

## ***Interactive comment on “An evaluation of ambient ammonia concentrations over southern Ontario simulated with different dry deposition schemes within STILT-Chem v0.8” by D. Wen et al.***

**Anonymous Referee #2**

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This manuscript attempts to evaluate the performance of three dry deposition schemes, i.e., two uni-directional schemes and one bi-directional scheme, by incorporating them into a Lagrangian Transport air quality model. The authors validated the modeling results using a weekly average data in a regional scale during two seasons. The modeling results can generally reproduce observational data, but different schemes appear to have the best performance in different concentration ranges. The authors rationalized the difference between modeling results and observational values. The comparative study is very useful for research community select these schemes for regional air quality modeling and the interpretations sound scientific. This reviewer has a few specific comments before it can be accepted for publishing in GMD.

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1) Page 6088, lines 7-13, why the assumption is necessary for the intercomparison among modeling results? 2) Page 6089, lines 1-3 “Figure 3 also shows that all three schemes considerably underestimated NH<sub>3</sub> concentrations at sites with high observed concentrations, and overestimated NH<sub>3</sub> concentrations at sites with low observed concentrations.” Does this mean the assumption mentioned above is invalid? 3) Page 6089, lines 13-14, “all schemes tended to underestimate NH<sub>3</sub> concentrations for sites with high observed concentrations”. To this reviewer, intensive agriculture zones usually have accident emissions of NH<sub>3</sub> associated with the use of fertilization and manure. This is not surprised that the modeling results underestimate NH<sub>3</sub> concentration in those intensive agriculture zones. No emission inventory includes those accident emissions. This reviewer suggested removing those episodic concentrations of NH<sub>3</sub> at sites in intensive agriculture zones for the comparison between the observational data and modeling results. 4) Page 6090, lines 26-30, and P6091, lines 1-2; even the reference is cited, the reviewer strongly suggested the authors elaborated more for Taylor diagrams, e.g., “Simulated patterns that agree well with observations will lie closer to the reference point marked “observed” on the x axis in a Taylor diagram. From Fig. 6, we can see all schemes did not differ substantially for agricultural sites and for all sites.” What are criteria for the statements? 5) Fig. 5, to this reviewer, It appears that the modeling results by ZBE at forest sites after the mid of October agree very well the observations, but they are systematically higher than the observations before mid of October? Also, at agriculture sites, from the mid of August to the mid of October, the ZBE's modeling results are consistent with the observations, but no other times. This should be explained. 6) From the mid of October to the November, it is a fertilization season for the next year agriculture activity. This could be a very important reason for underestimation of NH<sub>3</sub> by three schemes and the reason should be considered. 7) This reviewer suggested the authors added Scattering plot between modeling results by ZBE using the minimum and maximum emission potentials and observational data.

Interactive comment on Geosci. Model Dev. Discuss., 6, 6075, 2013.

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