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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characterization of particle cloud droplet activity and composition in the free troposphere and the boundary layer during INTEX-B" *by* G. C. Roberts et al.

Anonymous Referee #2

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General comments:

In the present work authors have presented air borne measurements of cloud condensation nuclei (CCN), aerosol size distributions, and submicron aerosol composition taken during INTEX-B campaign by focusing on three distinct air masses; free troposphere (FT), the marine boundary layer (MBL), and polluted continental boundary layer over the Californian central valley (CCV). Further, they have estimated the values of kappa for the understanding of CCN activity of aerosol particles of different chemical composition (organics and inorganic). The manuscript is carefully prepared and well written considering the size of the data set reported. The data appear to be of high

quality and of high relevance for atmospheric science studies and manuscript is within the scope of Atmospheric Chemistry and Physics (ACP). I recommend publication in ACP after the following points have been addressed.

Specific comments/suggestions

1) Introduction

1.1) Page 3503, line 6 and 7: Authors could consider citing recently published paper by Cooper et al., 2010, about spring pollution plumes originating in Asia and ending up across the Pacific.

2) Experimental methods

2.1) Page 3512: Authors may consider showing a general plot of back trajectories for the ease of visualization for the readers.

3) Results

3.1) Page 3513, line 18: Can authors please explain why did they choose geometric mean over arithmetic mean for representing the kappa value for each separate airmass? On the other hand, I thought, geometric mean was the appropriate choice to represent the overall average kappa value (averaged over all three airmasses; overall arithmetic mean 0.48 and overall geometric mean 0.37) which authors have not included.

3.2) Do authors have any explanation for such a high kappa value (0.98) observed in free tropospheric air mass in-spite of the fact that bulk sub-micron mass concentration was not highly variable in all three air masses? It seems that uncertainties in the supersaturation level in the CCN counter may be an explanation (Rose et al., 2008).

3.3) Page 3522, Section 4.2: I echo point raised by Referee#1 about HTDMA measurements. Please add some details about HTDMA measurement technique in section 2 of the manuscript (Experimental method section). Was the HTDMA set up identical

to the one used by Shinozuka et al., 2009? According to recent studies different H-TDMA systems can yield substantially different results (Good et al., 2010; Duplissy et al., 2009)

3.4) Page 3524, line 12: . . ...concentration (and assumed densities). Please specify if the values of Tab. 2 were used or what else was assumed.

3.5) Fig 6: According to Petters and Kreidenweis, 2007 kappa should depend (near) linearly on chemical composition (mass or volume fractions), as observed by Gunthe et al. (2009) and Dusek et al. (2010). Hence it might be worthwhile to compare/plot/present Fig. 6 and fit parameters on linear scale.

References:

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Gunthe, S. S., et al.: Cloud condensation nuclei in pristine tropical rainforest air of Amazonia: size-resolved measurements and modeling of atmospheric aerosol composition and CCN activity, Atmos. Chem. Phys., 9, (19), 7551-7575, 2009

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Shinozuka, Y., et al.: Aerosol optical properties relevant to regional remote sensing of CCN activity and links to their organic mass fraction: airborne observations over Central Mexico and the US West Coast during MILAGRO/INTEX-B, Atmos. Chem. Phys., 9, 6727- 6742, 2009

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