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## Comment on acp-2021-341

Anonymous Referee #1

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Referee comment on "Overview: Recent advances on the understanding of the Northern Eurasian environments and of the urban air quality in China - Pan Eurasian Experiment (PEEX) program perspective" by Hanna Lappalainen et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-341-RC1>, 2021

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Review of "Overview: Recent Advances on the understand of the Norther Eurasion environments and of the urban air quality in China - Pan Eurasian Experiment (PEEX) program perpsective"

### General Comments

This paper summarizes the results of a number of projects under the PEEX program, and pulls them into a single overview manuscript. The paper explores linkages between the various results and their connection to impacts, for example on human health. Overall, the paper contains a lot of potentially useful information with many associated references. However, I had a hard time understanding who the intended audience was. The paper could be a useful reference for scientists looking for information and related papers on environmental parameters in the Russian Arctic. However, in order to achieve this, some reorganization would be needed to help the reader find what they are looking for. Furthermore, some of the descriptions of the work lack detail. The specific comments below give examples of this, for the introduction, atmospheric composition, and synthesis sections.

### Specific comments

Line 87 (abstract): Include a clear statement of why a review paper is needed. Consolotation/linkages between datasets collected over large spatial area across multiple research themes?

Line 87 (abstract) and Line 106 (introduction): Why are urban megacities in China included in the paper? Would this fit better in a separate accompanying paper?

Line 128: What is the Silk Road Economic Belt Program?

Line 152: I am a bit confused about the study area. Can a map be produced that summarizes the region of interest?

Line 533: In a number of places, more information/context is needed. For example, the discussion around line 533 indicates that wilfires caused CO<sub>2</sub> increases. However, no

information is provided on wildfire activity. Furthermore, it is not clear what methods are being used to detect increases over what averaging period.

Line 566: Did wildfires impact CO concentrations?

Line 567: Why are CO and CH<sub>4</sub> being compared and across different time periods? I'm having a hard time interpreting the results.

Line 574: What does 0.9-1.7% per year refer to? Background concentrations only? What about urban concentrations?

Line 581: What method was used to determine that monoterpenes are major contributors to O<sub>3</sub> formation?

Line 589: Discussion of stratospheric ozone should be in a separate paragraph and clearly identified as stratospheric to avoid confusion. Or perhaps it can be moved to the "UV variations" section?

Line 598: Define threshold for NFP event days.

Line 627: Should the discussion on wildfire trends be included as a standalone section? I imagine that this is information that readers might be interested in (and want to find easily) for a variety of applications. Furthermore, this could then be cross-referenced from all sections discussing impact of wildfire trends on air quality.

Line 718: I feel like the section "methodologies and model developments" could be split up and moved into the relevant section. For example, readers interested in NFP may not think to read this part of the paper.

Line 853: Is there trend information for NO<sub>x</sub> and SO<sub>2</sub> emissions in the area?

Line 859: "relative frequent occurrence" -- compared to what?

Line 883: "... were analyzed for North China..." what method/data were used?

Line 936: This paragraph and the ones after it contains a lot of information about air quality that is outside urban environments, as well as information on deposition and emissions. If a reader was seeking this information, they would not think to look under "2.2.2 Urban air quality and megacities" Reorganization of content is needed.

Line 975: "... emissions of PM were observed..." what method was used?

Line 980: CO emissions are discussed. Why isn't this included (or cross-referenced) in the section describing ambient CO?

Line 1653: Should "UV variations" be linked to the discussion of stratospheric O<sub>3</sub> (line 589)

Line 1665: "Air pollution and related health effects" - the discussion of air pollution in Bergen is very specific and also does not have any direct ties to human health. Perhaps this discussion should be moved into the section about atmospheric composition so that a reader interested in meteorological impacts can find it easily?

Line 1665: "Air pollution and related health effects" - the scope of this section seems very narrow and focused on some example studies. What about the broad picture including all the species/locations monitored through the project? For example, there is no mention of

urban air quality in megacities in this section.

Line 1757: Why is BC highlighted as the most important air quality pollutant here for future study in relation to human health?

Line 1760: "... was found to vary from serious effects on population health..." I didn't see this evidence of health studies in the paper. Perhaps rephrase to something like "Air pollution was at concentrations that can be harmful to human health"?

Technical comments

Quite a few grammatical errors (recommend copy-editing).