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## ***Interactive comment on “Input and output of dissolved organic and inorganic nitrogen in subtropical forests of South China under high air pollution” by Y. T. Fang et al.***

### **Anonymous Referee #4**

Received and published: 4 January 2008

General comments:

The authors present measurements of fluxes of N in wet and bulk deposition, throughfall, and soil solution in 3 forest stands in a warm humid part of China. Deposition rates are very high overall, with some of the highest ever reported rates of DON deposition. Rates of inorganic N export below 20 cm soil depth are quite high as well, averaging  $\sim 14$ – $20$  kg N/ha/yr for  $\sim 70$  year-old pine stands and  $42$ – $48$  kg/ha/yr for a nearby old-growth broadleaf stand.

Overall, I find the results solid and interesting, presenting N budgets from an under-

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studied part of the world receiving massive, novel inputs of N in air pollution. The difference in N retention by stand type (species and/or successional status) contributes to the literature in understanding factors affecting N retention. The writing and English are generally good, although multiple minor edits are indicated below. The Introduction is particularly well-written.

I have a few modest requests for clarification and that some conclusions be toned down. First, I don't believe that sufficient measurements were taken to make such bold statements about the lack of importance of dry deposition at this site (e.g., abstract, p. 8, p. 12, p. 19). Dry deposition may make just a small additional contribution to bulk deposition compared to wet deposition alone, but bulk deposition does not capture all of dry deposition - especially NH<sub>3</sub> gas inputs, the form likely to dominate in an agriculturally intensive area. Throughout the manuscript, please clearly indicate what sort of deposition is what (wet-only, bulk, or wet + dry). This concern does not take away from the significance of the manuscript, however, since total (wet + dry) deposition rates are likely even higher than reported here.

Throughout the manuscript, please clarify what is meant by surface runoff from these plots. Is this overland flow? Streamflow?

I suggest some caution and clarification in the discussion comparing these N budget results with results from Nadelhoffer and others (1999), who used <sup>15</sup>N tracers to track the fate of N in temperate systems. Simple mass balance and <sup>15</sup>N studies can yield different estimates of where N is retained due to real time lags in N uptake and turnover.

The old-growth stand may well be losing more N than it receives (p. 16, top). Some alternatives should be mentioned, too: inputs could be underestimated somewhat due to lack of dry deposition measurements, or if these drier-than-normal years provided less N in wet deposition than typical (i.e., the site could be in rough balance over a longer time period). Also, "exports" may be overestimated, since measurements here are just the flux below 20 cm, not total loss from the system. The case that the old-

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growth systems may be a source rather than a sink for N would be made stronger should these minor concerns be addressed.

Finally, I suggest caution and clarification when comparing DON export from below 20 cm with values from the literature derived from catchment-level estimates (p. 19-20). Significant quantities of dissolved organic matter are typically retained in soil below 20 cm depth through sorption or decomposition processes. Measurements from 20 cm depth may well overestimate total ecosystem DON loss.

Specific/Technical Comments:

Although the manuscript's English reads fairly well overall, one unfortunate exception is the very first sentence of the abstract, which requires significant attention.

Please report the age of the "young" conifer stands in the abstract.

Throughout the manuscript, be sure to use "soil solution" where applicable rather than just "solution."

p. 4, line 7, "experiment" (singular).

p. 5, middle. Basal areas of 26 m<sup>2</sup>/ha seems surprisingly low for an old-growth humid temperate forest, as does 14 m<sup>2</sup>/ha for a 60- to 70-year-old successional forests.

p. 6, line 3. Do you mean "dry deposition" rather than "dry precipitation"?

p. 6, line 9. What do you mean "control plots"? Please describe the plot set-up at the start of this paragraph. (e.g., # plots/site, size).

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p. 6, line 14. “were” not “was”.

p. 6, line 16. Add “biomass” after “fine root”.

p. 6, line 25. Add a period after “2005”.

p. 7, line 3, “throughfall and soil solution samples” rather than “throughfalls and soil solutions”.

p. 7, line 11, “filtered” not “filtrated”.

p. 9, line 7 and beyond: “precipitation” chemistry is from wet deposition or bulk deposition?

p. 9, mid-page. “Unusually” high NO<sub>3</sub> after a long drought is perfectly reasonable as reflective of accumulated dry deposition. These values ought to be used in quantifying throughfall; this is not a good reason to use precipitation values instead of the measured throughfall values.

p. 12, line 4. The N is retained in both the upper 20 cm of soil and through plant uptake. Please be sure to mention the latter.

p. 14, line 13. “was observed” not “were observed”.

p. 15, line 11-13. “Starts”, not “start”; “exceeds”, not “exceed”; “occurs” not “occur”.

p. 15, bottom: was N deposition lower 15 years ago?

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p. 16, line 13. "amounts" not "amount".

p. 16 line 18-20. Delete "accounting for denitrification... (section 2.5)" as these calculations do not include denitrification, and there is no section 2.5.

p. 16, line 21. "forests" not "forest".

p. 18, bottom. "left" not "leaved".

p. 18, last line. "... soil solution leaching below 20 cm..." not just "solution leaching from the forests..."

Figure 2, 3, and 4. "Precipitation" (not "preciptation") and "Throughfall" (not "Througfall").

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