

Interactive comment on “Ammonia emission measurements of an intensively grazed pasture” by Karl Voglmeier et al.

Anonymous Referee #1

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This study investigated ammonia emissions from the urine (and also from dung patches) produced by cattle in a grazing operation. The manuscript needs work as it needs to be more concise, and also needs more information regarding exactly what was done in the methodology (e.g., modifications to bLS, procedure for correcting fluxes). The weakest part of the study was investigation in estimating urine patch locations to avoid assumptions on the uniformity of the source on pasture (by measuring dung pile locations and position of the cows). In applications where bLS is often used in non-uniform sources, it is realized that the detector should be some distance downwind to minimize the impact of non-uniform source on emissions but close enough to resolve horizontal gradient (elevated background concentration, a possible problem in this study). The strongest part of the study was the N balance of the two pasture

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systems and the possible mitigation of ammonia emissions from pastures with grazing cattle that excrete manure. Line numbering should be continuous, on every line, and the line spacing should be doubled to assist the reviewers in editing the manuscript. Page/line 1/7 delete 'in ambient air' 1/8 replace 'have therefore a large uncertainty' with 'is uncertain' 1/14 replace 'and prevailed within a range of' with 'and ranged from' 1/15 insert 'maximum of $x \mu\text{g N-NH}_3 \text{ m}^{-2} \text{ s}^{-1}$ at the end' 1/18 replace with 'Dung and cow location were monitored to account' 2/5 'about eight times lower' - could not find this in Kupper et al (2015) - re-check citation 2/8 delete 'the input of' 2/10 delete 'see' here and throughout text, redundant 2/10 separate authors by semicolon 2/13 abbreviate 'ammonia as 'NH₃' throughout MS 2/15 use 'and further developed' 2/18 use '12-d period' 2/25 was the model 'WindTrax' by ThunderBeach Scientific - need to cite model 3/10 what was the topography (slope, barriers to flow, etc) 4/5 use 30-min averages' 4/12 were pressure and temperature corrections needed, if so give calibration factors 4/12 was light intensity used to filter data, if so, give range 4/28 use 'Figs. 1 and 2' 5/3 describe the model, and what modifications were made to Flesch's model, what was different 5/4 use '30-min concentration' - same for 5/12 5/13 abbreviate as 'u*' previously defined 5/15 however, the 'underlying' assumption of homogeneity of the emitting surface is less true with increased distance between the source and detector, please include this - it is unclear why the bLS model was not run in its entirety 25/5 state the given NH₃ concentration certification 5/31 'this is not necessarily the case' - this deserves further comment 6/1 top page 11 states urine patches are the most important factor - then two ways of trying to estimate where these patches exit is tried by GPS of the dung piles and by locating the position of the cows - this cannot be direct emission map of ammonia since cows do not necessarily defecate and urinate at the same location, and the position of the cow adds little information to estimate urine patches. 6/7 it is not clear that the error would be reduced by compounding the errors in locating the urine patches, as opposed to assuming a uniform distribution, especially when the uniform criteria declines in importance with some distance downwind. 6/25 no need to introduce upcoming sections, delete lines 25 to 31 7/15 no need to intro-

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duce Fig 3 - delete sentence 7/27 need to expand by providing information on what was done regarding the bLS footprint 7/31 is this 50-70 hours per week? 1/8 what is a 'strong' data filter - need to rewrite 8/8 explain where the value '2.54' came from 8/13 use '28 and 23 hours' 8/20 use 'greater concentration signal' 8/17 are you saying that your design, at specific wind directions, caused an interference of the incoming concentration (upwind) measurement which lead to an under-estimate of emissions - why not filter out the estimates? 8/22 do you mean 'fewer concentration detectors' 8/32 use 'half-hourly fluxes' 9/3 use 'recorded' not 'retrieved' 9/4 use 'greatest air temperature' and 9/5 'greater emissions' 9/6 neither grazing duration nor N input is found in Table 3 - where are these data? 9/16 use 'data were' 10/2 'artificial gas' awkward, best to say 'tracer gas' and give the species name, e.g., SF₆ 10/8 use '30-min values' 10/10 usually as an alternative to mass flow controller, the entire tank is weight before and after, was this done in this study? 10/11 use '-7 and 9%' 10/15 use '88 and 124%' 10/16 do you mean 'air pressure' 10/16 don't understand the set-up, what was no longer air tight - needs clarification, also need to indicate why air pressure is involved in recovery 10/18 use 'half-hourly measurements' 10/19 'an unknown major error source is unlikely' - what does this mean, if unknown how can it be unlikely, delete this sentence as it adds no information - were the results used to correct the emission or was it used to characterize the data? How sure are you that the difference was systematic, if this is important there needs to be a t-test done and if different then an accuracy analysis performed to break the difference into systematic, random and slope errors 10/25 use 'for two' 11/5 use 'until' 11/11 how was this correction done in all systems except system G rotation2, needs clarification - also need to document what this means for this latter value that was not corrected 11/11 use 'greater uncertainty' 11/30 use '7.2 -16%' same for line 29 12/3 cited reference not listed 13/6 delete 'under real practice conditions'

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