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Comment

## ***Interactive comment on “Overview of the synoptic and pollution situation over Europe during the EUCAARI-LONGREX field campaign” by T. Hamburger et al.***

**Anonymous Referee #1**

Received and published: 14 October 2010

### **General Comments**

This paper provides an overview of the LONGREX (LONG Range EXperiment) component of the EUCAARI intensive observational period. It aims to put the extensive observations of the aerosol distribution across Europe into the context of the meteorological situation during the campaign. This is a difficult task but essential to give the new observations and deductions from them a wider applicability, both in time and space. Although not presenting innovation in measurements (since covered in related papers) or modelling and analysis techniques, the paper represents an important synthesis that will be of interest to many researchers across Europe and worldwide.

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The paper is well written and the figure quality is good.

The main value of the paper is to link together the temporal coverage of 6 ground stations taking aerosol profile measurements with the spatial coverage obtained by in situ measurements of aerosol number concentration and composition from two aircraft. Knowledge of the aerosol distribution is sparse, so even the average numbers obtained for aerosol concentration within the boundary layer and free troposphere during blocked or unblocked flow regimes is of great value.

My primary criticism is that the ground-based profiling and aircraft measurements are not assimilated together to estimate a spatial distribution of some key aerosol properties. The ideal way to do this would be using a model together with a data assimilation scheme. I realise that aerosol measurements are very heterogeneous (both in quantities measured and coverage), but the attempt would be very valuable for a variable which is comparable between measurement platforms, such as total particle number concentration or accumulation mode particle number concentration. Clearly there is sufficient data to produce Fig. 13 for example. As it stands, a free-running model is used to illustrate the distribution (e.g., Fig. 3 showing black carbon column amounts) but the data is only shown in time series, isolated profiles or scatter plots. It has not been integrated together to estimate a distribution, even if only some smooth pattern averaged over the two distinct flow regimes of the campaign.

My recommendation is to accept the paper subject to minor revisions. The revisions should include some attempt to marry together the spatial distributions implied by models and the measurements obtained during the campaign at isolated time or locations. This need not be in terms of a rigorous data assimilation approach but at least in terms of a model-data comparison in aerosol number concentration above the profiling stations. It is essential to give some form of appraisal on whether the data collected during EUCAARI is sufficient to constrain the regional distribution estimates. Are there obvious deficiencies in model simulations which appear to be systematic (i.e., biases in column amounts, average vertical profile shapes, the range of temporal variations and

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other such coarse-grained measures)?

To give real value to the EUCAARI experiment it would be excellent to widen the discussion in this paper. What needs to be done next, given the results from EUCAARI? Are more routine aerosol profiling stations required to infer distributions? If so, what spacing would be a minimum requirement? Is another campaign warranted? Is data assimilation of aerosol number concentration now feasible?

### Technical Corrections

1. p.19136, l.16: remove the word “inducing” and replace with “The ridge associated with high pressure ...”. Similarly, cyclones do not “induce” easterly flow. It would be more precise to say that the easterly flow on the northern flanks of these cyclones was ...
2. p.19137, l.25: Please make clear in this sentence that the “high pressure” group is a subset of the “anticyclonic flow pattern” group.
3. p.19149, l.19: Do you mean “above and west of Munich” which would be downwind of Munich during easterlies (and closer to OBF)?

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 19129, 2010.

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