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Interactive comment on “On the roles of sulphuric acid and low-volatility organic vapours in the initial steps of atmospheric new particle formation” by P. Paasonen et al.

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Response to the first comment by Anonymous Referee #1. Veli-Matti Kerminen and Markku Kulmala

The referee has serious doubts on our approach to link the observed atmospheric nucleation rate to organic vapors. We would like to clarify a few issues.

First of all, at present there is no way to experimentally identify (and determine their concentration levels) the organic vapors that participate in atmospheric nucleation. As a result, any attempt to link atmospheric nucleation to organic vapors necessary relies on some indirect metric on such vapors. In this work, we chose “growth equivalent

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organic vapor concentration”, i.e. [org], for such a metric. This is physically the most natural selection for the metric, since it is expected that the very initial steps of atmospheric new particle formation (nucleation + initial growth below 3 nm) is dictated by the same compounds.

Second, unlike the referee states, we do not claim that the initial growth of nucleated clusters is dictated by condensation alone. As a matter of fact, by using the “growth equivalent organic vapor concentration” as a metric, we leave the actual process that makes the smallest clusters to grow in size an open question. In case this process would be condensation alone, [org] would be equal to the concentration of non-volatile organic vapors. We definitely agree with the referee that both heterogeneous reactions and condensation might be important contributors to the initial growth of nucleated clusters.

Third, the referee notes that [org] determined by us is several orders of magnitude below the concentration levels of gaseous organics measured in field. This is exactly what one would expect: only a small fraction of organic vapors is capable of contributing to nuclei growth, regardless of the actual growth process.

Although our approach does not provide a final solution on how to deal with organic vapors when modeling atmospheric nucleation, we believe that this work is an important step toward doing so in the future.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 11795, 2010.

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