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Tracing changes of N_2O emission pathways in a permanent grassland under elevated atmospheric CO_2 concentrations

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The increase of greenhouse gases (GHG) in the atmosphere is of concern due to its effect on global temperatures. Nitrous oxide (N_2O) with a Global Warming Potential of 298 over a 100 year period is of particular concern because strong feedback effects of elevated atmospheric CO_2 on N_2O emissions have been observed. However, so far the changes in processes which are responsible for such a feedback effect are only poorly understood. Our study was carried out *in situ* in a long-term Free Air Carbon dioxide Enrichment (FACE) study on permanent grassland at atmospheric CO_2 concentrations 20% above ambient which expected at the middle of this century. We performed an *in situ* ^{15}N tracing with differentially labelled NH_4NO_3 to trace the main N_2O emission pathways. Over a period of more than one year we monitored at least weakly the N_2O emissions with the closed chamber technique and analyzed the ^{15}N signature of the N_2O. The observed gaseous emissions under ambient and elevated atmospheric CO_2 were associated with the observed gross N transformations and the microbial activities to identify the main emission pathways under ambient and elevated CO_2.