Intensified droughts will affect nitrogen emissions in rainfed agriculture

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NO and N_2O are major contributors to atmospheric pollution, and agriculture is a major source of both. Seasonal variation of precipitation input can affect plant growth, soil microbial activities, and emissions of NO and N_2O. However, the complexity of the mechanisms and the temporal and spatial variations related to the emissions of NO and N_2O

in rainfed ecosystem are unclear.

Recently, a research team led by Prof. Fang Yunting from the Institute of Applied Ecology (IAE) of the Chinese Academy of Sciences (CAS) used a fully automated system to continuously measure soil NO and N_2O emissions for two years in a typical rainfed maize field in Northeast China.

The studies were published online in *Environmental Pollution* and *Frontiers in Environmental Science*, respectively.

Two years measurements revealed substantial interannual and seasonal variations for N gaseous emissions, especially the NO loss.

The researchers found that annual NO emissions differ strongly between the two years, with 8.9 kg N ha^{-1} for the first year and 2.3 kg N ha^{-1} for the second year, accounting for 5.9% and 1.9% of the applied fertilizer N, respectively. This difference was mainly attributed to the variations in the timing and amount of precipitation before and after the fertilization.

Additionally, they found that the severe spring drought affects plant growth, soil NH_4^+ and NO_3^- availabilities, and NO and N_2O emissions. During growing season, the temporal pattern of NO and N_2O emissions were similar, and mainly controlled by soil mineral N content and soil temperature. Both NO and N_2O emissions during the freeze–thaw periods were negligible in this region for rainfed agriculture.

Rainfed agriculture is one of the most common farming practices in Northeast China. With the global climate change, severe drought makes the rainfed agriculture more vulnerable. The findings try to fill the gap in the understanding of climate change impacts on NO and N_2O emissions in rainfed agricultures (major cropping practices). They offer some advice to control the adverse effects of agricultural managements to

regional and global atmospheric pollution.

More information: Chenxia Su et al, Temporal Patterns of N_2O Fluxes From a Rainfed Maize Field in Northeast China, *Frontiers in Environmental Science* (2021). DOI: 10.3389/fenvs.2021.668084

Chenxia Su et al, Interannual and seasonal variabilities in soil NO fluxes from a rainfed maize field in the Northeast China, *Environmental Pollution* (2021). DOI: 10.1016/j.envpol.2021.117312

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