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To cite this version:

Renata Zocatelli, Jérémy Jacob, Sébastien Gogo, Claude Le Milbeau, Fatima Laggoun-Défarge. CHEMICAL DIVERSITY OF SOIL LIPIDS REFLECTS SURROUNDING BIODIVERSITY IN A FRENCH PEATBOG. 26th International Meeting on Organic Geochemistry, Sep 2013, Tenerife, Spain. 2013. <insu-01295607>

HAL Id: insu-01295607
https://hal-insu.archives-ouvertes.fr/insu-01295607
Submitted on 31 Mar 2016

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CHEMICAL DIVERSITY OF SOIL LIPIDS REFLECTS SURROUNDING BIODIVERSITY IN A FRENCH PEATBOG

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Introduction
The spatial heterogeneity of molecular biomarkers preserved in soils and sediments, and their representativeness of the spatial distribution of the surrounding vegetation, are seldom taken into account in environmental or paleoenvironmental studies. Here we examine the distribution of lipids in peat soils in relation to their potential plant sources in the surroundings.

Sampling Site
La Guette peatland is located in Neuvy-sur-Barangeon (Sologne, Cher) in the French Centre Region (154 m a.s.l.; N 47°19′, E 2°16′). This site covers 25 ha and is a transitional fen (pH about 4.4-5).

Specificity of biomarkers
We first explored lipid compounds that could be specific for distinct vegetation by comparing molecular imprints in soils with those of the surrounding plants.

Tree counting
Around each station, trees were counted in concentric circles of increasing radius (1, 2, 3, and 5 m, giving areas of 3.14; 12.6; 28.3; 50.3 and 78.5 m², respectively). Then, tree density (dtrees) and cover index (CI) were calculated.

Lipid Analyses
About 5 g of soil or plant sample were sonicated with CHCl₃ (3 x 10 min x 15 ml). Total extract was fractionated into neutral and acidic compounds using amionopropyl-bonded silica. Neutral fraction was separated into five fractions using a sequence of solvents of increasing polarity. Alcohol fractions were analysed by GC/MS.

Variability of molecular imprints in stations
We then compared the distribution of these lipid classes among soil samples in stations under varying vegetation cover.

Conclusions
- Pentacyclic triterpenyl acetates detected by Erica tetralix and Calluna vulgaris were found in high concentrations in open stations.
- Tricyclic diterpenes and methoxy-serratenedes detected in Pinus sylvestris were found in high concentrations in semi-close and close stations dominated by Betula pendula.
- Non-specific compounds showed rather homogeneous distribution along the stations. Reversely, the spatial dispersion of specific compounds appears controlled by the surrounding vegetation.
- Concentration of B. pendula and P. sylvestris biomarkers in soils are well correlated with tree density when an area of 80 m is considered. Here, the influence zone is valid over an area of at least 80 m².
- Soil lipids can thus constitute valuable tools for reflecting the spatial heterogeneity in the distribution of past and present vegetation in continental ecosystems.

Perspectives: Further work is now underway to apply the same approach to shrub, graminoid and moss strata. However, the spatial complexity of these types of vegetation impedes any simple direct estimation of density (unlike tree counting) and, thus, requires further development.