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Parameterization of NO soil emission using a neural network

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The nitrogen monoxide (NO) is essential in atmospheric chemistry and especially in the troposphere, although this gas is in low concentration in the atmosphere (approximately 1 ppb). Indeed, it quickly reacts to obtain nitrogen dioxide (NO2) and to form tropospheric ozone, the major atmospheric oxidant. Nowadays, the increase of NOx concentration in the atmosphere is considered to be 0.25% per year (Davidson, 1997). This rise is essentially due to the anthropologic pressure, in which changing in land occupation takes place. Globally, soil NO emission could represent nearly 40% of total NOx emission, an amount comparable to fossil fuel combustions. However, uncertainties are large since results are ranging between 5.5 and 21 TgN per year. NO emission variation laws with soil humidity, soil temperature and other environmental parameters are well known, but those results present a high level of temporal and geographical variation. In order to generalise those complex phenomena evolution laws, a neural network have been developed. By introducing different meteorological parameters as inputs, like soil and air humidity, soil and air temperature and precipitation, the neural network generates a general parameterisation law that gives calculated NO fluxes in output. Iteration processes lead to the minimization of the difference between calculated and measured fluxes, and the choice of the best score between several networks gives the best approximation and the more realistic equation. The selection of pertinent inputs and the choice between scores will be justified from a temperate climate data base built with in situ measurements. The neural network gives a parameterization that can be used for the simulation of NO fluxes in different temperate climate situations. Now, the stake is to build a larger data base to enlarge the application domain of the parameterizations.

Davidson E.A. and W.Kingerlee, A global inventory of nitric oxide emissions from soil, Cycling in Agroecosystems, volume 48, pages 47-50, 1997