



## **Role of interacting soil engineers in the transfers of C-N-S in a regenerating cutover peatland**

Aurélien Gicquel, Françoise Binet, Marie-Paule Briand, Nathalie Josselin, and André-Jean Francez  
ECOBIO UMR-CNRS-University of Rennes 1, Campus de Beaulieu, F-35042 RENNES Cedex, France  
(andre-jean.francez@univ-rennes1.fr)

Soil organisms, because they change soil physical and chemical properties as well as microbial communities, are efficient engineers that play a key role on soil nutrient cycling. Although the coupling of carbon (C) and nitrogen (N) in soil have been well studied, such studies in peat soils are scarce and even unavailable for sulphur (S). The aim of our study was to assess the impact of peat bioturbation by an epi-anecic earthworm (*Lumbricus rubellus* L.) and/or a plant (*Eriophorum angustifolium* L.) in the coupling of C-N-S in a regenerating cutover peatland, by using simultaneously three isotopic tracers ( $^{13}\text{C}$ - $^{15}\text{N}$ - $^{34}\text{S}$ ). We thus focused on C-N-S transfers in the drilosphere and rhizosphere which are representative of the earthworm and/or plant activities.

Labelled organisms (three earthworms or two plants) were introduced in unlabelled peat mesocosms (2 litres). Earthworm tissues, plants, representative peat samples of the drilosphere and the rhizosphere and bulk peat were analyzed for their  $\delta$  (‰)  $^{13}\text{C}$ ,  $^{15}\text{N}$  and  $^{34}\text{S}$  by using an elemental analyser-isotope ratio mass spectrometry (20-20 IRMS, Europa Scientific) after 3 and 18 days of incubation in a climate chamber.

We demonstrated rapid C, N and S enrichment of casts (x 1.3, x 70 and x 1.6 respectively) and burrows (x 1.2, x 30 and x 1.2) derived from labelled earthworms and of rhizosphere (x 1.1, x 10 and x 1.1) derived from labelled plants compared to the bulk soil. With regard to Nitrogen, a significant N transfer from labelled earthworms to unlabelled plants was shown, which reached up 4 % of  $^{15}\text{N}$  ( $40 \mu\text{g}$ ) within 18 days.

Our study highlighted the key role of soil engineers in the cycling of C-N-S in regenerating cutover peatlands by enhancing C-N-S transfers and providing nutrient enriched peat hot spots which are expected to sustain higher microbial activities. Further studies will therefore focus on microbial communities and C-N-S microbial uptake in the rhizosphere and the drilosphere.

**Keywords:** drilosphere, rhizosphere, triple isotopic labelling, stoichiometry, mesocosms