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Up-scaling of biogenic soil emissions of nitric oxide for the Tohsun depression in Northwest China using GIS techniques

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We will provide estimates of average biogenic nitric oxide (NO) emissions from soils of the Tohsun depression in Northwest China. We estimated the NO fluxes for two biomes of different land use, namely “Desert Grassland” and “Irrigated Farmland. Estimates are based on (a) laboratory NO flux parameterization (in terms of soil temperature and moisture), (b) field data of soil temperature and moisture, (c) soil physical properties such as the bulk density, and (d) information on the individual agricultural management practices. Laboratory flux measurements of "Desert Grassland" and "Irrigated Farmland" soils used the Galbally and Johansson algorithm to estimate the NO flux (in terms of mass of N per unit area per unit of time) from laboratory measurements of release and uptake of NO within the soil. Our up-scaling of soil NO emission from laboratory data to regional land use type estimates are based on the hypothesis that soil temperature and moisture are the primary large-scale controls on microbial production and consumption of NO in desert regions. Three up-scaling GIS tools were developed to estimate the average NO fluxes from the entire Tohsun depression (13943km2). The first up-scaling tool was the generation of ground-truth plots for the purpose of landscape/vegetation classification (remote sensing images, Landsat TM). Furthermore, soil types were classified according to the “Soil Map of China” (based on the FAO/Unesco soil map of the world), which permits association of the ground-truth plots to the soil classification scheme. The second up-scaling tool consists of soil

moisture estimates from MODIS (Moderate Resolution Imaging Spectroradiometer) products. Combining MODIS surface temperature and MODIS NDVI products, the temperature vegetation dryness index (TVDI) was obtained. In turn, TVDI was used to evaluate the soil moisture status of the ground-truth plots. The generated data from the first two tools were used for the third tool, which is identical to a GIS model of biogenic soil NO emissions using the Galbally and Johansson algorithm. The result of applying these GIS tools demonstrates that these tools are useful for the estimation of soil NO emissions on regional and national scales.