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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol particle size distributions in the lower Fraser Valley: evidence for particle nucleation and growth" *by* M. Mozurkewich et al.

Anonymous Referee #1

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General Comments:

The manuscript addresses two questions of relevance to the atmospheric chemistry and physics community: (1) formation of new particles via nucleation and their subsequent growth to larger sizes; (2) temporal and spatial patterns of aerosol size distributions. The authors report SMPS (Scanning Mobility Particle Sizer) measurements in the vicinity of Vancouver, British Columbia during three weeks of summer 2001. The SMPS data (9-640 nm size range) is supplemented by particle counts from a CPC (Condensation Particle Sizer) and by hTDMA (Hygroscopic Tandem Differential Mobility Analysis). The authors report that a variety of atmospheric processes appear to control the evolution of size distributions in the airshed, including combustion emis-

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sions, condensational growth from organic and inorganic compounds, coagulation of the urban plume en route to the sampling site, and new particle formation and growth from photochemical reactions.

The experimental data appears to be of high quality, with adequate quality assurance. The scientific methods are sound. In my opinion, the most important conclusions to be drawn from the paper are: (1) new particle formation occurs at this particular locale; (2) biogenic secondary organic aerosol is a likely suspect for growth of ultrafine particles at this locale.

The work is an important archive of a key aspect of the Pacific 2001 Air Quality Study. By itself, the study does not shed much new light on the nucleation and growth process. However, it may aid in planning future field studies to look in more detail at aerosol dynamics in this type of airshed (complex topography; significant biogenic aerosol precursors; a mixture of marine/urban/forested/agricultural influence to air masses).

A feature of the work is a detailed qualitative consideration of the time evolution of the observed size distributions, in conjunction with time series of atmospheric mixing height, NOx, O3, and CO.

Specific Comments:

1. The article gives the impression in several places (e.g. abstract, conclusions) that the nuclei composition is organic, although the techniques employed cannot determine the nuclei composition. In some parts of the article, the authors are more careful to distinguish between the growth chemistry and the nuclei formation chemistry. To avoid confusion, the authors should more explicitly acknowledge that the nuclei (1-5 nm) composition is unknown in this study.

2. At times, the writers assume too much familiarity with the airshed, its meteorology, and its sources. For example, the discussion of outflow/inflow meteorology on page 1636 could be improved with a few more directional cues.

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3. The authors do not mention any specific sources (power plants, highways, the general urban plume of Vancouver, etc.). I assume this is because the Eagle Ridge site is not impacted by any. In other words, the authors imply that the valley-wide pollution is mixed before it reaches the site. This should be clarified, especially as there is a section entitled: localized pollution event (section 3.1.3), implying a local source.

4. A brief formula for how the organic fraction (e.g. y-values in Figure 6) is calculated from the hTDMA data would be appropriate in the experimental section.

5. Figure 6 y-axes label should be more specific (e.g. Organic Mass Fraction, 50 nm particles). I assume that the calculations are done on a mass equivalent basis from the description in the experimental section.

Technical Corrections:

Page 1625, line 7 Clarify makeup of the forest (coniferous vs. broadleaf; predominant species).

Page 1627, line 9 Spelling error (growing)

Page 1630, line 25 Highest mass or number concentrations

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 1623, 2004.