



The ^{15}N tracing model Ntrace: A flexible tool to quantify gross N transformations and N_2O pathways in soil-plant systems

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The development of the ^{15}N tracing model Ntrace started in 2004 with a basic model to quantify gross transformation rates among six soil N pools with nine simultaneous N transformations based on either zero- or first-order kinetics. To allow the analysis of more complex models an optimization routine based on Bayesian statistics was introduced in 2007. Subsequently the model was extended to allow for the analysis of plant-soil interactions, nitrite dynamics, biochar amendments as well as gaseous N pathways. Also the N dynamics of soil N pools such as amino acids or urea can be analysed. Since its creation more than 70 peer reviewed papers have been published in international journals where Ntrace was used for data analysis including all ecosystems (e.g. natural but also forest and arable) from all climatic regions of the world (tropics to the boreal zone). This includes laboratory but also field studies. To allow for greater flexibility the various Ntrace models and submodels can now be accessed via a common platform. Various additional options are now available including different numerical solvers with fixed and variable step length as well as specific parameter selections for submodels such as the plant and nitrite models. Here we present the working of the tracing model by some example data to show the analysis options that are available with Ntrace. The philosophy of this analysis tool is to utilize a suitable conceptual model for each data analysis, including all necessary details but at the same time keep the model as simple as possible. Several statistical criteria are used to find the most appropriate model that is sufficient to describe the data set in questions.