Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., author comment AC2
https://doi.org/10.5194/amt-2021-437-AC2, 2022

Reply on RC2

Boris D. Belan et al.

Author comment on "Integrated airborne investigation of the air composition over the Russian sector of the Arctic" by Boris D. Belan et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-437-AC2, 2022

Response to Reviewer 2

Review of Integrated airborne investigation of the air composition over the Russian Sector of the Arctic by Boris Belan et al.

The paper describes measurements of traces gases, aerosol properties and ocean extinction coefficient from an aircraft campaign in the Russian Arctic in Sep. 2020.

The research plane was well equipped and the presented data is valuable and well suited for publication.

The aim of this work is to introduce the measurement campaign and the data. Hence, the paper is a little weaker on the interpretation of the findings. However, given the wealth of data (and the length of the article) I am completely fine with this.

I only found a few minor comments, listed below. Generally the paper is well-written and clearly structured.

Introduction

Lines 51/52: you may give the keyword “Arctic amplification”

Response: The keyword is added.

Instrumentation:

This is a well equipped aircraft for relevant measurements. Could you describe in 1 or 2 sentences what is meant by “with good resolution” in line 170? (e.g. sampling time, insecurities …)

Response: This sentence concerns the ranges of particles that are recorded by the counter. It can be omitted as the ranges are already listed in lines 164 and 165.

Line 265: please write “laser induced fluorescence” to introduce “LIF” at first use

Response: Corrected.

Fig 10: does Karskoye mean Kara Sea? Could you clarify?

Response: Corrected.

Discussion on origin of CH4 line 465 ff: Did you consider that the CH4 may have originated from the ocean? See e.g. here: https://phys.org/news/2021-03-east-siberian-arctic-ocean-elevated.html

If you had seen higher CH4 over lakes in tundra compared to the Arctic Ocean I would be convinced. Fig 12 (hysplit) is good from a methodologic point of view; however, as the sources of CH4 are the ground (land or sea) I am not sure here, whether your reasoning is complete. – Do you have any idea how in (e.g.) Sabetta region the gradient of CH4 in boundary layer looks like when flying from the tundra towards the ocean?

Response: We have the measured gradients between the continent and the Kara Sea and between the continent and the Laptev Sea in the lower 200-m layer. During the experiment, the gradients were directed from the continent to the ocean. These data will be presented in detail in the next paper.

Line 599: I do not understand the sentence: A relatively small number of samples is caused (or impaired?) …

Response: This means that the concentration of organic matter in the atmosphere is low. Therefore, to collect the amount of substance needed for analysis, it is necessary to pump a lot of air. It takes a lot of flight time. Therefore, the number of samples for organic matter is small. And it is small relative to the number of samples for inorganic matter.

Fig 19: can we understand the high values over Chukchi Sea?

Response: We have a publication on this topic. In it, we explain these high values by the transport from Alaska based on the back trajectory method. When this paper was being prepared, this result was not available yet.

Caption of Fig 20 I would repeat in the figure caption that one high data point has been omitted.

Response: Corrected

Line 665: good correlation between scattering and BC. I see this for Arkhangelsk and Tiksi and this is indeed remarkable. But would we expect generally a good correlation between those quantities? I am not sure on this.

Response: Reviewer's remark is absolutely correct. Of course, we cannot expect that these two characteristics in all arrays are well correlated. It is only noted here that the main features of the vertical BC distribution in every realization generally correspond to those of the scattering coefficient, since in these measurements we deal with air masses from remote areas, in which the vertical distribution is formed by general factors during the air mass transport (ageing) over the territory having no powerful sources of particles of various origin.

Please also note the supplement to this comment:
https://amt.copernicus.org/preprints/amt-2021-437/amt-2021-437-AC2-supplement.pdf