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The biogenic emission potential of nitric oxide from sandy soils

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There are about 160.9 Mha of sandy land in China, about 17.6% of total Chinese area, which mainly distributed in 35°-50° N. The western Songnen Plain, which located in the semi-arid region of Northeastern China, is one of the main sandy soil distribution regions. The changes of land use in sandy soil are accompanied by changes in biogeochemical cycles of nutrients, particularly of the air-surface exchange of trace gases like nitric oxide. Our study, based on results obtained by a laboratory incubation technique, focuses on (a) NO production and consumption in sandy soils from two types of land use as function of soil temperature and soil moisture, and (b) The biogenic emission potential of nitric oxide from sandy soils in semi-arid region.

At 25˚C, average NO production (in terms of mass of N) was 0.016,and 0.013 ng kg-1s-1 in sandy soils from soybean land (SL) and man-made forest (MF), re¬spectively. NO consumption rate constant ranged from 0.26×10-6 to 7.28×10-6 m3 kg-1s-1. At 25˚C and under optimum soil moisture conditions for NO production, the NO compensation point mixing ratio was about 266 and 161 ug m-3 (465,and 281 ppb) for soils of SL and MF, respectively. Statistically sound relationships have been observed between NO fluxes and soil moisture (optimum curves). NO fluxes also increased exponentially with soil temperature at any given soil moisture. The optimum soil moisture for which maximum NO flux was observed was independent of soil temperature. The maximum of NO flux potentials for SL and MF soils (at 25°C) were 59.6 and 36.5 ng m-2s-1 at water-filled pore space (%WFPS) of 26 and 24, respectively. The NO flux potential was about 2 times larger for cropland soil than for man-made forest soils, most likely due to fertilizer application to the cropland soils.