GENERAL INFORMATION

author(s)	Bot J
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English title	Study of the N mineralisation and nitrification in Flemish and South-Chilean forest soils using stable isotopes
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taxa	*Nothofagus betuloides*, *Fagus sylvatica*, *Quercus robur*, *Fitzroya cupressoides*, *Araucaria araucana*
project	
supervisor	Van Cleemput O, Boeckx P
institution	Laboratory of Applied Physical Chemistry
document	pdf_short, hardcopy at the Laboratory of Applied Physical Chemistry (ISOFYS)
data	

MATERIALS & METHODS

study area	
time period	August–November 2002
goal	Study of the N transformation processes (mineralisation, nitrification, immobilisation) in soils of an old forest in southern Chile (low N deposition) and in a mixed broadleaved forest in Flanders (high N deposition) to gain insight into the consequences of an increase in N deposition.
set-up	3 experiments: - determination of the net mineralisation in the forests in Chile and Flanders & linked with chemical soil parameters - determination of the gross N transformation processes (mineralisation, nitrification, immobilisation of NH4+ and NO3-): distinction between production and consumption processes and measurement of real process rates - study of the changes in $d^{15}N$ and TN in different soil profiles and for $d^{13}C$ and TC in 3 forest soils in southern Chile
data collection	net mineralisation - soil samples o Antillanca (10 August 2002): each 5 cm until 30 cm depth, no organic layer o Aelmoeseneie (November 2002): each 5 cm until 10 cm depth, F & H layer - mineralisation rate = changes in the amount of anorganic N (NH_4^+, NO_3^-) between 6 or 8 sample dates during a period of 30 or 29 days ^{15}N incubation - soil samples: Antillanca (0-5, 5-10 cm), Aelmoeseneie (F, H, 0-5 cm) - gross mineralisation and NH_4^+ N immobilisation: changes in NH_4^+ N, NO_3^- N and the ^{15}N increase of the NH_4^+ and NO3- were measured at day 0, 2, and 7 profiles of $d^{15}N$, TN, $d^{13}C$, and TC - 3 forests in Chile: *Nothofagus betuloides*, *Fitzroya cupressoides*, *Araucaria araucana* (August 2002)

	- Fitzroya & Araucaria: each 2 cm until 30 and 10 cm, no organic layer samples - Aelmoeseneie: unpublished data from P Boeckx chemical characteristics of the soils - pH KCl, H_2O - total N, total C - anorganic N - stable isotopes physical characteristics of the soils - soil particle density - soil bulk density - porosity - gravimetric water content - water filled pore space
remarks	$d^{15}N$ and TN for different soil depths in appendix

RESULTS

Net mineralisation was 20 times higher in the evergreen *Nothofagus* forest in southern Chile than in the Aelmoeseneie forest in Flanders, probably due to the favourable soil conditions in the *Nothofagus* forest: the low C/N ratio and the high pH might favour the decomposition of organic matter. Net mineralisation decreased with soil depth. In the Aelmoeseneie forest, net mineralisation (per mass unit) was higher in the organic layers than in the mineral soil. The contribution of the nitrification was also higher in the organic layers. High total N and total C levels were correlated with high net mineralisation. The amount of anorganic N produced yearly in the *Nothofagus* forest was 10 times larger than in the Aelmoeseneie forest.

Gross mineralisation was a multiple of the net mineralisation in both forests. Gross nitrification was important in both forests and was also larger than net nitrification. In the Aelmoeseneie forest, the ratio gross/net nitrification was smaller than in the *Nothofagus* forest, which indicates that the gross mineralisation is important in the Aelmoeseneie forest, maybe due to the high N deposition. Microbial immobilisation of NH_4^+ and NO_3^- was lowest in the Aelmoeseneie forest, and the large gross nitrification results in nitrate seepage, which signifies an open N cycle. In the *Nothofagus* forest, nitrate seepage was negligible despite the high gross mineralisation and nitrification, which indicates a closed N cycle. The immobilisation of NH_4^+ and NO_3^- were much higher than in the Aelmoeseneie forest. N losses in the *Nothofagus* forest occur mainly as dissolved organic nitrogen.

The $d^{15}N$ profiles were similar in the 3 Chilean forests; the slow increase of $d^{15}N$ with soil depth indicates a closed N cycle. In the Aelmoeseneie forest, the rapid increase in the top 10 cm of the mineral soil and a decrease below 15 cm were associated to a seepage of NO3 impoverished in ^{15}N: an open N cycle. A clear negative correlation was found between $d^{15}N$ and total N in the 4 forest soils. The correlation was similar for the 3 Chilean forests. In the Aelmoeseneie forest, $d^{15}N$ was higher and TN was lower, possibly due to the seepage of NO_3 poor in ^{15}N. A strong linear relationship was found between $d^{15}N$ and net mineralisation in the *Nothofagus* forest and the Aelmoeseneie forest, although the relationship was different in the two forests. The $d^{15}N$ at a certain soil depth might be an indication of the N mineralisation.