

Interactive comment on “Impact of nucleation on global CCN” by J. Merikanto et al.

Anonymous Referee #2

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General:

The manuscript makes an attempt to evaluate the relative contribution of primary and secondary particle sources to the global CCN budget. This is a very important topic of which practically no studies have been made so far. In general, the paper is very well written and structured. There are no major scientific flaws. The manuscript should be published in Atmospheric Chemistry and Physics after the authors have addressed the few comments given below.

Scientific Comments:

The model misses dust as one of the main chemical aerosol components. This should be at least mentioned in the paper. Could inclusion of dust change any of the conclusions reached in the paper?

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The transfer from hydrophobic to hydrophilic size distribution is being made when particle contain one monolayer of either sulfuric acid or secondary organics. Why have the authors ended up with this approach? Physically, it is the volume fraction rather than surface coverage that determines how cloud active particles of certain size are. While the actual cloud activation is treated properly (using the kappa-Kohler) in the model, transferring particles from hydrophobic to hydrophilic size distribution either too early or too late may lead to biased hygroscopic properties of the hydrophilic particle population.

Is it so that the total switch of primary emissions in run 8 concerns only primary particles, not trace gases associated with these emissions? In practice, both particle and trace gas emission increase or decrease together when anthropogenic activities evolve in time. This should be brought up and briefly discussed in the paper.

It remains somewhat unclear to me how the sensitivity tests (runs 4 to 6) show up in the results. Are they included in uncertainty ranges or where?

Technical comments:

In Table 1, I suppose that minimum, standard and maximum schemes refer to the relative strength of the sources in producing particles globally. The authors could be more specific in defining this grouping in the table caption.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 12999, 2009.

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