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Biogenic NO emission from a spruce forest soil in the Fichtelgebirge (Germany) under the influence of different understorey vegetation cover

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Within the framework of the EGER project (ExchanGE processes in mountainous Regions) soil samples have been taken from the spruce forest site "Weidenbrunnen" (Fichtelgebirge, Germany) in September 2008 to determine the NO exchange in the laboratory and for a series of soil analyses. The soil was sampled below different understorey vegetation covers: young Norway spruce, moss/litter, blueberries and grass. We investigated the net NO release rate from corresponding organic layers as well as from the A horizon of respective soils. Additionally we measured pH, C/N ratio, contents of ammonium, nitrate, and organic C, bulk density, the thickness of the organic layer and the quality of the organic matter.

Net NO release rates (as well as the NO production and NO consumption rates) from the soil samples were determined by a fully automated laboratory incubation & fumigation system. Purified dry air passed five dynamic incubation chambers, four containing water saturated soil samples and one reference chamber. By this procedure, the soil samples dried out slowly (within 2-6 days), covering the full range of soil moisture (0-300% gravimetric soil moisture). To quantify NO production and NO consumption rates separately, soil samples were fumigated with zero-air (approx. 0 ppb NO) and air of 133 ppb NO. The chambers were placed in a thermostatted cabinet for incubation at 10 an 20˚C. NO and H_2O concentrations at the outlet of the five dynamic chambers were measured sequentially by chemiluminescence and IR-absorption based analyzers, switching corresponding valves every two minutes. Net NO release rates were determined from the NO concentration difference between soil containing and reference chambers. Corresponding measurements of H_2O mixing ratio yielded the evaporation loss of the soil samples, which (referenced to the gravimetric soil water content before and after the incubation experiment) provided the individual soil moisture contents of each soil samples during the incubation experiment.

Our contribution focus net NO release rates, NO production and NO consumption rates of spruce forest soils sampled under different understorey vegetation covers. Generally, organic layers show significant higher NO production and NO consumption rates than the soils from the corresponding A horizons. Soils under the understorey vegetation cover “moos/litter” revealed the lowest NO production and NO consumption rates. Net NO release rates, NO production and NO consumption rates of soil samples obtained below the four different under- storey vegetation covers will be discussed in terms of pH, C/N ratio, contents of ammonium, nitrate, and organic C, bulk density, thickness of organic layer, as well as quality of the organic matter.