

Atmos. Chem. Phys. Discuss., referee comment RC3
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Comment on acp-2021-1063

Anonymous Referee #3

Referee comment on "Investigation of new particle formation mechanisms and aerosol processes at Marambio Station, Antarctic Peninsula" by Lauriane L. J. Quéléver et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-1063-RC3>, 2022

I congratulate the authors for the excellent paper, this is a ground breaking paper with lots of excellent measurements.

I suggest publication on ACP following minor revisions:

1) The authors seem not to give importance to sympagic sea ice areas as a source of organic nitrogen, as discussed in Dall'Osto et al (2017), Dall'Osto et al (2019) and Rinaldi et al (2020) - given the fact it is a likely source of an important gaseous precursors, it may be worth to bring it into discussions

2) Following this, I am afraid the discussion on point 4 on page 17 is somehow hard to follow. The authors report 13 nucleation events: event 1 and 3 have high GR, event 6,9,10 have very high J. The authors then decide to reports an important case study for the last day (event 12 and 13). However, the discussion of the wind roses is rather weak. The whole interesting event of the case study event (high organic nitrogen) has the opposite wind roses of the claimed penguin colonies. Also, event 6,7,8,9 have contrasting wind roses - so there must be some influence from the contrary sector (again coincidentally open pack sea ice regions around Marambio).

Following the points above, please consider to address other possible source regions. On this regards, you may want to consider to run concentration weighted trajectory for particle formation rate or to see where these particles may originate - the dataset is a brilliant one and worth analyzing a bit more in detail. Also, only one mass defect plot is presented (Figure 6). This is unusual, on previous papers (ie Antarctic measurements in Jokinen et al., 2018) mass defect api-tof measurements for each NPF events were presente - may be worth reporting them in supporting information

I congratulate once again for the brilliant dataset produced and the well presented paper, I hope these modifications can be considered before accepting the paper.