

Review of “Quantifying cloud masking in a single column”

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Summary

This work aims to quantify the cloud radiative effect under a “fixed-cloud-albedo” hypothesis and explore the cloud masking effect on the reduced climate sensitivity compared with clear sky. While I find the overall idea of this work interesting and worthy of further investigation, the presentation and scientific quality of this paper require improvement to meet the publication standards. Here are the concerns in detail:

1. Lack of clarity and coherence in title, abstract and the contents. For example, the title is about the cloud masking effect, but refers to the masking of what? In the abstract (and in the main text), the author introduces an important hypothesis/concept – “fixed cloud albedo”, but the hypothesis itself is not adequately defined/explained, like what is this hypothesis and how is the cloud albedo being fixed (e.g., through fixing the cloud cover and cloud microphysical properties or else?). In the conclusion part, “a null-hypothesis for cloud-altitude change”, this is barely mentioned in previous content and what is its connection with “fixed cloud albedo” hypothesis?
2. In the methodology part, the method is not well documented and hence is hard for other scientists to reproduce the results. Key assumptions and model setting are either insufficiently described or entirely missing. For example, what are the assumptions regarding relative humidity, cloud properties and etc. used in this work? How will the results be affected by these assumptions and how reliable are they? Given that this work uses a single column model with several simplifying assumptions, the authors also need to discuss the robustness and implications of their findings more carefully.
3. Key conclusions lack the support of enough evidence or proper interpretation. The current main text lacks sufficient details to support the conclusions, making it difficult for readers to understand how these conclusions were derived? How does the cloud masking effect connect with the fixed-cloud albedo hypothesis?
4. The writing and presentation need improvement. For example, there is a “Section 5” but it is not outlined in the structure of this paper. The abbreviation of “PHAT” is introduced but not explained. In table 1, what does “mean” mean? Does it mean “the same as the previous line”? Line 142, $-83 \sim -28 \text{ W/m}^2$, is this from all-cloud results or which panel are the authors referring to? Figure 3, what does the dot represent in this figure, ensemble mean?

Overall, given the deficiencies outlined above, I recommend major revision to address the issues thoroughly.