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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Do alternative inventories converge on the spatiotemporal representation of spring ammonia emissions in France?" *by* Audrey Fortems-Cheiney et al.

Anonymous Referee #1

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Referee omment on "Do alternative inventories converge on the spatiotemporal representation of spring ammonia emissions in France?" by Audrey Fortems-Cheiney et al.

GENERAL COMMENTS

The manuscript compares 3 inventories of NH3 over France for the year 2011. The inventories are referred to as the "TNO" dataset (from a European inventory, based on reported national totals), the "NH3SAT" dataset (based on IASI inventories), and the "CADASTRE" dataset (based on a highly detailed model). The emission inventories are compared to each other, and used in simulations with a regional transport model

from which simulated concentrations are compared too. Since NH3 is an important precursor for aerosols and nitrogen deposition in agriculture intensive regions, this study provides a useful contribution to air quality modelling. I would therefore recommend to publish the manuscript after some minor clarifications.

The results show that to a large extend the three inventories are in agreement with each other, with exception of northern France during the spring period. An important conclusion is that application of mineral fertilizer in combination with certain soil properties could be very relevant when compiling NH3 emission database. When this is taken into account, as is done in the "CADASTRE" set, then simulated NH3 concentration columns are in better agreement with IASI observations than simulations driven by the "TNO" emissions, which uses a more simple approach for spatial distribution of emissions.

It would be useful of the authors could provide an outlook on how their results should be used in future. It is clear that a more detailed emission model as used in "CADASTRE" could provide better emission inventories, but from the provided information it seems not possible to apply this over, for example, the rest of Europe. In addition, it seems that in spite of its high detail also "CADASTRE" is not able predict the timing of emission right. But could the information that is used in "CADASTRE" find it's way into the "official" inventories such as that from "TNO" ? For example, would it be sufficient to just have maps of fertilizer use and soil properties for a better spatial redistribution, which is now primary based on live-stock densities? Or is modelling of emissions to uncertain anyway, and should we rely most on (satellite) observations? Also, should the official national reporting of NH3 emissions be changed following the results of this study? Some clear recommendations on this would be useful.

SPECIFIC COMMENTS

Table 1. Some clarifications on the temporal resolutions would be useful. Emission inventories like "TNO-GEN" are usually accompanied with profiles for month-of-the-year

(as used here), but also "day-of-the-week" and "hour-of-the-day". That would change the resolution to "hourly", although the uncertainty is high of course. For "NH3SAT" there is no full daily resolutions, since data coverage in time is not 100% as shown in Figure 1 lower panel. For "CADASTRE" line 525-526 mentions two-weekly data on agricultural practices; what does this do with the "daily" temporal resolution of the emission model?

Line 154. CHIMERE has not been mentioned before, maybe point forward to section 2.2.1.

Paragraph 192-196. It is not clear to me how many IASI pixels are typically used for a single "super-observation". The "robustness" of the data is mentioned, does that mean the the variability between nearby pixels is low? Figure 1 shows some some strong gradients however. Or thus "robustness" more refer to the temporal and regional differences?

Line 219-221. When no IASI super-obs is available, the "NH3SAT" inventory uses the "TNO-GEN" data. Given Figure 1 that would mean that for at least half of the days in a month the "TNO" emissions are used. Given the regional differences between the "TNO" and "NH3SAT" inventories, wouldn't it be logical to assume some kind of persistency here? Thus, use the latest "NH3SAT" value if for some day there is no super-obs available? Also temporal interpolation would be an option. How would that change the emission totals? And the conclusions on temporal variability, e.g. at line 433?

Figure 4. This figure would be better interpreted if also maps with absolute emissions for "NH3SAT" and "CADASTRE" are added, and not only the differences. In general, the comparisons are now often "against" the "TNO" set, while I would think that it should not serve as a "truth" but just as one of the 3 inventories, each with their advantages and disadvantages.

TECHNICAL CORRECTIONS

Text changes needed?

45. "encourage" instead of "encouraging"

72. "may not be well"

85. "... its temporal and spatial ..."

129. just "crops", not "N crops"

219. "When IASI is not available ..."

240. "There is no evaluation available ..." ?

246. "excluding" instead of "except"?

296. "Weather condition effects"

325. "that can"

379. "Regions are marked in bold ..."

440. "after spreading, reducing"

448. "inventory"

Figure 5 and 6: I would call this color "black" rather than "gray" . . .

At many places it seems that white-space is missing (or is this something in the pdf?):

38. "to the"

50. "it produced"

51. "sunflower, wheat"

93. "Moreover, agricultural"

139. "on the"

196. "did not"

272. "of the"

291. "inventory comparison"

297. "emissions is"

320. "regions (the ...)"

371. "nuanced as"

433. "NH3SAT and"

446. "related to"

475. "domains (Figures ..."

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