

Interactive comment on “A meteorological overview of the ARCTAS 2008 mission” by H. E. Fuelberg et al.

Anonymous Referee #1

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General comments

This manuscript presents an overview of the meteorological conditions during the spring and summer ARCTAS missions. This paper presents extensively the different transport regimes during the time period of the two campaigns, and compares them with climatologies to highlight the specificity of the ARCTAS measurements. For that reason, this paper is of interest because it put on a larger context future papers based on ARCTAS measurements, and gives an idea of the representativeness of those measurements. However, the paper is a bit too long, and sometimes not well written which makes the paper hard to follow. A rewording and reorganization of the "example cases" and "transport to the arctic" sections for spring and summer would reduce the size of the paper and help the reader to get the key informations.

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I recommend this paper for publication after addressing the following comments.

Specific comments

1) The organization of the subsections "example cases" and "transport to the arctic" is not appropriate. Those sections look like a catalog of informations rather than a true analysis. Those sections would gain in clarity by improving the style, reducing redundant informations between the different sections and paragraphs, and by using transitions between paragraphs. In those sections, it is difficult for the reader to pick up the key informations. Because the informations are given without a clear logic sometimes, in my opinion, it is hard to stay focused while reading the whole paper. Perhaps, the authors could merge their "example cases" and "origins of air sampled by ARCTAS aircraft" sections in a section "biomass burning and anthropogenic transport", to reduce redundant informations. For instance, the authors can exemplify the transport of figures 5 and 6 on the specific cases found on figures 12 to show transport of biomass burning and anthropogenic emissions.

2) The paper gives extensive informations about long range transport toward the arctic. I would like to see more comments on the "local" meteorology in the arctic in the lower part of the atmosphere. What was the average temperature, surface wind speed, position of the arctic front? What was the impact of meteorology (relative to the climatology) on the ice sheet and the impact of wind speed and wind direction on the ocean open leads during the mission? It is of interest for a meteorological point of view since the ice sheet and ocean leads affect the mixing in the arctic boundary layer. It is also of interest for local chemistry in the boundary layer such as ozone depletion events.

3) section 3.2: Concerning the examples, you should talk about the position of the arctic front as well.

section 3.4: you should cite also the FLEXPART website for ARCTAS (<http://transport.nilu.no/flexpart-projects?cmp=ARCTAS>) where extensive products are available for the DC8.

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Technical comments

P18418 I16: FLEXPART Lagrangian particle dispersion model. Please add Lagrangian where it is needed throughout the paper.

P18419 2nd paragraph: About the meteorology playing a major role, you can talk about the turbulent processes and mixing which dilute or mix polluted plumes and affect chemistry.

P18420 I11: this sentence needs perhaps a reference.

P18421 I6: "Two, two-way ..." If you say "Two", where is the "One"?

I11: Please give an average vertical resolution in the boundary layer and free troposphere.

P14822 I18: "biomass sources": you mean biomass burning sources? Please, use "biomass burning CO" instead of "biomass CO" throughout the paper.

P18424 I1: 1km AGL: Perhaps it's a bit too short for biomass burning plumes. Studies have shown that most of the time the injection height is equal to the boundary layer height. Make a comment.

P18425 I22: ", with greater heights to the right in the Northern Hemisphere". I don't understand what you mean.

P18427 1st paragraph: you can talk about "storm tracks" here.

P18427 I8: you should add the reference of Eckhardt et al., 2004 here.

P18427 I18: middle troposphere and upper troposphere.

P18427 I20: I don't know what the authors mean by "details", but Cooper et al., 2001 have shown ozone, CO and NO_y concentrations in the different air streams, even the cold conveyor belt.

P18427 I24: "The DI sometimes ... stream aloft". Please rephrase this sentence,
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because your description of the dry air stream and tropopause fold is a bit odd. A reference of Danielsen (1968) on tropopause folds is missing as well.

P18436 I14: What do you mean by this sentence?

P18437 2nd paragraph: You should talk about the LiNO_x production as well.

P18439 I29: Please rephrase this sentence.

Figure 4,6,16,17: The quality of these figures is quite poor. Please make sure that their qualities match at least the quality of figures 2 and 3.

Figure7: caption: "... 10 day period. d) Numbers of trajectories ..."

Figure 11: A polar projection would be better.

Figure 12 and 13: It seems more natural to put the different subplots in a chronological order instead of a somewhat random one.

Figure 13: those plots are a little bit ugly. please use the same size for the different subplots.

Figure 23: poor quality

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 18417, 2009.