Atmos. Chem. Phys. Discuss., 11, C14037–C14038, 2012
www.atmos-chem-phys-discuss.net/11/C14037/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Dry deposition fluxes and deposition velocities of seven trace metal species at five sites in Central Taiwan – a summary of surrogate surface measurements and a comparison with model estimation" *by* L. Zhang et al.

Anonymous Referee #1

Received and published: 10 January 2012

In this study, the authors measured the dry deposition fluxes and deposition velocities of seven trace metals at five sites in central Taiwan. They reported that seasonal variations in deposition fluxes are mostly determined by those of air concentrations and to a less extent by those of deposition velocities. Moreover, it was found that the measured dry deposition fluxes can be reproduced reasonably well using the size-segregated particle dry deposition model if the mass fractions of trace metals in PM2.5, PM2.5-10 and PM10+ were known. I think that this is an important contribution to the dry de-

position of trace metals, because such data is scarce. In this study, however, there are major problems, as described below. Hence, I cannot recommend the publication of this paper. 1. The authors used a HNO3 digestion to measure the concentrations of trace metals in atmospheric PM and dry deposition samples. However, the bulk of crustal elements, such as Fe and Al, are not dissolved in HNO3. This may be one reason why the dry deposition velocity of Fe is smaller than those of other metals. It is generally expected that Fe in PM has much higher dry deposition velocity, because Fe is contained primarily in soil particles with larger particle sizes. 2. The sources of trace metals at each site are unclear. The authors should evaluate their sources using several methods, such as principal component analysis, back trajectory analysis and lead isotope analysis. Also, the authors should discuss the contribution of long-range transport of air pollutants from the China continent along with the contribution of domestic sources. 3. The dry deposition flux is defined as the product of the atmospheric concentration and the deposition velocity for each constituent. Hence, it varies depending on these two parameters. The authors investigated the correlation between the measured dry deposition fluxes and atmospheric PM concentrations (shown in Fig. 3). They concluded that the lack of correlation for several metals at several sites is due to large uncertainties in flux measurements. However, does not the lack of correlation suggest that the dry deposition flux is dependent on the dry deposition velocity rather than on the atmospheric PM concentration? It is well known that the dry deposition velocities are primarily dependent on the deposition of larger particles in PM. I think that the particle size distributions of trace metals in the atmosphere are likely the most important factor controlling their dry deposition fluxes. Further research, including intensive dry deposition and particle size distribution measurements, is required to better understand the relationship between the dry deposition fluxes and the particle size distribution for each metal.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 32847, 2011.