

## ***Interactive comment on “Spatial-temporal patterns of inorganic nitrogen air concentrations and deposition in eastern China” by Wen Xu et al.***

**Anonymous Referee #2**

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This paper presents a statistical summary and discussion of measurements of components of reactive nitrogen (Nr) in the air and in bulk deposition from the 27 sites of a national network that are located in the eastern part of China. The measurement dataset spans the 5-year period from 2011-2015 inclusive. Measurements are also converted into estimates of wet and dry deposition. The authors analyse various spatiotemporal aspects of the concentrations and deposition dataset including seasonality, trends over the 5-year period, and a comparison between sites in the northern half and the southern half of eastern China. The authors supplement the analysis of measurement data with some GEOS-Chem model runs to explore source contributions to Nr in this region. Discussion includes implication for policymakers concerning the different trends in emissions of Nr versus concentrations and deposition of Nr and of the need

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to include emissions of NH<sub>3</sub> in emissions reductions planning.

The dataset is comprehensive. The presentation of the results is thorough and the text and figures and tables are very clearly presented. There is an extensive discussion. The data are of importance for understanding Nr in eastern China.

Specific comments:

Five years is not a long time period to attempt to discern ‘true’ long-term trends in concentrations of atmospheric species. The authors recognise that their time period is short in respect of this aspect of their analysis but they could phrase relevant parts of their text to be more cautious about conclusions on long-term trends.

L124: Replace “subsequence” with “subsequent”

L207: It is not clear what is meant by the phrase “where field sampling was carried out after the year 2010”. Is this intended to mean that at some sites the measurements did not begin until after 2010?

L271-2: There is a contradiction between a sentence that states that IASI data up until 31 December 2015 was used and the following sentence that states that data only up until 30 September 2014 was used.

Table 1: (1) State in the caption or footnote what the significance test is testing, i.e. that it is testing for significant difference in mean concentration of a pollutant at a given site type between the northern region and the southern region. (2) The footnote should read LUY not LSY to be consistent with column heading.

Figure 2: The reader is referred to Table S1 in the supplement for the number of sites for each land use type in each region, but cannot the reader be directed more easily to Table 1 in the main paper for these numbers?

Figure 3: (1) I assume the data shown are the means for the 5-year period, in which case it may be helpful to make this explicit in the opening sentence thus: “Seasonal

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mean concentrations averaged over 2011-2015 of...". (2) As for Figure 2, can the text "in Table S1 in the supplement" be replaced more directly with "in Table 1". (3) The last part of the caption should refer to significant differences between "seasons" not "sites".

Figure 4: The same 3 comments as made above in connection with Figure 3.

Table 2: Same comments as for Table 1.

Figure 5: Can the reader be directed to Table 2, rather than to Table S1 in the supplement, for the number of sites of each type in each region.

Figure 7: Same comments as for Figure 3 (but with substitution of reference to Table 2 rather than to Table 1).

Figure 8: Same comments as for Figure 7.

L598: Rephrase start of sentence to "Eastern China is a highly industrialized. . ."

L 761: In comparing ion balance, presumably the (molar) concentration of  $\text{NH}_4^+$  was compared against the sum of the molar concentrations of  $\text{NO}_3^-$  and TWICE the molar concentration of  $\text{SO}_4^{2-}$ ? The factor 2 is missing from the text and from the axis title of Figure 10f.

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