Geophysical Research Abstracts, Vol. 7, 02669, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02669

Nitrogen oxides emission from two beech forests subjected to different nitrogen loads

B. Kitzler (1), S. Zechmeister-Boltenstern (1), C. Holtermann (2), U. Skiba (3) and K. Butterbach-Bahl (4)

(1) Austrian Federal Office and Research Centre of Forests (BFW), Seckendorff-Gudent-Weg 8, Vienna, Austria (barbara.kitzler@bfw.gv.at), (2) Sellenyg. 2-4/52, Vienna, Austria, (3) Institute of Terrestrial Ecology, Bush Estate, Penicuik, Midlothian EH26 OQB, Schottland, (4) Division Biosphere/Atmosphere Exchange, Dept. of Soil Microbiology, Fraunhofer Institut for Atmospheric Environmental Research, Kreuzeckbahnstraße 19, D-82467, Garmisch-Partenkirchen, Germany

We measured nitrogen oxides (N_2O and NO_x) and carbon dioxide (CO_2) emissions from two beech forest soils near Vienna, Austria, which were exposed to different loads of nitrogen input from the atmosphere. The site Schottenwald (SW) was receiving 27 kg and Klausenleopoldsdorf (KL) 15 kg nitrogen via wet and dry deposition. N_2O and CO_2 emissions were measured with manually operated chambers biweekly (SW) or monthly (KL). Additionally, daily N_2O measurements were carried out with an automatic gas sampling system. NO_x emissions from soil were detected hourly with an automatic dynamic chamber system. We used the autoregression procedure (time-series analysis) to estimate the relationship between nitrogen oxide emissions and several climate, soil chemistry and N-deposition data. Changes in soil moisture and soil temperature had the most profound effect on CO_2 and on nitrogen oxide emissions and could explain up to 94% of the temporal variations of gas emissions. In the two investigation years, annual gaseous N losses ranged from 0.70 to 0.82 kg N_2O-N ha^{-1} y^{-1} and from 0.34 to 0.61 kg NO-N ha^{-1} y^{-1} in SW. In KL significantly lower annual N_2O emissions were determined (0.43 and 0.66 kg N_2O-N kg ha^{-1} y^{-1}). In KL measuring campaign, revealed a NO-loss of 0.02 kg, whereas in the same time significantly more NO was emitted in SW (0.32 kg NO-N ha^{-1} y^{-1}). Higher nitrogen oxides, especially NO emissions from the high nitrogen input site (SW) indicate that atmospheric deposition had a strong impact on losses of gaseous nitrogen from our

forest soils. The spatial and temporal variability of nitrogen oxide fluxes was high. Event emissions after rain or during freezing and thawing cycles made up a high proportion (for NO 50%) of overall nitrogen oxides emissions. To cover the spatial and temporal variability within the soil and to gain better estimates of annual gaseous nitrogen losses from forest soils, long-term measurements on a large-scale are required.