Supplementary Table S1. Sensitivity analysis of different initial ^{15}N values for the 'missing' amino acid pool (see main text for further explanation). A mix of 20 different amino acids (AA) was added to the soil. However, four of those (Arginine, Cysteine, Glutamine and Histidine) could not be measured with the current methodology. The nitrogen (N) content of these four AAs accounted for 22 % of the added ^{15}N in the experiment. As those four AAs also contribute to the free amino acid (FAA)-N dynamics in soil, they were considered in the numerical ^{15}N tracing model as follows: as default we assumed that the non-measured AAs had, after soil labelling with ^{15}N, the same ^{15}N enrichment as the pool of the measurable 16 AAs (weighted average). To evaluate the effect of this assumption on the quantification of the gross rates, an uncertainty data analysis with altered ^{15}N enrichment for the missing AAs was conducted. The following ^{15}N enrichments were considered: (1) the mean of the 16 measurable AAs, and the (2) upper and (3) lower 90 % confidence interval (CI) of the ^{15}N enrichment of the measured AAs. The percentage agreement of gross rates with the default ^{15}N enrichment (i.e. weighted average of 16 measured AAs) is presented (see Fig. 1 for abbreviations; n.d. not determined). Generally, very good agreement between the gross rates were found, with the exception of D_{SON} in the Podzol, which we assign to the high uncertainty due to the truncation of the process parameter in the default model (see main text).

	M_{SON}	I_{NH4}	M_{FAA}	I_{FAA}	D_{SON}
Umbrisol					
Upper 90 % CI	n.d.	97	97	98	98
Mean	n.d.	97	97	96	96
Lower 90 % CI	n.d.	100	100	97	98
Podzol					
Upper 90 % CI	101	99	93	93	86
Mean	103	103	95	94	88
Lower 90 % CI	101	100	97	97	84