**Atmospheric
Chemistry
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Discussions**

Interactive comment on "A climatology of surface ozone in the extra tropics: cluster analysis of observations and model results" by O. A. Tarasova et al.

Anonymous Referee #3

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Summary: The authors use an established method of statistical analysis to assess characteristics of surface ozone measurements and model data. The method is not commonly used in atmospheric science, although the authors cite a few examples. Their approach to handling the data is basically sound; using cluster analysis they manage to greatly reduce the wealth of information on ozone, so basically every station or model gridpoint is characterized by its association with a particular cluster, and the cluster is described in terms of the seasonal and diurnal variability of ozone. The paper is concise, well written and pleasantly short, topically fits into ACP and conveys some new findings on surface ozone data. I would like to see a little more about the scientific implications of the results obtained. While it is obvious that a cluster

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analysis can be applied to the data, producing cluster characteristics that are plausible, I wonder what the use is of that data reduction beyond the purely statistical results. Also I find the diversity of stations within the same cluster surprising, for example, a station in southern South America is in the same cluster as most Central European stations. Regarding the difference between the number of clusters obtained from the observations (5) and the model (4), I suppose it would be possible to redo the analysis for the model data but prescribing the number of clusters needed, namely 5. In this way a one-to-one correspondence could be achieved between model and measurement clusters.

I recommend that a native speaker should look through the paper to sort out some minor linguistic problems.

Details:

Abstract:

p12542 l 25: ...partly semi-elevated, semi-polluted ... This is an unclear formulation. What does "partly" refer to?

p12542 l 27: ...the comparison carried out ... (word order)

Sec 1:

p12544 l 15:Replace "stronger" with "more strongly"

p12545 l 2: "the formation"

p12545 l 3: "underlaying" -> "underlying"

Sec 2:

p12545 l17: Why do you exclude tropical data?

p12547 l8-9: Replace "nmol/mol a year" with "ppbv/year".

p12547 l9: I guess that stations in the same cluster may have quite a range of different

ozone trends associated with them?

p12547 l12: word order: "seasonal cycles averages over the measurement period"

p12548 l5: Perhaps you need to make it clear that each station is represented by one seasonal-diurnal matrix of mean ozone. As the algorithm proceeds, you merge stations with similar matrices. N initially stands for the number of stations (114).

p12549 l3: I don't understand eq. 3. If $O_{3,i}$ is a centre of cluster i, then i should not occur as a counting index. Also I thought it would make sense to normalize the dispersion by $1/n_i$, the number of elements in the cluster.

Table 1, caption: Replace "denote to" with "denote"

Fig 3: The caption implies that the model results are also included in panel (a) which is no longer the case. Please make the caption more precise.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 12541, 2007.

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