

## ***Interactive comment on “Sensitivities of Amazonian clouds to aerosols and updraft speed” by Micael A. Cecchini et al.***

**Anonymous Referee #2**

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This paper by Cecchini et al describes the use of the German HALO aircraft, with a very comprehensive payload for studying atmospheric physics and chemistry, and powerful performance characteristics in range and altitude, to study clouds forming over Amazonia. The results are important because Amazonia is an understudied region which is capable of having a profound influence on the Earth's climate. They appear to show a clear dominance of the influence of particle number concentration in air entering the cumulus clouds on their further development. Other factors such as updraft speed have less influence as does height above cloud base.

The paper is well written in the most part and is acceptable for publication subject to dealing with the comments below.

1. It would be much easier to read this paper if it contained a table defining the many

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physical quantities in the equations, and in the diagrams. Ideally this should be Table 1.

2. Page 7, line 22: The text refers to supplementary material in the form of figures S1-S4. These are not shown in the manuscript. Are these shown in an appendix somewhere?

3. The real physical significance of Figure 2 could be better explained by describing the shape of the lines drawn in the figure as the droplet size 'D' increases particularly the significance of the inflexions. Reasons could be given for why droplet size continues to increase with altitude. To some extent this is dealt with in the concluding remarks but for clarity should be included when the figure is described in detail.

4. The axis labelling and figure caption shown in Figure 2 needs improvement. In particular, is the vertical axis  $n_a$  – is the same quantity as shown in Table 1. Some linkage between the numbers referred to in Table 1 and Figure 2 would be helpful.

5. It appears from Table 1 that there is a significant difference in particle number or CCN, and possibly chemical composition, between maritime and continental cumulus clouds. Are there obvious differences in cloud appearance and shape associated with the differing input parameters? This would be suggested from their conclusions regarding the importance of particle number on cloud development.

6. Is there any information on the chemical composition of particles entering the different clouds, and in particular regarding the contrast with flight AC19 and the rest? Figure 2 suggests there should be.

7. Is there a diagram showing the total aircraft instrumentation package and its capabilities in the series dealing with the overall experiment in Amazonia? Perhaps this is described elsewhere and if so should be referenced. Perhaps the Wendisch et al 2016 paper covers this.