

Interactive  
Comment

## ***Interactive comment on “A process-based model for ammonia emission from urine patches, GAG (Generation of Ammonia from Grazing): description, validation and sensitivity analysis” by A. Móring et al.***

**W. Bussink**

wim.bussink@nmi-agro.nl

Received and published: 30 July 2015

The paper is well written and an improvement in modelling weather driven ammonia losses from urine patches. Nevertheless I have a few comments. 1) The effect of urine composition on ammonia emission is simplified to an urea solution. This is a simplification which will lead to an underestimation of the amount of TAN that is used in the calculations (page 10065, line 26). It becomes the more important since feeding practices aim to increase the N efficiency of the diet. As a consequence urea excretion with urine decreases. Sometimes it is no more than 50% of the total N excretion (on pure

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



grass diets it can be much higher). This means that other components like allantoin, creatine and creatinine become more important (see i.e. Whitehead et al., 1989) and can make up to more than 15% of the N in urine (Bristow et al., 1992). These components can also decompose to urea, resulting in ammonia emission (Whitehead, 1989). Furthermore the composition of urine influences the urea hydrolysis rate (Whitehead et al., 1989; Dijkstra et al., 2013) and own unpublished results. However, due to the setup of the validation - cow urine of 5 g/l (Laubach 2012) was enriched with artificial urea to obtain a urine-urea solution with 10 gN/l. So in fact a “pure” urea solution was used. – a urea based model was tested against an urea solution, resulting in a negligible effect of other N constituents in urine. But, using this model for other situations may lead to an underestimation of TAN and thereby to an underestimation of the driving force for ammonia emission. 2) Page 10070, line 20: Napp is equal to the nitrogen content of urine. This presumes that all N is directly available, which is certainly not the case. It is not clear to me why not TAN is used instead of total nitrogen content of urine. 3) Page 10078 and 10079. The soil chemistry is neglected. The ammonium release after urea hydrolysis is buffered by the soil complex. The buffering efficiency is determined by i) the cation exchange capacity which depends on clay content and the organic matter content but ii) also on the affinity for ammonium adsorption which is clay mineral type dependent. Also the K content of urine can be of importance since it interacts with ammonium to be adsorbed by the soil complex. The result of this adsorption behaviour of soil is that the concentration of TAN in solution will decrease and thereby the driving force for ammonia emission, especially on the more heavy soils. (Of course this effect can be matched by adapting the resistance values used in the model) The results presented suggest that the model can be used in all situations. I don't agree with that (see also results of Jarvis et al., and Bussink 1994, Whitehead and Raistrick, 1993), soil type and soil buffering should be taken into account. It should be proven that the modelling results are in principal soil type (and buffering behaviour) independent before extrapolation/usage for other situations takes place.

Bristow et al., (1992) Nitrogenous Constituents in the Urine of Cattle, Sheep and Goats.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

J Sci Food Agric, 59, 387-394 Bussink DW (1994) Relationships between ammonia volatilization and nitrogen fertilizer application rate, intake and excretion of herbage nitrogen by cattle on grazed swards. Fertilizer Research Volume 38, pp 111-121 Dijkstra et al (2013). Diet effects on urine composition of cattle and N<sub>2</sub>O emissions. Animal 7:s2, pp 292–302 Jarvis SC, Hatch DJ and Lockyer DR (1989) Ammonia fluxes from grazed grassland: annual losses from cattle production systems and their relation to nitrogen inputs. The Journal of Agricultural Science, Volume 113 pp 99-108

---

Interactive comment on Biogeosciences Discuss., 12, 10059, 2015.

**BGD**

12, C3922–C3924, 2015

---

Interactive  
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

C3924

