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EVOLUTION OF LIPIDS DURING THE PODZOLISATION OF LATERITES IN THE UPPER AMAZON BASIN

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Although they usually account for only a few percent of soil organic matter (SOM), lipids can be of major importance for soil properties and dynamics. For example, they can be toxic towards living organisms, have a high reactivity towards polyvalent cations and their hydrophobic properties can affect aggregate stability and water retention (Dinel *et al.*, 1990). Furthermore, they are useful biomarkers and can provide information about the sources of SOM, microbial activity and the pathways of degradation and/or stabilisation of SOM.

In the Upper Amazon Basin, podzolisation involves the remobilization of large amounts of potentially damaging chemical elements (Fe, Al, Si) previously accumulated in lateritic formations. Lipids generally accumulate in acidic soils such as podzols and could take part in the development of podzols (Jambu *et al.*, 1978). In order to better understand the mechanisms involved in the podzolisation process in the Amazon Basin, the evolutions of lipid abundance and composition were studied along a representative soil catena showing the transition between a latosol and a well-developed podzol (Nascimento *et al.*, 2004). Total free lipid extracts were obtained from eight key samples of the catena, which enable to follow both lateral and vertical evolutions. Litter samples were considered in parallel to assess the inputs from overlying vegetation. Several compound classes were analysed (alkanes, alkanones, free fatty acids, free alkanols) and their composition was determined by GC and GC-MS.

As expected, free lipids accumulate with increasing acidity from the latosol to the podzol, both as a percentage of total soil and of SOM. However, they are present in very low amount during early stages of podzolisation. In addition to different abundances, an evolution of the composition of lipids during the different stages of podzol development is observed. For example, the distribution of alkanoic acids in surface horizons shows interesting features. Unsaturated acids such as $C_{16:1}$ and $C_{18:1}$ are observed, consistently with a low level of lipid degradation. Furthermore, the occurence of short-chain branched alkanes, together with *n*-, *iso*- and *anteiso*- C_{15} and C_{17} fatty acids, indicating a microbial contribution. However, they show variations in their relative abundances which points to a change in microbial community structure and/or activity when the well-developed podzol is compared with the latosol and weakly-developed podzol. Finally, in early stages of podzolisation, the short chain ($<C_{20}$) alkanoic acid contribution is decreased relative to the long chain ($>C_{20}$) one (Figure 1).

The very low abundance of free lipids in the early stages of podzolisation is visible especially in horizons containing large amounts of organo-metallic complexes. This, together with the previous observations about the distribution of organic acids suggest that lipids may be immobilized by complexation with metals released during the intense mineral weathering going on at this point. Analysis after complex dissociation using pyrophosphate is under progress to test this hypothesis.

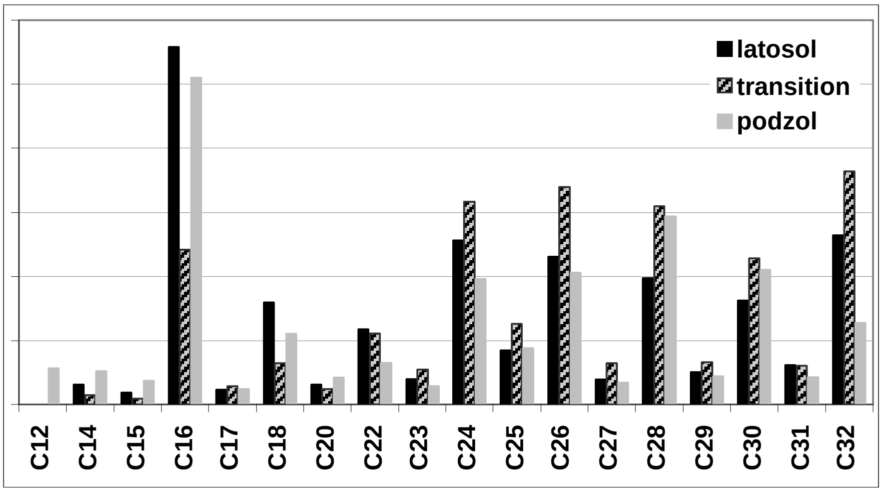

Figure 1. Distribution of n-alkanoic acids in surface horizons during the different stages of podzol development

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