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Interactive comment on “A climate-dependent global model of ammonia emissions from chicken farming” by Jize Jiang et al.

Anonymous Referee #1

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The paper presents an extensive and well detailed model for NH₃ emissions from chickens. As mentioned in the manuscript, most of the current global emission inventories for livestock are based on emission factors without any consideration for regional climate conditions and farming practices. The introduction of a few regional dependent parameters should greatly improve the spatial and temporal variations in the NH₃ emissions which is of great value in for example in air quality modelling. The manuscript is well written, structured and easy to read.

Major comments

1. Hourly and Daily timescales; the authors describe in section 2.1 that their model operates at an hourly timescale for outdoors emissions while only at a daily level for indoor emissions. While variations in temperatures inside can reasonably be expected to

Interactive
comment

be small, emissions will show some variations as a function of the inside temperature, which will lead to variations in the emissions to the outside. If possible add a sentence about the choice for two different timescales and the potential impact.

2. Section 3.1.3; line 17. I would argue that the model does an average job at capturing the overall level of emissions but that some of the major changes at the start of the measurement period seem to be over and underestimated by up to a factor 2 (figure 5 May-June and ~September). Add some discussion on the main cause for the discrepancy between the modeled and measured emissions.

3. Uncertainties; the various uncertainties within the model are discussed to great extent but what is missing is a final summary and overall estimate of uncertainty. If possible add a table summarizing the various errors and uncertainties, including an expected (back of the envelope) range of uncertainty for each individual error. Similarly add a summary/discussion on the total expected uncertainty, and a summary for the uncertainties in the spatial and temporal distributions (similar to the ranges, at a back of the envelope level).

4. Current inventories; that brings us to a comparison to current inventories which is as of yet missing in the manuscript. Most regional/country scale inventories, to some extent, do have emission totals for chicken housing/open-range chickens. How do the emissions reported in this manuscript compare to some of those emission inventories (for example, UK, Netherlands, Denmark, US, German inventories...etc), and did the added complexity of the model improve the overall uncertainty in the emission totals?

5. Similarly, add some discussion on the average Volatilization levels reported in this study compared to those in current literature.

Minor edits and remarks

- a. Figure S1, is there any reasoning behind the choice of a third order polynomial?
- b. Page 6., line 9, add “of” between lack and knowledge.

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