

Reviewer Comment

This study investigates aerosol and cloud condensation nuclei (CCN) properties over the Central and Northern Great Barrier Reef during a 2022 research cruise. It finds that continental air masses increase CCN concentrations despite lower aerosol hygroscopicity, largely due to organic emissions. Precipitation history and aerosol source regions notably influence particle properties. These results are important for assessing Marine Cloud Brightening as a climate intervention to protect the reef. Long-term observations are recommended for a full climatological understanding. Measurement data with analysis presented in this paper is meaningful, and the manuscript and figures supporting the points are sufficient for the publication. However, it would be nice to reflect some of points listed below in the manuscript.

1. In the section 2, it seems that a description of the meteorological conditions during the observation period is missing. Since these conditions can also influence aerosol concentration, size distribution and CCN properties, it would be beneficial to include a discussion on this aspect. Even if they are not directly relevant to the main findings, providing this information is essential to help readers better understand the measurement period.
2. The measurement period covered in the study was from February to March. Are there any other measurement results or references from similar locations during different seasons? If available, including discussion or comparison regarding seasonal influences could further enrich the analysis.
3. While the study addresses the precipitation effect on aerosol and CCN properties, it appears that only correlation coefficient analysis is presented. A more detailed case study analysis seems necessary to better understand how precipitation actually impacted on the aerosol characteristics – for example, by comparing aerosol properties before and after precipitation events. Additionally, a more in-depth discussion on how precipitation influences high concentration cases would further strengthen the interpretation of the results.
4. It would be important to discuss whether any new particle formation (NPF) events observed during the measurement period, and whether such events contributed to the observed high aerosol concentrations. In the current manuscript, only an increase in

the nucleation mode is mentioned, but there does not appear to be any explicit discussion of NPF events. Given the size range covered by SEMS, it seems sufficient to detect NPF events, and therefore a more detailed discussion on this point would be valuable.

5. In the supporting information, the method for deriving κ value is explained. This approach estimates κ value based on size distribution and CCN number concentration, rather than direct measurement such as size-resolved CCN measurements of HTDMA. Since this method inherently involves assumptions about the aerosol mixing state, it would be beneficial to explicitly mention these assumptions and to discuss the associated uncertainties in the estimation method.
6. In Figure 5, the dots representing precipitation events are highly clustered, which makes it difficult to distinguish. It is recommended to consider alternative visualization strategies to improve clarity.