

## ***Interactive comment on “Simulation of nitrogen deposition in the North China Plain by the FRAME model” by Y. Zhang et al.***

**Anonymous Referee #1**

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Dear authors,

Thank you for this interesting paper. According to my knowledge it presents results of a high resolution calculation of the nitrogen deposition for a specific area in China. I personally think the article is well written and I only have some comments to make. I will list them in chronological order.

p8164 l13: please use NHx (NH<sub>3</sub> and NH<sub>4</sub><sup>+</sup>) and NOy (NO<sub>x</sub> and NO<sub>3</sub>) p8166 l5: 'displayed higher intercepts' - higher than what? p8167 l7-l18: you use rather a lot of words here to say that the deposition is high in the NCP. Furthermore, I don't think that the comparisons are always relevant, given the large difference in emissions/activities in those areas. p8167 l26-l28: 'Excluding the NHx-N deposition, only the average ....'. I do not fully understand what you want to tell us with this sentence, please explain.

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p8168 l8: exported and imported N budget. I'm not native English speaking, but I'm not sure if one can export/import a N budget. Perhaps just leave budget out of this sentence. p8170 l6: bi-exchange. is perhaps 'bi-directional exchange'? p8170 l13: 'Therefore there is some potential to improve ....'. perhaps you want to say that there is some 'need' rather than 'potential' to improve? p8170 l16-l26: this bit is perhaps somewhat confusing. First you start with a sentence about critical loads, then critical levels and the loads again. I would suggest to cluster it: first start with levels and then start explaining the loads p8171 l2: 'intolerant'? shouldn't this be 'tolerant'? p8171 l22: '..exposed to high N deposition for the transportation of ....'. strange sentence, please rephrase. p8171 l27-l29: are you sure about these statements with respect to the contribution of high N concentrations to 'reduced visibility, regional haze ....'? Please give references for it. p8172 l11: 'must had been happened already'. again, I'm not perfect in English, but please check this again since it sounds a bit funny. p8172 l12-l13: 'have been kept increasing'. also a strange phrase. perhaps just leave out the 'have been' p8172 l13: change 'downwind' to 'downward' p8172 l21: 'Assuming total N deposition in the coastal region from precipitation'. I guess you want to say something like 'Assuming that the total N deposition in the coastal region originates from precipitation'? p8173 l4: 'As our study, something is missing here - don't know what. p8174 l21: 'resulted coastal' - 'resulted in coastal'

general remark with respect to the model calculations: when comparing the NHx-dry deposition/NH<sub>3</sub> concentration and NH<sub>3</sub> emission maps, a strange inconsistency occurs - for the Shandong province (the large part outside NCP), high NHx depositions seem to occur at locations where there are low NH<sub>3</sub> concentrations/emissions. How is that possible? Can only a multiplication with a dry deposition velocity explain such a large difference in the overall pattern? How does this influence the overall picture with respect to NHx?