

Atmos. Chem. Phys. Discuss., referee comment RC1 https://doi.org/10.5194/acp-2022-280-RC1, 2022 © Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.

Comment on acp-2022-280

Anonymous Referee #1

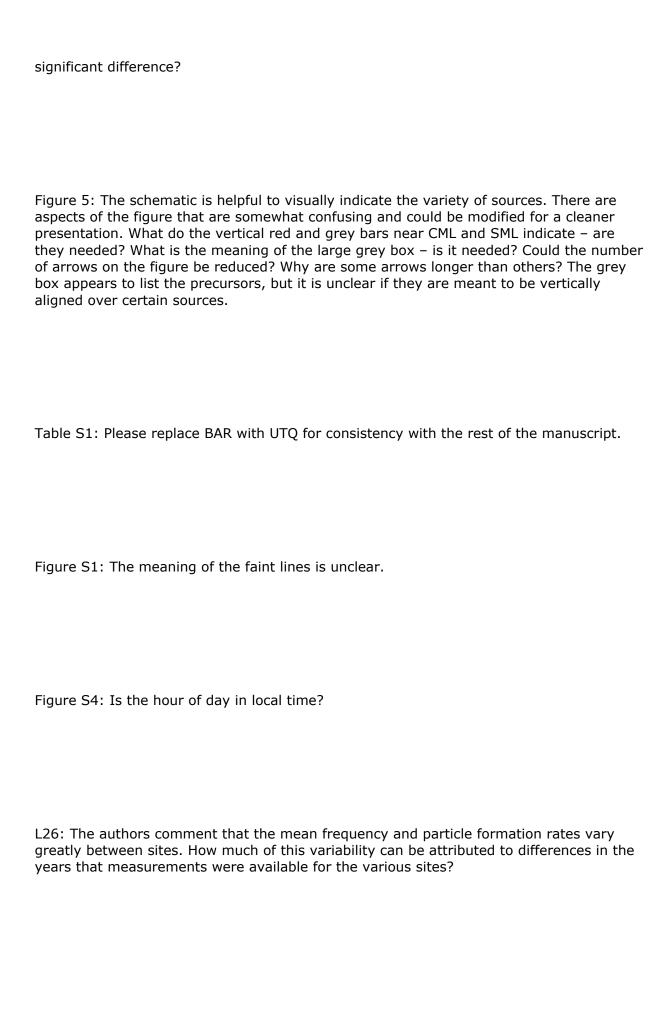
Referee comment on "Collective geographical ecoregions and precursor sources driving Arctic new particle formation" by James Brean et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-280-RC1, 2022

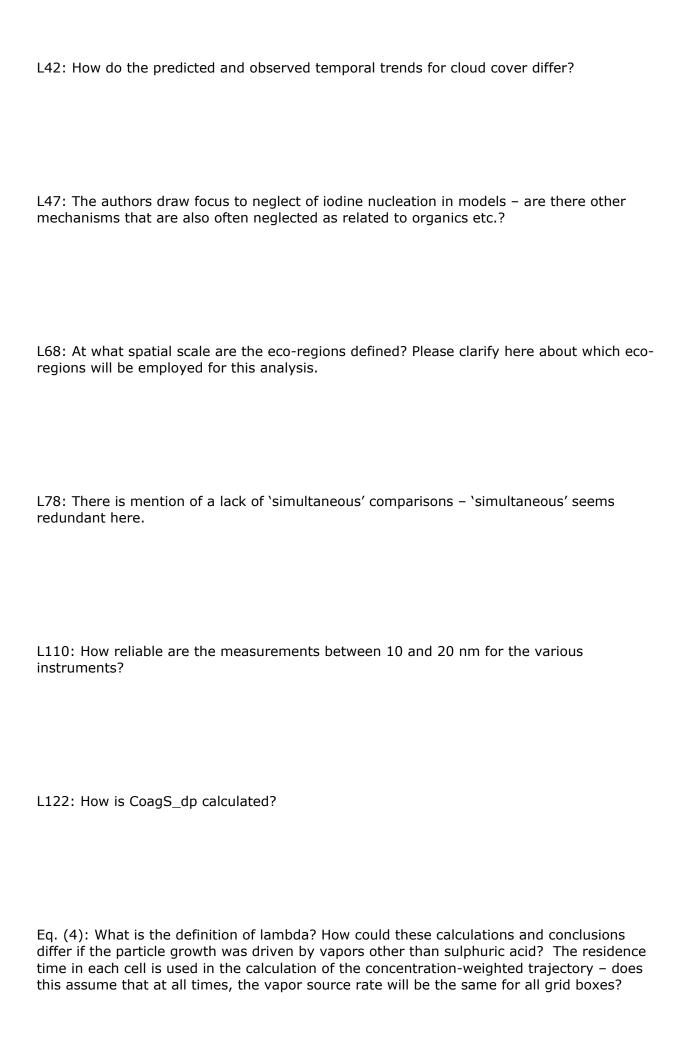
General comments: This manuscript analyzes atmospheric particle formation and growth rates for six Arctic sites. Back trajectories are used to examine the potential locations for particle precursors. The manuscript provides a useful scientific contribution since there remains considerable uncertainty about sources and processes associated with new particle formation (NPF)/growth in the Arctic. The following questions/concerns should be satisfactorily addressed prior to final publication.

Specific comments:

Figure 1: Please consider adding numerical labelling to the vertical axis for GR, CS, and Q. Currently there is only 1 tick labelled for the GR, CS, and Q panels.

Figure 4: To help with the interpretation of Fig. 4, which of these differences are statistically significant? For example, for GRU and ZEP, there does not appear to be any appreciable difference between NPF and non-NPF trajectories. However, for ALE, TIK and VRS, there are increases in the trajectory fraction over sea and land for NPF versus non-NPF, but it is uncertain if these differences are statistically significant. Likewise for UTQ, there is an increase in time over sea ice for NPF versus non-NPF, but is this a statistically





Please clarify and if so, how does this assumption impact the conclusions?
Section 2.4: 3-day back trajectories are used to examine the regions that the air mass has passed over prior to arriving at the time of NPF. To help with interpreting these trajectories, please indicate the expected lifetime of the precursor vapors. How do vapor aging processes impact this calculation?
L151: How does the 1x1 degree resolution of the grid cells impact the results?
L157: How does neglect of trajectories above 1 km impact the conclusions?
L167: Why does the condensation sink not appear greater in the Arctic Haze season? This seems unexpected – what contributes to this lack of difference between seasons?
L174: Is this local time?
L209: What is the driver of NPF at VRS if there appears to be no link to any specific ecoregion?

