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Biogeosciences Discussions

Interactive comment on "Ammonia fluxes in relation to cutting and fertilization of an intensively managed grassland derived from an inter-comparison of gradient measurements" *by* C. Milford et al.

Anonymous Referee #3

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The MS describes an inter-comparison of ammonia concentrations and ammonia fluxes measured over grassland by 4 different systems. It also quantifies the magnitude of the divergence of the vertical ammonia flux in the experimental situation due to horizontal advection and explores the changes in ammonia emission brought about by cutting the grass and then fertilising. The main messages are that the performance of the 4 systems was variable with agreement within 20% on some days , but poorer agreement on others, emphasising the need for replication whenever possible, that advection amounted to as much as 32% of the measured fluxes when they were small,

but only 1 to 2% when they were large, and that very large changes in ammonia emissions can occur with different management activities. This is a very good paper. It is well written, the work was done very carefully and the MS provides a very good outline of the precautions and protocols necessary to obtain precise flux measurements.

I have only a few comments for the authors: 1. The flux gradient technique that was employed is a conventional one, but recent work suggests that it may not be universally applicable. It relies on Monin-Obukhov similarity theory whose validity has been questioned by some micrometeorologists, most notably McNaughton (2006), Boundary-Layer Meteorology 118: 83-107. I don’t expect the authors to change their analysis, but perhaps they should mention that questions about the validity of their approach exist. 2. Another difficulty to the approach has been raised by Flesch et al. (2002), Agric. For. Meteorol. 111: 299-307 who suggest that Eq. (1) and (2) may underestimate gas fluxes considerably. They compared fluxes of a gaseous pesticide emitted from a treated field with fluxes calculated by the flux-gradient technique, Eq.(1) and (2), and a supposedly unequivocal mass balance method and concluded that in their experiment, the flux-gradient technique gave fluxes that were as small as 0.6 times those from the mass balance method. Again, it would be enough just to note this difficulty. 3. I imagine χa is an average of the NH3 concentration between the ground and z-d, but there are usually quite large vertical gradients in this surface layer, particularly in the crop/grass canopy. Was this taken into account? 4. This is a semantic point, but in Eq. (2), I would prefer to see Δ rather than the partial differential operator ∂. We are dealing with finite differences, not gradients. 5. I couldn’t find in the Methods Section a statement about the amount and form of the nitrogen fertiliser applied during the experiment, although I could work it out from information in the Discussion.

Interactive comment on Biogeosciences Discuss., 5, 4699, 2008.

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Interactive Comment