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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 #2**

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General comments: This was a well done study investigating the relationship between air concentrations and dry deposition fluxes of seven metal species. This issue is of great concern for human and environmental health. The investigators sought to account for seasonal and spatial variability (including different sources and land uses). The methods and analysis are sound; however, more detail on variability within a single site (site replicates) as well as discussion of significance in observed patterns with respect to this variability is required. I could not determine if the patterns observed



spatially and temporally were greater than the analytical error and natural variability. All the figures should have means and standard errors and differences between seasons and sites should be discussed in terms of significance (give p-values for significant differences). You can use a simple t-test or similar non-parametric test for this. Another avenue the author might consider investigating either in this paper or another, would be whether it would be possible to develop a "universal" model for air concentration versus deposition might be possible. As the authors note, concentration data is easier to come by than deposition data so a model for each metal species that has qualifiers for land use, particle size, etc. would be incredibly useful to environmental managers and policy makers. It looks like such a model might be possible (e.g. Fe and Mn) based on the author's data and I would be interested to hear their thoughts on such a possibility.

Specific comments: Abstract, Lines 13-20: please be more specific here which species had good results and which had poor results? Section 2.2: This section needs some discussion on sample variability, standard deviations on sample replicates and how this compares to the variability between sites and among seasons. It also needs some discussion on how significant the seasonal and site-to-site differences are (e.g. p-values or similar). Section 2.3: Again, this section needs discussion on variability and significance between seasons and sites. Section 2.4: Again, discussion on variability and significance. Section 2.5: Here you bring up measurement uncertainties, but you do not define them. Please expand this discussion. Also for the correlations, please give p-values. The correlations may be significant (low Pvalue) but not precise (low R2). Then you can discuss the lack of precision in the correlations. Also, a discussion of why this relationship is better for some species compared to others would be appropriate. This might also be a nice place to discuss whether a "universal" model could be developed for any or all of the metal species. Maybe a logistic regression that accounts for several factors (land-use, season, sources, particle size, etc.). This would be an incredibly useful tool. Section 3.1 and 3.2: Again, you need to include a discussion of error, variability and significance in these sections. Section 3.3. I'm a little concerned

with these correlations. I do not think this comparison is appropriate because modeled fluxes and measured concentrations are NOT independent. Don't you calculate your modeled fluxes based on concentration data? If so then of course they are related. You even say this on page 32860, line 3. So it's not a very useful line of inquiry.

Technical comments: Introduction, lines 25-27: this sentence is awkward. "wet and dry deposit" doesn't sound quite right. Section 2.2, page 32851, line 17: "res-suspended are"... I think a word is missing in between. Section 2.2, page 32852, line 1: delete the words "during several seasons"– it is redundant. Section 3.2., page 32859, line2: "then" should be "than" Figure 2. add error bars Figure 3. add p-values Figure 4. add error bars Figure 5. add p-values Figures S1 & S2. add error bars Figure S3. add p-values.

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