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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Distribution of lead in single atmospheric particles" *by* D. M. Murphy et al.

Anonymous Referee #1

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This paper reports the results of multiple field studies performed by the 11 co-authors from five research institutions on the occurrence of lead in ambient particles. Three different single particle mass spectrometers were used. Measurements were made at multiple fixed locations in the U.S. and Europe as well as during multiple mobile (aircraft-based) field studies at locations across the U.S., Canada, and off the Pacific coast. The authors conclude that measurable lead is present in more than 5% of all ambient particles over a wide range of particle sizes. The lead concentrations in individual particles vary widely. The relatively few particles that contain large fractions of lead also contain large quantities of other metals and sulfur consistent with metallurgical, coal combustion, and smelting point sources. Wind direction analysis supports this conclusion. The authors also note that large numbers of particles contain relatively

small quantities of lead. These particles are more ubiquitous and independent of wind direction, and are explained by long range transport and coagulation of lead-rich nuclei (also from high temperature sources) with other ambient particles to produce an accumulation mode. Relative lead concentrations and particle size dependence are consistent with this mechanism. Measurements over the Pacific suggest long-range transport of lead from Asia.

While my background does not include atmospheric particle mass spectrometry, the measurements involving multiple systems by multiple groups seem to have been performed carefully. The authors' results and discussion are well presented and provide a reasonable interpretation of the data. The description of the characteristic times for coagulation to produce ambient particles with lead contents similar to those measured (and their size dependence) is reasonable, insightful, and convincing. I recommend publication as is.

I do wonder why the authors use the term vacuum aerodynamic diameter. I have never seen the term vacuum used like this before. In fact, a number of impactor designs use sections of reduced pressure to improve separation of particles with aerodynamic diameters $<\tilde{}$0.3 um.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 3763, 2007.