Spatial variability of compound-specific δD at the field scale: A case study from miliacin in broomcorn millet (Panicum miliaceum).

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IMOG Abstract Template

Title only (not Authors & Affiliations)	**Spatial variability of compound-specific δD at the field scale: A case study from miliacin in broomcorn millet (Panicum miliaceum).**

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The hydrogen isotopic composition (δD) of individual compounds preserved in lake sediments has been proposed as a proxy of the hydrological conditions that prevailed at time of their synthesis. Numerous parameters are susceptible of influencing this parameter, the first of them being the δD of environmental waters. Then, the combination of environmental (aridity, soil properties…) and biological parameters alter the δD of leaf water that is finally used for the biosynthesis of organic molecules that fractionate hydrogen isotopes through enzymatic reactions. Lake sediments accumulate organic matter produced at catchment scale, thus produced by various organisms developed on soils of potentially different properties. The spatial variability of δD in plants at a catchment scale is rarely taken into account (Hou et al., 2007), although it might represent a serious source of uncertainty on the paleoclimatic interpretation of sedimentary lipids δD.

In order to asses the confidence level in the δD of sedimentary lipids, we have measured the δD of miliacin (olean-18-en-3βol ME), a biomarker specific of broomcorn millet (*Panicum miliaceum* L.; Jacob et al., 2008). Miliacin was extracted from the seeds of millet plants collected from 26 sites (3 replicates per site) randomly distributed in a field that shows a strong heterogeneity in soil physical and chemical properties in Mézières-lez-Cléry (Loiret, France; Figure 1). After extraction and purification, miliacin was quantified and its purity assessed by GC-MS. Miliacin was then co-injected with a series of n-alkanes of known δD (Arndt Schiemelmann, Indiana University) on a TraceGC chromatograph coupled to a DeltaV Advantage irMS through an Isolink interface and a Conflo IV system. Precision for n-alkanes was around 3 ‰ and accuracy of miliacin δD was better than 6 ‰. Reproducibility for triplicates plants at a single site was 6.88 ‰.

Miliacin δD values range from -90 to -140‰ V-SMOW. The distribution of δD values respects a gaussian law ($p>0.95$) with an average of -121.3+/-9.1‰ V-SMOW, i.e. close to values reported for other pentacyclic triterpenes (Sessions et al., 2006).

A 50 ‰ range in compound-specific δD values is interpreted as a radical change of environmental conditions (i.e. savannah to tropical forest) when found in sedimentary archives (Jacob et al., 2007). However, the propagation

of this uncertainty from spatially distributed biological sources towards sedimentary archives through soils remains to be estimated.

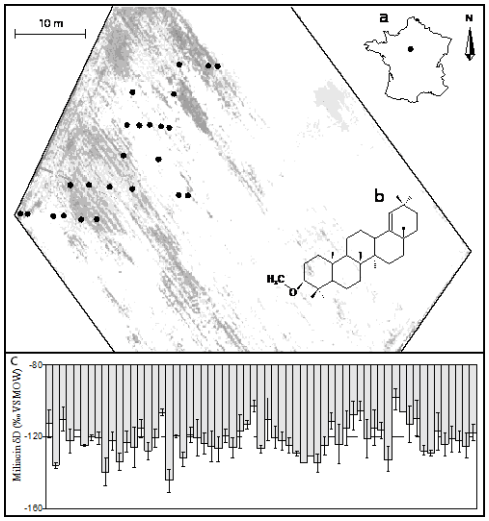

Figure 1: (a) Location of *P. miliaceum* field, heterogeneity of soil properties on aerial picture (grey scale) and location of samples; (b) Structure of miliacin (c) Distribution of miliacin δD values per plant.

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