

We would first like to thank referee #2 for its very helpful comments, which we hope have helped improving the paper very much. The comments from the referee #2 are in blue and answers are in red.

Benjamin LOUBET

### **Reply to anonymous referee #2 comments bgd-8-C5102-2011**

**General comments:** This paper presents two months of ammonia flux measurements using a new ammonia analyser (ROSAA, RObust and Sensitive Ammonia Analyser) and process based modelling of these flux measurements. It is a valuable contribution to the field of biosphere/atmosphere ammonia exchange. However the paper would benefit from more discussion of the implications of the findings. In addition, some more details on the development of the ROSAA analyser would be helpful. What is new about this analyser? What is the expected improvement of this analyser compared with existing ammonia analysers? What is the measurement range?

Some more details were already given in the answer to general comments of referee #1, especially on the accuracy measure in the laboratory (4.4% of the concentration measured).

The ROSAA analyzer is not as such a new analyzer. It put together low air-flow rates denuders with a standard flow injection  $\text{NH}_4^+$  semi-permeable membrane conductivity analyzer. To do so a storage system was set up. The expected improvement is not great, it is just that it is continuously calibrated in the liquid phase and that the denuder set-up were optimized to get as robust as possible measurements. It is not our goal to show that this analyzer is better than other ones, however the low air flow rate should allow measuring in small volumes (like chambers) and lower into the canopy. The measurement range that we have experimented is 0.5 - 3000  $\mu\text{g NH}_3 \text{ m}^{-3}$ .

### **Specific comments:**

**Page 10318: l. 23-24: Specify the time period over which this significant decrease of sulphur and nitrogen has occurred.**

Done

**Page 10319: l. 1: Include more up to date references on ammonia emissions.**

Done

**Page 10321 l. 14: What is meant by ‘accounting for the measured gaseous acid concentrations at the site.’**

This sentence was not well formulated indeed. We meant that we discussed the potential effect of acid concentrations on the cuticular uptake at the site.

**l. 25: What is the distance between the measurement site and the AgroParisTech experimental farm?**

It is 460 m. See detailed discussion on the footprint and advection issues in the answer to referee #1.

**Page 10323 l. 13: Apart from the patent registration, is there any other reference for the ROSAA analyser?**

No, unfortunately, since when a patent is pending no publications are allowed.

**Page 10328 l. 5: Why are averaged concentration values given for June and July 2010 when the experimental period covered May and June 2010? What other reasons could account for the differences between the ROSAA analyser and the DELTA measurement technique?**

We made a mistake in the months: We meant May and June instead of June and July. Other reasons may be the calibration standards used in ROSAA and DELTA. However in both measurements, these standards were carefully prepared.

**Page 10335 l. 14: In the abstract and conclusions it is stated that the ammonia concentrations were largely influenced by advection from the nearby farm. However, although the final paragraph of section 3.2 acknowledges that the concentration increased when the wind was blowing from the farm there is no real assessment of how the advection may have affected the concentration and flux measurements.**

This issue was also spotted by referee #1 and was largely discussed already. A section has been added in the material and method and results section to deal with this issue. It appears that the advection from the farm would only (but still) add an 8% contribution to the measured flux

**Technical corrections:**

**Page 10318: l. 24: change 'lead' to 'led'**

Done

**Page 10321 l. 11: Inconsistency with term: 'mini-wed'. Use the same term throughout manuscript (mini-WEDD or mini-wedd).**

Mini-wedd was used throughout.

**Page 10327 l. 6 & 8: Inconsistency with rain event (10 to 12 June or 11 June).**

Indeed 10 to 12 June was correct

**l. 26: The standard deviation is stated as up to 20 ppb NH<sub>4</sub> in the text and 22ppb in the legend of Figure 3.**

It should be 22 ppb indeed. Changed.

**Page 10334 l. 7: Change 'North' to 'north' l. 8: Change 'West' to 'west'**

Done.

**Page 10335 l. 2: Change 'explanation' to 'explanations'**

Done.

**l. 22: Change 'North' to 'north' and 'West' to 'west'**

Done

**Page 10336**

**l. 16: Change 'partitioning' to 'partition'.**

Done

**Figure 5b: Include concentration units and wind direction on figure.**

Done