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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical characteristics assigned to trajectory clusters during the MINOS campaign" *by* M. Traub et al.

M. Traub et al.

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We would like to thank the referees for their thourough review of our manuscript. We carefully checked their comments and made the following changes:

Reply to both referees:

1)We agree that more information should be given about the vertical motion of the trajectories. Therefore we additionally analyzed the mean concentrations of the level 1 and level 2 trajectories that originated in the boundary layer. Furthermore we now distinguish between trajectories that originated in the stratosphere and in the troposphere. These new results (text, tables and pictures)are added in Sections 5.1, 5.2 and 5.4.

2) The expressiveness of the 2-day trajectories results is very low. Therefore we removed these parts.

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Reply to referee 1:

<Don`t use NAONA as an abbreviation, because NAO normally stands for the North Atlantic Oscillation.

We changed NAONA to NANA.

<The lengthy explanation of the NAO is not really necessary, because the authors do not come back to this later in the paper.

It is correct that we do not come back to this in the paper. Nevertheless, the NAO substantially influences the meteorology over the Mediterranean and therefore should be mentioned.

< I suggest to add a figure showing the flight tracks of the experiment.

A figure showing the flight tracks is added.

<Page 115, line 3: It can NOT be seen that ALL trajectories with source regions in eastern Europe are associated with higher concentrations. It is only seen that they are associated with higher MEAN concentrations.

This is absolutely correct. We added the word "mean".

<It is not explained on page 119, when the Indian forward trajectories were started. Furthemore I believe that showing these trajectories is not really necessary. Remove Fig. 5.

It is indeed not explained on page 119, when the Indian forward trajectories were started, however, it has been mentioned in the caption page 134, that the trajectories were started in July, 2001. We did not remove Fig. 5 (now Fig. 7) because it spectacularly shows the transport from Indian boundary layer air into the upper troposphere, and subsequent entrainment into the upper tropospheric anticyclone.

<p. 110, line 10: instrument`s OK

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<p. 110, line 15: Isn`t IAP an institute of DLR? Indeed, this is now mentioned.

<p. 115, line 10 and other places: North Atlantic region (not Region) OK

<p. 115, line 10 and other places: North Atlantic region (not Region) OK

<p. 116, line 8: ... as far north as those at .... OK

<p. 117, line 13: ... trajectories ending between 4 and 8 km.... OK

Reply to referee 2:

<Finally, it would be very helpful to the reader if the authors gave a general description of the meteorological situation associated with each trajectory cluster (similar to that given for the South Asian cluster).

We added some more information on the meteorological situation associated with the remaining clusters.

<Section 5. How were the trajectories clustered and how were the source regions determined? Was a clustering routine used or were they examined visually?

The trajectories were examined visually. We added it in the text.

<The trajectory plots in Figure 2 are very small. They would be clearer if each panel were larger. Then focus on the actual trajectories so that they fill the panel. It would also be very helpful if the trajectories were colored according to their altitude.

We enlarged the trajectory plots in Figure 2. Additionally we highlighted trajectories originating in the boundary layer and in the stratosphere. Coloring the trajectories according to their altitude appears to be very confusing.

<Section 5.4 Page 117 line 23-24 How many of the NAONA trajectories come from the lower troposphere above North America? What are the mixing ratios associated with these traj?

There are only a few trajectories that originate in the lower troposphere above North

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America. Mixing ratios of the relatively short-lived gases associated with these trajectories are not very high.

< Page 118 line 28 The paper states that mixing ratios above 80 ppbv indicate a direct continental influence. Please clarify what you mean by "direct". Do you mean transport of just a few days? Very aged air masses can have summertime CO greater than 80 ppbv.

We do mean transport of just a few days and added "just a few days" to the concerning sentence in the revised manuscript. As it can can be seen in Fig. 5 air from South Asia is transported toward the Mediterranean in about 10-15 days.

< Abstract, line 7 from the NORTH Atlantic Ocean OK

< Abstract, line 14 mean TRACE gas mixing ratios OK

<Abstract, line 15, higher than THOSE from western Europe OK

<Page 108, line 23 long-range TRANSPORT of pollutants OK

<Page 109, line 3 air mass TRANSPORT OK

<Page 109, line 4 categorized INTO particular clusters OK

<Page 109, lines 20 and 23 Use Section instead of Sect. OK

<Page 110, line 3 Average accuracy WAS 1% OK

<Page 110, line 15 5% and 15%, RESPECTIVELY OK

<Page 111, line 7 Monthly and INTERANNUAL variability OK

<Page 111, lines 11 and 12 Rearrange this sentence to read: leads to northerly flow in the lower atmosphere toward the Mediterranean area. OK

<Page 111 line 15 under the DESCENDING branch OK

<Page 112, line 16 Rearrange this sentence to read: the FLEXTRA trajectory model

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OK

<Page 113 line 10 backward-trajectories WERE computed OK

<Page 113 line 10 Replace the sentence beginning with "As starting point E.", with: Trajectories were initialized at every minute along the Falcon flight tracks. OK

<Page 113, line 15 I was a little confused with the discussion of trajectory ending and starting points. I think you mean to say: i.e. the INITIALIZATION points of the back trajectories. This implies, FOR EXAMPLE, THAT all trajectories with INITIALIZATION points between 4 and 8 km are attributed to one height level regardless of ALTITUDE 5 days earlier. OK

<Page 114 lines 9 and 10 Some trade gases are chemically formed from PRECURSOR gases that are emitted elsewhere. OK

<Page 114, line 20 AS A RESULT, 184 of the 2690 computed back trajectories (6.8%) were disregarded. OK

<Page 114 lines 22-25 E..we distinguish BETWEEN air masses from western Europe (notably France, Germany and northern Italy) and eastern Europe. OK

<Page 116 line 16, Echange only slightly, AS nearly all 5-day trajectories E. Figure 3 This image is not very clear. Please use a bright color for the fire locations and replace the shaded region with a box that outlines the defined region. OK

<Figure 5 would be much clearer if the images were larger. We enlarged the images.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 107, 2003.