

ANSWERS TO REFEREE #1

We thank the referee for his numerous corrections in the paper. Our answers to several questions are given below.

REFEREE: Why is it that the results depend on the dataset available? This is a little misleading. Emissions are a form of input, as is meteorology. And meteorology requires inputs as well. A CTM cannot be run (well) without some kind input data. You should reword this sentence to remove "as they do not require".

AUTHORS : Here, we mean that when no observations of inorganic compounds are available, one can only rely on the use of CTMs with emission scenarios, but results (in terms of limited species among NH_3 and HNO_3 in the formation of nitrates) remain uncertain as CTMs and their input data have their own uncertainties. The second approach described in the paper is better but requires measurements of the TNH_3 , TNO_3 and TS concentrations, which is not so common due to its cost. In order to avoid misleading, we removed this part of the sentence : « Various approaches have been proposed in the literature to investigate these points. Chemistry-transport models (CTMs) simulations and emission reduction scenarios [...] »

REFEREE: What do you mean by 3km away? Away from what? Each other? If that's what you mean than say "the sites were located ~3km apart". If not, please explain what you mean.

AUTHORS : Indeed, we mean « 3 km away from each other ». We modified the text.

REFEREE: Provide reference or link.

AUTHORS : We added the link «(<http://rda.ucar.edu/datasets/ds083.2>) ».

REFEREE: This needs a reference.

AUTHORS : The sentence is modified as follows : « In addition, as NH_3 is strongly impacted by dry deposition in which high uncertainties persist (e.g. Flechard et al., 2011), a third simulation (so-called MOD-nodep) is performed without any NH_3 dry deposition over the entire domain in order to investigate its influence on concentrations within Paris. »

REFEREE: What calculations are performed every six hours? It's not clear at all what this statement is referring to.

AUTHORS : The FLEXTRA simulations (i.e. the release of particles) are performed every 6 hours. The sentence is modified as follows : « The FLEXTRA simulations are performed by releasing, every 6 hours, 10 particles around the center of Paris, starting at 500 m altitude, which leads to a daily set of 40 back-trajectories. »

REFEREE: This needs to be reworded

AUTHORS : The sentence is modified as follows : « [...] allows to assess how strongly oxidized is a plume containing sulfur. »

REFEREE: This caption needs to be reworded. It's not clear at all.

AUTHORS : The caption is modified as follows : « Figure 4: Daily observed (in black) and modelled (in blue) NH₃ concentrations versus temperature in Paris (for the model, only days with available observations are plotted). »

REFEREE: Do the authors mean that an additional NH₃ source is present? If so, just say present instead of "at stake"

AUTHORS : Yes indeed, the modification is applied.

REFEREE: What is this statement referring to? It's not clear from the context of the statement.

AUTHORS : The sentence is modified as follows : « Interestingly, these latter sources may be influenced by temperature, as are the NH₃ concentrations measured in Paris (see Fig. 4). »

REFEREE: What's meant by in altitude?

AUTHORS : We mean « at altitude » as trajectories correspond to particles released at 500 m a.g.l.; the sentence is modified as follows : « Most NH₃ episodes are associated with moderate winds at altitude (particles being released at 500 m a.g.l. in FLEXTRA simulations), »

REFEREE: Where is this station?

AUTHORS : This stations is already described in Sect. 2.3.

REFEREE: There should be better wording for this

AUTHORS : The sentence is modified as follows : « The episode ends concomitantly with a significant decrease in temperature and an increase in wind speed (thus favoring the dispersion). »

REFEREE: Were the meteorological conditions conducive for dew formation?

AUTHORS : This is only an hypothesis. We do not have meteorological observations locally at this site. We modified the sentence as follows : « A slight decrease of HNO₃ is found at around 6:00 UTC, which may be explained by dew formation processes that allows the absorption of water-soluble gases such as HNO₃ (Mulawa et al., 1986; Parmar et al., 2001; Pierson et al., 1988) although no data are available to address this hypothesis. »

REFEREE: Are there documented errors in the ISORROPIA model that can be referred to here?

AUTHORS : We added the following reference : « (i.e. the errors on either the other inorganic compounds or the ISORROPIA model itself (Fountoukis and Nenes, 2007)) »

REFEREE: This needs a reference (or several references since the authors are generalizing CTMs)

AUTHORS : To our knowledge, the OH fields simulated by CHIMERE have not been directly evaluated (likely due to the complexity of such exercise). The sentence is modified as follows : « Indeed, due to the absence of appropriate validation, uncertainties in simulated OH still remain high in CHIMERE (probably more than a factor of 2) and reducing OH sources have shown »

REFEREE: What is meant by "slightly more difficult"?

AUTHORS : The sentence is modified as follows : « This result thus suggests that the formation of nitrates is slightly less thermodynamically favored in the model than in the reality »

REFEREE: Which regimes specifically?

AUTHORS : The sentence is modified as follows : « Daily values continuously alternate between the NH₃-rich and NH₃-poor regimes [...] »

REFEREE: What is meant by "family" species?

AUTHORS : Family species here refer to TNO₃ or TNH₃ (the family of both the gas and aerosol portions). The sentence is modified as follows : « Decreasing the concentration of TNO₃ (or TNH₃) leads to a change in its partitioning between both the gas and aerosol phases. »

REFEREE: This is confusing and needs to be reworded

AUTHORS : The sentence is modified as follows : « However, the model highly overestimates the sensitivity to TNH₃ changes, with median S_{TNH3} up to 2.5 for moderate NH₃ decreases while observations show (as for TNO₃ changes) a linear response to TNH₃ changes (i.e. S_{TNH3} around 1). »

REFEREE: This statement is purely speculation and should be removed (unless it can be supported with some references)

AUTHORS : The sentence has been removed.

REFEREE: These statements are simply not true. There have been a number of evaluations of CTMs that have examined the performance of precursor gases (such as NO, NO₂ and NH₃). The authors cannot generalize the performance of all other CTMs here. These statements need to be removed.

AUTHORS : The sentence has been removed.