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Nitrogen turnover of three different agricultural soils determined by ^{15}N triple labelling

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To meet the demand for data to improve existing N turnover models and to evaluate the effect of different soil physical properties on gross nitrogen (N) transformation rates, we investigated two arable soils and a grassland soil after addition of ammonium nitrate (NH_4NO_3), where either ammonium (NH_4^+), or nitrate (NO_3^-), or both pools have been labelled with ^{15}N at 60 atom% excess (triple ^{15}N tracing method). Besides NH_4^+, NO_3^- and nitrite (NO_2^-) contents with their respective ^{15}N enrichment, nitrous oxide (N_2O) and dinitrogen (N_2) fluxes have been determined.

Each soil was adjusted to 60 % of maximum water holding capacity and pre-incubated at 20˚C for two weeks. After application of the differently labelled N fertilizer, the soils were further incubated at 20˚C under aerobic conditions in a He-N_2-O_2 atmosphere (21 % O_2, 76 He, 2% N_2) to increase the sensitivity of N_2 rates via the ^{15}N gas flux method. Over a 2 week period soil N pools were quantified by 2 M KCl extraction (adjusted to pH 7 to prevent nitrite losses) (Stevens and Laughlin, 1995) and N gas fluxes were measured by gas chromatography in combination with IRMS. Here, we present the pool sizes and fluxes as well as the ^{15}N enrichments during the study. Results are discussed in light of the soil differences that were responsible for the difference in gross N dynamics quantified by the ^{15}N tracing model Ntrace (Müller *et al.*, 2007).

References

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