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RELEVANCE OF DIRECT ORGANIC N-OXIDATION AS SOURCE OF NITROUS GASES (NO AND N2O)

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Forest soils exhibit a variety of complex biochemical N reactions in which nitric oxide (NO) and nitrous oxide (N2O) can be produced by coexisting processes which differently respond to environmental conditions. In general two biochemical processes, (i) oxidation of ammonia (nitrification) and (ii) reduction of nitrate (denitrification), are well-known to act as the major sources of nitrous gases. Besides the inorganic nitrogen substrates, also soil organic N compounds (Norg) have recently been reported to be oxidized and transformed into N2O. During the last years triplet 15N-tracer experiments (TTE) have been developed and applied to allow a source-related quantification of N species which are simultaneously produced via the three known pathways. The influence of two different oxygen levels (21 and 2 vol.% O2) on the NO- and N2O-release of soil samples from 5 different Basque forest sites (Pine, New Plantation, Young pine, Young beech, Beech) was investigated. From each stand 9 soil samples were incubated: 3 treatments with 15N tracer in the pools NH4+, NO3-, and NH4+ and NO3-, respectively. The experiments have revealed that under oxic condition N2O-production based on Norg was the dominant source. Under limited O2-availability, the relative fraction of the Norg-pool strongly decreased, while the absolute N2O-release from Norg increased concomitantly. In accordance with other studies, denitrification was the dominant process of soil N2O release under limited O2-availability (2 vol.% O2). Concerning NO-emission, denitrification was the main source for both O2-conditions.