A bi-directionnal exchange model of ammonia (SurfAtm-NH3) used as a tool in order to investigate the main compartments at the field scale for ammonia source and sink after slurry application over a growing wheat

Personne Erwan, Tardy Florence., Decuq Céline, Génermont Sophie, Durand Brigitte, Fanucci Olivier, Gueudet Jean-Christophe, Lauransot Michel, Mascher Nicolas, Masson Sylvie, and Loubet Benjamin.

The current NH3 bi-directional exchange models have significantly improved estimates of emission and deposition fluxes over the ecosystems. The SurfAtm-NH3 model is a coupled model for energy balance, and exchange of NH3, at the field scale. It is based on a resistive scheme similar for energy and NH3 exchanges. It distinguishes three compartments for the exchanges with the atmosphere: soil, stomatal and cuticular pathway. This model is used here to interpret the results of a measurement campaign for a wheat crop in 2012, after manure application. Physico-chemical measurements were carried out and were used to calculate the potential emissions of the three compartments (and their dynamics with time). The integration of these measured emission potentials in the model were used to test various scenarios to determine the source of NH3 from the ground. Tests were conducted on ground resistance by searching for predictors of the strong soil/manure contribution of the NH3 emission the first few days after manure application. The results suggested to distinguish three different periods after the manure application, *i/* a period of one day when the NH3 emission comes directly from the ground surface without transfer resistance from the soil surface, indicating that there were no manure infiltration into the soil, *ii/* a two-week period during which the source comes mainly from NH3 slurry which were gradually infiltrated into the soil and the last period, three weeks after the application of manure, during which the emission from the ground can be considered negligible. For the latter period, the NH3 fluxes were mainly deposition which depends on the exchanges with the leaves (stomatal and cuticular deposition). Regarding the intermediate period during which the soil were a NH3 pool for emission, if the main source is identified, the factors regulating this issue appear complex. In fact, soil resistance for NH3 transfer seems to be dependent on the soil evaporation.

UMR 1091 Environnement et Grandes Cultures, INRA-AgroParisTech, , 78850 Thiverval-Grignon, France.

Corresponding authors : erwan.personne@agroparistech.fr
Tel : +33 1 30 81 55 70