

Atmos. Chem. Phys. Discuss., referee comment RC2  
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## Comment on acp-2021-349

Anonymous Referee #2

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Referee comment on "Arctic black carbon during PAMARCMiP 2018 and previous aircraft experiments in spring" by Sho Ohata et al., Atmos. Chem. Phys. Discuss.,  
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The manuscript documents an Arctic aircraft campaign for measuring the amount and some properties of the black carbon aerosol. As three dimensional measurements are sparse, but important for understanding the Arctic atmospheric composition this is a very relevant contribution. The authors show additionally to the measurement data, data from two chemistry transport models, a trajectory analysis and satellite detected fire hot spots to investigate in the importance of the biomass burning aerosol for this, but also for past campaigns. The study is well presented, however I think it has some shortcomings by not exploring the modelling results sufficiently and relying only on fire hot spots counts on a northern mid and high latitude region.

Another aspect which should be investigated, is a comparison of all the measurements (including station data), which are based on SP2 method with black carbon derived from other methods on nearby locations. For example eBC timeseries taken at Zeppelin station could be added.

The authors assume the models might underestimate the BB emission which are observed at the beginning of April. Instead of an extensive comparison to the fire hot spots I think following is missing:

There is no detailed explanation of how large the biomass burning and the anthropogenic emissions are in both models (maybe split for mid and high latitudes). Also the BC lifetime for both modelling approaches should be given.

The measurements of the PAMARCMIP campaign are given as average concentrations or a summary showing the vertical distribution. A time series of the aircraft data and the model results (showing both anthropogenic and biomass burning) would give a better insight in the variability of the measurements.

In Figure 2, which shows the vertical distribution also the modelled concentrations should be added.

Figure 7, which shows the biomass burning plume could be made more readable by showing the location of the transect on the map and removing the violet regions for the low or zero concentrations. Additionally the anthropogenic contribution could be shown.

Figure 4 shows the fire counts, I wonder why not BC emissions (as total mass emitted) have been used and the flight tracks could be added to get a better impression which fire sources potentially could influence the campaign.