

Atmos. Chem. Phys. Discuss., referee comment RC2  
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## Comment on acp-2021-458

Anonymous Referee #2

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Referee comment on "Influence of springtime atmospheric circulation types on the distribution of air pollutants in the Arctic" by Manu Anna Thomas et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-458-RC2>, 2021

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Review of "Influence of springtime atmospheric circulation types on the distribution of air pollutants in the Arctic" by Thomas, Devasthale, and Nygard

This is a study about pollutant distributions in the Arctic, as they relate to the atmospheric circulation patterns in the springtime. SLCPs; O<sub>3</sub>, NO<sub>2</sub>, CO, and aerosols (via AOD) were examined, and correlations were found between an increase/decrease in pollutants and types of circulation. Satellite (OMI, AIRS, CALIPSO) and reanalysis (CAM5, ERA5) datasets were used, and the 20 circulation patterns were determined using a Self-Organizing Map method for the 2007-2018 time period. O<sub>3</sub> concentrations were found to have the opposite behavior as that of NO<sub>2</sub> for the circulation types, and NO<sub>2</sub> was found to be the most sensitive to circulation type than the other pollutants.

General comments:

Lines 151-162: Can you please add an explanation or justification on why mean sea-level pressure is the only variable needed to characterize a distinct circulation pattern?

From Fig 1 – if I interpret it correctly, CT#20 is the most frequently occurring CT in March. And CT#1 & 4 are the most commonly occurring CTs in May. CT#6 and 7 are not very frequent in any of the 3 months. It would be helpful if the authors spent some time discussing which of the 20 CTs are the most common conditions and which are more rare and to further discuss that frequency in terms of the SLCP concentrations. If I've misunderstood and all 20 CTs have a similar frequency of occurrence, than the authors should explain that too.

Minor comments:

Line 18: spell out acronym "MSLP".

Line 21: spell out acronym "AOD".

Line 94: "descend" should be "descent"?

Figure 1: The caption says (a) and (b), but the figure panels aren't labelled with (a) and (b) but they should be. Otherwise, the caption should be changed to (top) and (bottom).

The x-axis of both panels should be labelled ("number of days"?). The colour bar or the the lower panel is labelled "circulation type number", but I think it should instead be labelled "weighing factor", no?

Line 262: add "and" between 'humidity, rainfall'.

Figure 6: what's the unit on the O3 anomalies? Is it unitless VMR? Perhaps multiply by  $10^9$  and provide units of ppbv. Or else, add to the caption as you've done in Fig 8 ("The ... volume mixing ratio anomalies...")