

Interactive comment on “Seasonal variation in nitrogen pools and $^{15}\text{N}/^{13}\text{C}$ natural abundances in different tissues of grassland plants” by L. Wang and J. K. Schjoerring

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Referee comment #1 At the end of the introduction (page 12321 lines 11 to 14) it is stated that intensive measurements of NH_3 fluxes were carried out at several sites. How is the work presented in this paper related to those measurements? Were such measurements carried out at this specific site? If so why they are not cited or discussed in relation to the present work? If no such measurements were done then this sentence should be removed.

Response: We have added some paragraphs at the end of section 4.3: “Coinciding micrometeorological measurements showed that during the period from 15 August to 4

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September 2008, NH_3 emission dominated over the grassland. However, the gamma values of the senescent leaves were not markedly elevated during that period as was also the case for green tissues. This suggests that the applied fertilizer was the main source of NH_3 during this period. As a matter of fact, urea application on 28 August 2008 caused an immediate large NH_3 emission, which rapidly declined after a few days due to rainfall.”

Referee comment #2 In the discussion section (page 12330 lines 25 to 29) it is stated that the peak values in gamma for green and senescent leaves coincided which indicates that the green leaves recaptured the NH_3 released by senescent leaves or litter. Are there any other indications for this? If not then I would rather put it as a hypothesis rather than state it as a clear fact. Can this be verified or at least backed up by an interpretation of the measurements of ^{15}N ratios?

Response: The statement has been revised to “Gamma peak values coincided in green and senescent leaves (Fig. 5). One reason for this may be that the green leaves recaptured the ammonia released by senescent leaves and litter (David et al., 2009; Mattsson et al., 2009), which may have raised the NH_4^+ concentration”. The ^{15}N ratio in the canopy during the summer period was affected by mixed sources such as soil organic matter mineralization, mineral fertilizer, animal urine and faeces, why it was not possible to use the ^{15}N ratio to interpret the ammonia recapture.

Referee comment #3 In general I find that the paper lacks a discussion part relating the different measurements. It is clear why NH_4^+ and H^+ measurements were done and why the ratios of ^{15}N and ^{13}C were measured. However, can for example the ^{15}N ratios in the different plant tissues help us interpreting the seasonal variation of gamma values or do they give us more information on the source of this NH_4^+ (recapture of atmospheric NH_3 , mobilized N for other leaf tissues, N absorbed via the roots, : : :)? How do those measurements help us in better understanding what are the drivers for plant-atmosphere exchange of NH_3 ?

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Response: As mentioned above, the tissue ^{15}N ratios reflect contributions from several different N sources. We have discussed these aspects in the paper and tried qualitatively to describe links with other canopy parameters and climatic conditions (see e.g. reply to Referee 1, comment #1). The data material and experimental design do not allow for more mechanistic conclusions to be drawn without being overly speculative.

Referee comment #4 Furthermore, I do not see why chlorophyll content measurements were done. I would suggest removing this part.

Response: The reason for presenting chlorophyll data is to characterise the degree of senescence of the ryegrass leaves since their source/sink potential for NH_3 is related to the developmental stage. Therefore, this part was maintained.

All the specific corrections listed have been implemented.

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