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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Simulating ultrafine particle formation in Europe using a regional CTM: contribution of primary emissions versus secondary formation to aerosol number concentrations" *by* C. Fountoukis et al.

Anonymous Referee #1

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This manuscript simulates atmospheric aerosol formation over Europe using a regional modeling framework. The investigated research topic is very important, yet very few investigations like this have published before. As a result, I consider the paper very welcome to the scientific community. The paper itself is clearly written and easy to follow. The presented analysis appears scientifically sound, but it should be expanded a bit in order to get a better idea how robust the obtained results really are.

Major issues:

As the authors point out in section 2 (the top of page 13589), organic vapors do not assist the growth of <100 nm in the current model implementation. This is understandable considering the current complexities in simulating secondary organic aerosol formation. However, since organics probably do play an important role in ultrafine aerosol growth in many parts of Europe, the authors should bring out this thing in a bit concrete manner when discussing the results and their implications.

The model evaluation is based only on comparing particle number concentration. The capability of the model to reproduce observed growth rate could be investigated as well, at least for the sites for which such information has been published in the literature. Such an analysis, if possible carry out based on model output information, would immediate give some hints whether "missing organic condensation" is a serious problem and where.

Concerning the sensitivity analysis, is there any possibility to investigate how sensitive the results are on the availability of condensable vapors (other than sulfuric acid)? For example, could one think of artificially enhancing the ultrafine particle growth rate by a certain factor to mimic what organics might do for these particles.

Minor/technical issues:

The kinetic approach (equation 2) was suggested already by McMurry and Friedlander (1979, Atmos. Environ., p 1635) and should therefore be cited here.

Page 13597, lines 9-10: organics contributing to the growth of fresh particles are considered to be low-volatile rather than semi-volatile.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 13581, 2012.