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# Modelling the effects of vegetation and soil moisture onto biogenic nitrogen oxide emissions from Sahelian soils.

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Natural (biogenic) emissions of nitrogen oxide (NO) from soils are strongly dependent on soil moisture, particularly in Sahelian regions where the soil moisture is very low at the end of the dry season (around 2% in top soil 0-20 cm). When the first rains fall at the beginning of the wet season, soil moisture increases sharply, until reaching a threshold value above which the microbial population can develop, and the microbial activity generating nitrogen within the soil is reactivated. NO emissions to the atmosphere result from the microbial decomposition of organic matter, and present important peaks at the beginning of the wet season.
In Sahelian soils, the organic matter decomposition is very efficient at the onset of the wet season because part of the litter has been buried during the dry season by livestock trampling, and is rapidly decomposed when soil moisture is sufficient.

The goal of the work presented here is to simulate NO emissions from soils thanks to a parameterization based on a neural network development, coupled to a vegetation model (STEP) and a litter decomposition model (GENDEC), at the Agoufou site (15.1°N, 1.7°W, Gourma, Mali, super site of the AMMA-CATCH observatory).
The resulting coupled model (STEP-GENDEC) includes vegetation growth in a dynamic way, and the quantity of nitrogen brought to the soil either as litter and straws or as livestock excretions. Livestock contributes to the N flux either directly trough excretion deposition (faeces and urine) or indirectly through grazing uptake, conversion of standing straw to litter, fragmentation and burying of litter by trampling.
A small part of this N available in the soil is released to the atmosphere in the form of different N compounds such as NO. Knowing the quantity of N available in the soil, NO emissions to the atmosphere are calculated for the years 2006-2007-2008, and compared to the few existing measurements.
These results show that Sahelian soils emit non negligible quantities of NO to the atmosphere, compared to anthropogenic NO emissions (fires) at the continental scale, and that the processes of these emissions are original due to the specificity of the climate (short wet season, sandy soils, hot temperatures). However, too few studies have been dedicated to N emissions in these arid environments, and many questions remain on their underlying processes.