



Process-based modelling of ammonia emission over a urine patch - Towards developing a field scale emission model for regional use

Andrea Moring (1,2), Massimo Vieno (1,2), Ruth Doherty (1), and Mark A. Sutton (2)

(1) University of Edinburgh, United Kingdom (a.moring@sms.ed.ac.uk), (2) Natural Environment Research Council, Centre for Ecology and Hydrology, Edinburgh, United Kingdom

This work investigates the influence of meteorological factors on ammonia related atmospheric processes, with a special focus on emission from grazing. For this purpose we are developing a process-based model (GAG: Generation of Ammonia from Grazing) driven by meteorology that can simulate the ammonia emission from a field covered by urine patches. The aim of this work is to implement the GAG model into the EMEP atmospheric chemical transport model (ACTM), and examine the changes of surface ammonia concentrations under future climate scenarios. The research is carried out within the framework of the ECLAIRE project (Effects of Climate Change on Air Pollution and Response Strategies for European Ecosystems).

To estimate the sensitivity of surface concentrations of ammonia to a temperature dependent emission approach, we applied a temperature function in the EMEP model for the agricultural ammonia emissions from the UK. With the original emissions the resulting surface ammonia concentration has a bimodal seasonal tendency, with a peak in the beginning of the spring when agricultural management starts and with a second maximum during the autumn when fertilizer is typically spread. With our new temperature dependent approach the seasonal cycle became unimodal with a peak in June. This significant difference supports the need for a dynamic emission approach in ACTMs.

The GAG model currently works for a single urine patch. Before it calculates the ammonia emission flux over the urine patch the model simulates the ammoniacal nitrogen budget and the water budget under the patch. The preliminary results for emission fluxes are in good agreement with the measurements. However, the differences highlight that further improvements are necessary.