**Atmospheric
Chemistry
and Physics
Discussions**

Interactive
Comment

Interactive comment on "Investigation of how observed methane concentrations in Ny-Ålesund are influenced by atmospheric flow patterns" *by* I. T. Pedersen and K. J. Holmén

Anonymous Referee #1

Received and published: 13 December 2006

General comments:

The paper describes a climatology of trajectories for the Ny-Alesund station over the years 2001-2003 and uses a cluster analysis to investigate the impact on measured methane concentrations. The topic is fully appropriate for ACP. The authors rightly note that the transport needs to be taken into account when attributing observed changes in methane to changes in sources. They investigate differences between the 2001-2003 climatology and the 1992-2001 climatology (Eneroth et al., 2003) for the trajectories.

My main criticism of the paper is that when comparing frequencies of certain transport clusters between the two periods, the necessary care has not been taken as to whether

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these differences are significant. Factors that cause uncertainty in these frequencies are: a) atmospheric variability, b) inconsistencies in the method. Atmospheric variability for example causes the year to year variability, which can (and should) be simply compared with the claimed trend. Inconsistencies in the method are for example if the clusters that are compared to find a trend are not identical in both climatologies. This is the case of this investigation, where there is only a loose correspondence in the clusters due to their general appearance. Changes or temporal trends in the clusters however can strictly be addressed only when using the same clustering procedure on the whole dataset rather than on the different time periods separately. The authors also seem to realize this in their conclusion; however I don't see a practical way to derive trends in the transport pathways that avoid a clustering of the whole ensemble. In my view this has to be done in the revised version of the paper.

Further there is some confusion about the method: It should be clearly stated in the section ĎTrajectory model and cluster analysis" what the variables are that are used in the cluster analysis. Is the variable the horizontal position (i.e. computing horizontal distances between trajectories) or does it include altitude? Is the whole trajectory used or only the endpoint 5 days prior to the measurement? For the rest of the review I assumed that the distance between the trajectories at all time steps was used, similar to Eneroth et al., 2003.

Overall I suggest the paper needs significant work with respect to readability. Some figures and tables should be modified, also the referencing to clusters by simple numbers make the paper hard to read.

Specific comments:

Pg 11028, line 17: "The data series are too short to calculate a trend" why are the measurements prior to 2001 not shown, or used? Would a trend calculation be possible when including all data from 1997 onward? This should be described in the text.

Pg 11028, line 19: "These episodes typically last for 2 days and deviate more than

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12 ppb (standard deviation) 20 from the 14 days running mean of the data series." I assume that events with this characteristics are classified as "high methane episodes", but that there are a number of events that have smaller enhancements above the 14-day average. Pg 11030 line 11: How was the "fraction that has been below 950 hPa" calculated? Does it take into account the altitude of the trajectory endpoint (5 days back) only, or also the altitude of the trajectory between the endpoint and the measurement station?

Pg 11030 line 18 ff.: How are the clusters ordered? Since there is no property that the numbering of the clusters follows, I would suggest to use the size (number of elements) as the criterion, with cluster 1 being the largest (i.e. current cluster 6). Further, I strongly suggest to use intuitive names for the clusters, such as "North Europe and Russia" for cluster 6. This makes the paper easier to read.

Pg 11033 line 21-27: it should be noted that the largest peak on 14th July is not from the clusters that have the most association with methane emissions.

Pg 11036 line 16: The OH-sink is not absent. This might be the case locally, but for the whole region that the measured air is travelling over the OH-sink can may be called "less strong" or "less pronounced" rather than "absent".

Technical corrections:

Pg 11027, line 1: replace Ďstabilized on about" by Ďstabilized at about"

Pg 11028, line 16: replace Ďseen. Low methane" by Ďseen, with low methane "

Fig. 2: The quality is not sufficient to properly see the white circle around the station.

Caption Fig. 2: What are the different symbols? Why are there different colors? This should be described.

Fig 5: a legend showing the colors and the clusters with names (east-siberia etc.) should be given.

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Pg 11033 line 2, references: Stohl 2006 is missing in the references.

Pg 11033 line 8: replace "trajectories that has been" with "trajectories that have been"

Caption table 3: replace "trajectories that has been" with "trajectories that have been"

Pg 11033 line 11: I assume "In consistent with Stohl" should not read "Inconsistent with Stohl", but "Consistent with Stohl".

Pg 11033 line 13, also many other locations: replace "that has been" with "that have been"

Pg 11033 line 20: replace "data for July 2002 is plotted" with "data for July 2002 are plotted"

Fig 5, also Table 1: Instead of showing similar data once in a table and once in a figure and making the reader compare these two, I suggest to create two proper figures, each with 8 line plots, different line types and symbols, may be also different colors.

Pg 11034 line 17: "Though in December the standard deviation is high to be a summer cluster." This sentence is unclear.

Pg 11035 line 1: replace "have change the" with "have changed the"

Pg 11035 line 14: replace "has not as strong effect" with "has not as strong an effect"

Pg 11036 line 7: replace "and the data are in these two clusters represent" with "and the data in these two clusters represent"

Fig 8: titles of graphs (number of cluster) shouldn't appear in the axis labels.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 11025, 2006.