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Spatial and temporal evolution of detritusphere hotspots at different soil moistures

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Among the factors that control the dynamics of soil organic matter, recent work is placing growing importance on soil structure, which determines the local environmental conditions of decomposing microorganisms (availability of water and air). and regulates the accessibility of organic compounds to these microorganisms.

Soils are spatially heterogeneous environments at different scales and this heterogeneity still very little taken-into-account in the study and prediction of soil organic matter dynamics. The incorporation of plant residues in soils leads to a number of hot spots of microbial activity and biogeochemical cycling at fine scale. However these are still little studied.
The objectives of this study were: (i) to determine the spatio-temporal evolution of microorganisms and their activity after the incorporation of fresh plant residues in soils, and (ii) to determine how this evolution was affected by soil moisture, given the importance of soil moisture in regulating decomposition.

The experimental set-up was based on incubated soil microcosms with addition of a central layer of 13C labelled maize residues at different soil moistures (pF 1.5, 2.5 and 3.5). Total and residue derived 13C mineralization were monitored and the microcosms were destructively sampled at four dates, fractionated into soil layers with increasing distance from the residue layer and we quantified residue-derived carbon in these layers and determined microbial community abundance, structure and contribution to the biodegradation of residues with PLFA and SIP-PLFA.
We observed that the mineralization of the residues decreased with soil moisture but that the extent of the detritusphere (defined the zone in which residue derived C was present and microorganisms had been stimulated) unchanged. Soil moisture also affected the microbial community structure.