

## ***Interactive comment on “Wet and dry deposition of atmospheric nitrogen at ten sites in Northern China” by Y. P. Pan et al.***

### **Anonymous Referee #2**

Received and published: 21 February 2012

#### General comments:

The topic of the paper is about wet and dry deposition of oxidized and reduced nitrogen compounds in Northern China, using a three-year data base. Deposition amounts are high, and measurements have been made in sites dominated by anthropogenic emissions such as fertilizers, power plants, and traffic. The paper is well written and easy to read, except the last part before the conclusion which is a bit confusing. The paper gives novel and interesting results on N deposition in a region where emissions are supposed to increase in the near future. Revisions are needed before publication.

However, several points can be addressed to improve the quality of the paper:

- The description of the sites needs to be done better than giving a reference. The

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reader needs to know more precisely what type of emissions will influence the deposition fluxes at the different sites. Some explanations are given at the end of the paper, but this arrives far too late. A table should be included with site description in terms of mean annual meteorological parameters (rainfall, temperature), local emissions, density of population, soil type, and other relevant information specified in the specific comments.

- The modelling of deposition velocities needs to be better described. What parameterizations are used? Is the compensation point concept used for the calculation of NH<sub>3</sub> deposition velocity? At what height are calculated the velocities? Is there a seasonal variation in these velocities for each specific compound?

- Monthly means for deposition velocities and concentrations are needed for comparison with other studies.

- The interannual variation is not significant, according to the authors. But why? This point should be addressed in more details.

- Uncertainties should be given for wet and dry deposition fluxes, as well as for emission estimates.

## Specific comments

P757 L8: “for another purpose”: what purpose?

P758 L24: Describe in a few words the procedure before referring to Pan et al. (2010a)

P759 L 5-8: The volume-weighted concentrations and the amount precipitation are multiplied to obtain the wet deposition flux. But what is the time scale of the integration: week? month?

P759 L13: Pan et al. 2010b is in Chinese. Is it possible to have another reference in English?

P760 L3: Same question as for wet deposition fluxes: what is the time integration?

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P760 L7: What is the height of measurements?

P760 L15-19: As mentioned in the general comments, this paragraph is too short and does not give sufficient explanation on how the deposition velocities are calculated. What is the height chosen for the calculation in the model? Is it in accordance with the height of measurements? If not is there a correction made? Deposition velocities can be quite different depending on the wind velocity (refer to Zhang et al., doi:10.1029/2008JD010640, JGR, 2009). A range of variation of deposition velocities used in this study could be useful, as well as a range of variation of concentrations, for each compound taken into account.

P761 L19: In Fig 3a-b, could you add the monthly rainfall?

P762 L4: A reference to a table containing site information is needed here. Is it possible to have an idea of the amount of fertilizers used in each agricultural site? Is there a possible influence of long range transport of pollutants such as NH<sub>3</sub> to explain such high deposition fluxes, or local sources are sufficient to justify these amounts?

P762 L13: Site's rural characteristics: more explanation is needed (cf site description table)

P762 L26: Why pNO<sub>3</sub><sup>-</sup> is notably higher in July August and September at the BJ site?

P765 L15: Give a standard deviation for IN deposition flux.

P768 L3: Do you mean dissolved organic nitrogen?

P768 L15: What is the scavenging ratio? Why do you assume it is constant at all sites?

P770 L19: Information about the timing of fertilization should be given in the site description table.

P770 L23: This title is not appropriate in my opinion.

P771 L16-end of paragraph: This paragraph is a bit confusing and it is difficult to

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understand exactly what has been done by the authors. Is it a comparison between several simulations, a specific simulation performed for this study, results taken from other studies? Several sub paragraphs are needed to clarify.

P773 L26: Forests and grasslands are not part of the measurement sites, and deposition fluxes on this type of ecosystems should be lower than in urban or agricultural sites.

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Interactive comment on Atmos. Chem. Phys. Discuss., 12, 753, 2012.

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