMs. Moreover, I find it surprising that at the end of this introduction, instead of presenting the structure of the paper, it's the results that are described.

As for parts 2 and 3, I think they could be combined into one, trying to be more direct about the motivations for studying cloud perimeters and how these have already been studied and fitted. Also, some sections of part 3 could be put in the introduction.
L131 to 156: I would have put this paragraph to the discussion about the different parameters alpha beta.

Another of my comments concerns the relevance of starting with SAM layers and comparing them with satellite data. Satellite data represents compressed data. It would have been a useful approach to compare this with the satellite data, and to show that the results are different when SAM is viewed in layers. I'd also like to see whether there is any dependence on the horizontal resolution of the model in determining the alpha and beta parameters.

It would be better to arrange references in chronological order when quoting articles (example: l.111-112).

Minor comments:

Figures and table:

- Figure 1: what are the x-y axis? And the labels?
- Figure 2 and 3: Be consistent with the units, use parenthesis for km^2 (same Fig. A1)
  Caption: what the dashed line represents ?
- Figure 3: Put « Model » as a label and deleted « satellites » in the Figure.
- Figure 5: Caption: over water (ocean) → over ocean (right)
- I'll reverse the order of figures 4, 5 and 6 as:
  Fig.4 → Fig.5
  Fig.5 → Fig.6

Fig.6 → Fig.4
- Figure 8: what do the colors correspond to? Also, a problem in the caption «Appendix ??.»
- I don't quite understand what the insert in the middle figure does for the reader. Please be clearer,

- Table 1:
Reverse GOES WEST and EST, METEOSAT 9 and 11
Please make sure that sensor names are correct (METEOSAT ⇒ SEVIRI etc.)

Organization:

- Subsection 4.1.1 and 4.1.2 are not necessary and can put directly in the section 4.1
- L.243: You have a section 5.1 but no others.
- L.36: A more recent study (Garett et al., 2018) → The study of Garett et al. (2018)
- Equation 3: what pmin and pmax represent? You defined 20 lines after.

- Clear-skies → cler-sky