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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Assessment of parameters describing representativeness of air quality in-situ measurement sites" *by* S. Henne et al.

Anonymous Referee #1

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The authors present a classification of 34 European surface observations sites with "background" - characteristics. A cluster algorithm is applied to classify the sites. The classification is based on proxies for mean and variability of emissions and dry deposition within a catchment area. The catchment areas are calculated from backward trajectories. An interesting specific of the presented classification is that it does not rely on observed concentrations, which makes it potentially applicable for network planning. The title of the manuscripts suggest that representativeness is the key target of the study.

I recommend publication with major revisions. I liked the approach to use backward

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trajectories to identify catchment areas. The cluster technique has been thoroughly carried out. However, I see a general problem (points 1.-3.) with the usefulness of the classification in its present form.

1. What is finally the representativeness of the considered stations?

It did not become clear how the "parameters of representativeness", i.e. average and variability of the integrated population density or dry deposition velocity, quantify representativeness? For instance, does low variability mean high representativeness? How do the six regimes differ in their representativeness? Which of the stations is more suited for model and satellite evaluation or data assimilation? These questions are not satisfactorily answered. The catchment area as such would describe the potential area of surface influence but, as pointed out by the authors, its size alone does not account for the varying impact of surface fluxes. An interesting exercise would be to investigate in which category an "urban" AQ-stations would fall, when it would be characterized in the same way. Would its parameters be very different from the values of a nearby background station?

2. What do we learn from such a detailed classification?

The (sub-) classification of the rather uniform (in comparison to urban or traffic stations etc.) group of background stations seems to be a bit excessive. What do we learn from the fact that a station belongs to the "remote coastal/high altitude", "semi-remote coastal/high altitude" or "very remote coastal" category. Easy to comprehend characteristics like "coastal" or "high altitude" are used in several category labels, which undermines the meaningfulness of the classification. The scepticism against this too detailed categorisation is also motivated by the well discussed sensitivity of the classification to parameter choice, scaling, temporal variability etc. I would recommend a smaller number of categories, more distinct category names and a better description of the specifics of each group.

3. Mountain sites

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It seems that high altitude sites have the smallest catchment areas (see table 1 and 2a/b/c) but it would not be correct to conclude that these stations have a small area of representativeness. For mountain sites, it is interesting to know from which part of the atmosphere the sampled air originated. In other words, the vertical representativeness of the mountain site is often unknown, which complicates the use of these data. The presented trajectory approach seems to be very suitable to gain more insight in the vertical representativeness of the mountain observations.

Further comments and questions:

The simulation of the PBL seems to be vital for the determination of the surface influence. How does the simulation of the PBL differ between COSMO and Flexpart. Was there a difference in the catchment area for night and day conditions? How is the choice of the trajectory starting point (80 m) motivated? To what extent did the model orographies resolve the high altitude sites?

In data assimilation, the representativeness is often explained in terms of correlation length or radii of influence. How could these parameters be determined for each site with the given approach?

It is know that GAW observations are sometimes filtered to exclude influence from local sources. Has this been considered in the study.

A bit more details on how the explained percentage of variance of the concentrations medians was determined (section 3.5) would help to better understand this important check of the classification.

Tables:

Tables 2a/b/c contain a lot of detail but it is difficult obtain a more general message. Would it be possible to add station altitude and to sort the data according to an important parameter. Two of the tables could also be moved to the supplement.

Figures:

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The labels are very small and font size should be increased. Plotting station labels should be avoided in Figure 2 and only be kept in Figure 4 if the labels are readable.

Figure captions:

Use same name and label of parameters in all figure captions.

Wording:

The wording would benefit from a check by a native speaker. Repetitions of "derived" in connection with "parameter" as in e.g. p. 20020 l. 18 should be avoided.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20019, 2009.