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Interactive comment on "Particle number concentrations over Europe in 2030: the role of emissions and new particle formation" *by* L. Ahlm et al.

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We thank Dr. Saunders for his comment on our reply.

The statement "If the model cannot be shown to be capturing reasonably well the 'real' numbers throughout the 20-odd year period, and thereby validate the emissions data, the validation at an arbitrary chosen long-term single year is less convincing" would be more relevant if we would have run a model from 2008 to 2030 and thereby simulated a long time series. Then we agree that it would have been somewhat arbitrary to just report one point in time along such a time series. However, what we have done is a number of sensitivity tests. As described in the paper, the model set up is such that

we run the model for 28 days: 1-28 May. (Such a simulation takes approximately one month in computational time with PMCAMx-UF). This was first done for emissions representing 2008, and then repeated with emissions reduced with certain percentages according to the IIASA report for the year 2030. The simulations using the emissions predicted for 2030 resulted in significantly lower particle number concentrations compared to the simulation with the 2008 emissions. Since emissions of SO2, PM2.5 and NOx are all predicted to gradually decrease between 2008 and 2030 according to the IIASA report, we do not think that additional simulations for years somewhere between 2008 and 2030, with emission reductions somewhat lower than those for 2030, would gain that much to our investigation. Such additional simulations would most likely give particle number concentrations somewhere in between those obtained for the 2008 and 2030 scenarios. We have already shown that the simulations of the MCE scenario, with the largest emission reductions, result in the largest reductions in particle number concentrations; the MTFR scenario with emission reductions somewhere in between those within the MCE and baseline scenarios results in particle number concentration reductions smaller than those in the MCE scenario but larger than those in the baseline scenario; and the baseline scenario with the smallest emission reductions results in the smallest reductions in particle number concentrations. Hence, by running these simulations of the three different scenarios and the default case for 2008, and presenting them in the paper, we have already shown that the larger the emission reductions are, the larger the particle number concentration reductions predicted by PMCAMx-UF.

Furthermore, a detailed particle number concentration forecast for the period 2008-2030 is not the main focus of this paper. Instead we want to investigate what emission reductions are most efficient in reducing particle number concentrations over Europe during the coming two decades, and how important new particle formation will be compared with primary emissions for these reduced aerosol particle number concentrations. We hope that this clarifies the scope and the purpose of our paper.