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Interactive comment on "On the growth of nucleation mode particles: source rates of condensable vapor in polluted and clean environments" *by* M. Kulmala et al.

Anonymous Referee #2

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This paper reports measurement of aerosol size distribution at six different sites and results are used to investigate formation and growth of aerosol particles in the nucleation mode with aim to learn about diameter growth-rates and condensation sinks. Analytical expressions described in the paper are used to calculate source rate of condensable vapors and condensational sink. Paper is clearly written and conclusions well formulated.

Comparing different environments in a wide range from very clean Antarctica to heavily polluted New Delhi bring somewhat expected results about much larger source rate

of condensable vapors and condensational sink in polluted environment compared to clean background atmosphere. The differences between sites are so large that quite many assumptions done by authors will most likely not change overall picture. The main value of this paper is that it introduces quite straight forward method to estimate condensable vapor source rate from aerosol size distribution measurements only. Before more specific comments I would like to rise following couple of more general questions:

How did authors consider direct aerosol emissions in polluted environment? Moreover, temporal and spatial scale of particle formation in car exhaust pipe is so small enough to assume these particles as primarily emitted with respect to this study. And emission rate of these particles will most likely change a lot during course of a day. How did authors avoid that these particles will not contribute to calculated condensable vapors source and particle growth due to coagulation is not misinterpreted as condensational growth?

Can authors address how much are 2 - 3 weeks campaigns representative for longer time periods, what is for modelers probably of same importance like values listed in Table 1?

Specific comments

P 6947 l 19-25: There is no overlap between both DMPS ranges. Did authors made a check if both DMPS systems measure the same particle number density at least at 20 nm size?

p 6948 l 24-30: Authors mentioned explicitly drying of aerosol during Marseille and Athens campaigns. This brings question if RH was controlled or monitored during all campaigns? Was change in size of particles with RH included in data analysis?

P 6949 l 10-13: Why authors assume that they can apply estimations of large particle condensational sink from remote sites as Hyytiälä and Mace Head to conditions in New

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Delhi? Fig. 4 and 5 indicate that concentration of large particles in New Delhi can be several orders of magnitude larger compared to Hyytiälä.

P 6949 l 21: Authors report length of the campaign datasets to be 3 - 4 weeks, but later on (P 6950) shows that Athens campaign represents only 16 days, Marseille campaign 18 days and Delhi only 15 days, respectively.

P 6955 l 4-7: What detailed aerosol dynamic simulations?

P 6960 Table 1: Can authors include some range of uncertainties from all assumptions made?

P 6962 Fig 2: The sharp change of size distribution shortly after noon looks suspicious as measurement artifact. Is there some natural explanation for such sharp shift in size distribution and total number density?

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 6943, 2004.