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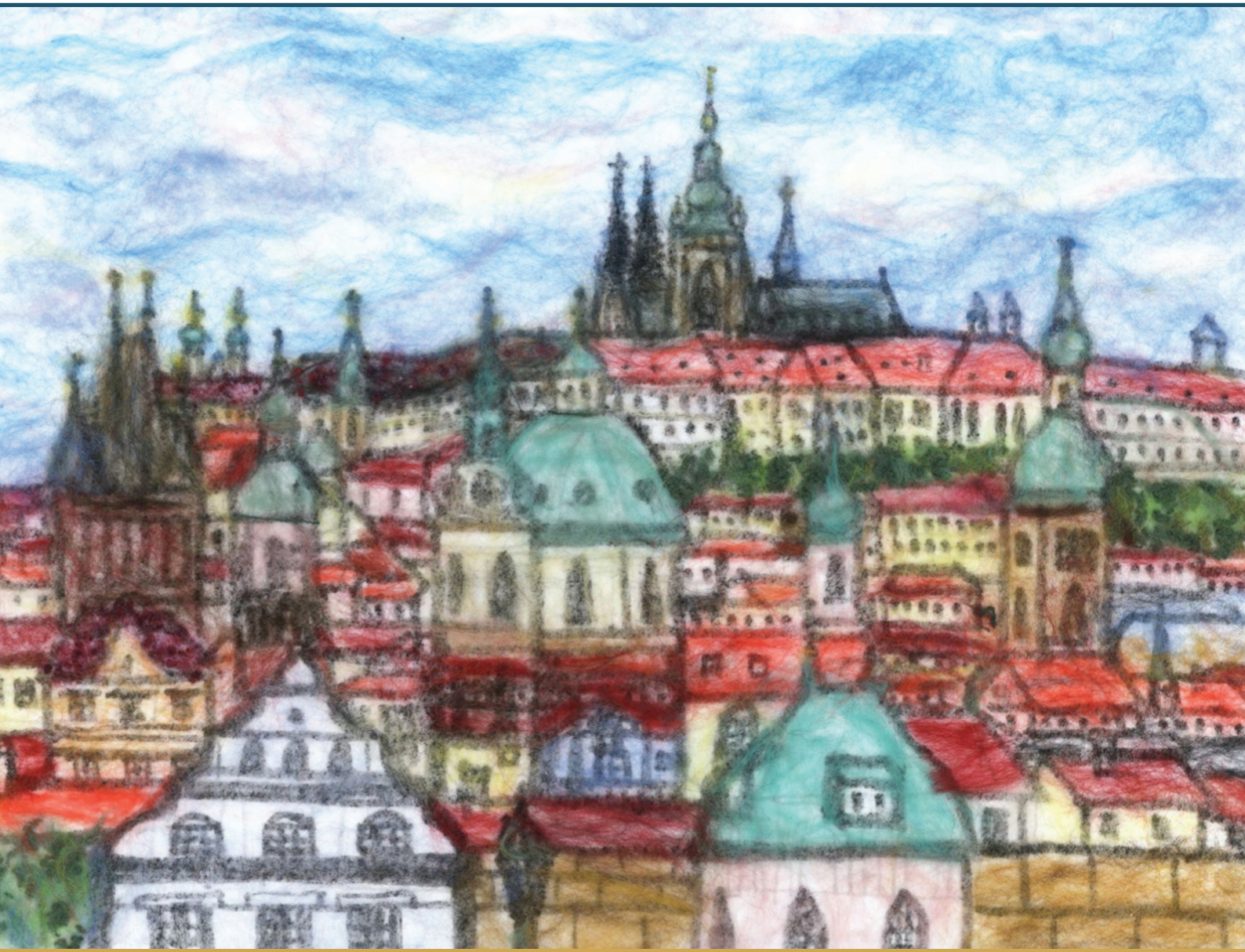
BOOK OF ABSTRACTS



Factors involved in soil organic matter stabilization in Peruvian Amazonian soils (Ucayali region) and the molecular composition of extractable lipids

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Amazonian ecosystems are considered important sinks for atmospheric CO_2 on Earth. It is therefore desirable to preserve their biodiversity and productivity. In this communication an assessment of the influence of different agro-forestry practices on soil C storage in representative ecosystems from the Peruvian Ucayali region is approached by analyzing the soil lipid fraction. In fact, this organic matter fraction is an important source of analytical surrogates of soil C stabilization and accumulation processes (Naafs at al., 2004; Poulenard et al., 2004; Rumpel et al., 2004).

Top (0–20 cm) and subsoil (20–40 cm) samples were taken from the Amazonian Ucayali region (Pucallpa, Perú), ranging from recent alluvial soils in muddy zones of riverside areas (wetlands referred to as 'mud', 'beach' and low 'restinga' soils) to more developed soils located in medium and higher riverine terraces, as well as in hills. The lipid fraction was Soxhlet extracted with a mixture of dichloromethane:methanol (2:1 by vol.), saponified and divided into neutral and acid subfractions. The acid fractions were then sequentially methylated and silylated prior to the chromatographic analysis (González-Vila et al., 2003).

Neutral and acid sub-fractions were separated and the major compounds were identified by gas chromatography-mass spectrometry using an HP G1800A GCD System (electron impact detector at 70 eV) equipped with a DB-5 fused silica capillary column (30 m × 0.32 mm i.d., film thickness 0.25 μm) and using He as carrier gas at a flow rate of 1.5 mL min^{-1}. The chromatographic oven temperature was programmed to increase from 40 to 100 ºC at 30 ºC min^{-1} and then to 300 ºC at 6 ºC min^{-1}.

The values of soil organic matter and lipids ranged from 25.8 to 5.8 g kg^{-1}, and from 5.2 to 0.2 g kg^{-1}, respectively. This variability as well as the differences in lipid molecular composition could suggest differences in the soils' use and management practices (Van Bergen et al.,1996).

The main families of signature lipids detected in the soil extracts were *n*-alkanes, linear isoprenoids, cyclic alkanes, *n*-fatty acids, branched fatty acids, unsaturated fatty acids, hydroxyacids, *n*-alcohols, ketones, polycyclic hydrocarbons and sterols. Very significant differences in qualitative and quantitative lipid composition were found in terms of soil depth. This effect was more pronounced in the soils from the riverine high terraces devoted to agro-forestry practices (Figs. 1 and 2). In addition, lipidic compounds of high molecular weight (i.e., di- and triterpenes) were detected as regular components of the free lipid fractions from the different ecosystems (wetlands, terraces and hills) reflecting specific vegetation and soil-use influences. Xenobiotic compounds (naphthenic acids) detected within the unresolved chromatographic 'hump' (highly unresolved mixture of cyclic or branched hydrocarbons) were also observed, indicating anthropogenic contamination by mineral oils. Likewise, dialkyl phthalates (Phth) from plasticizers were also detected.

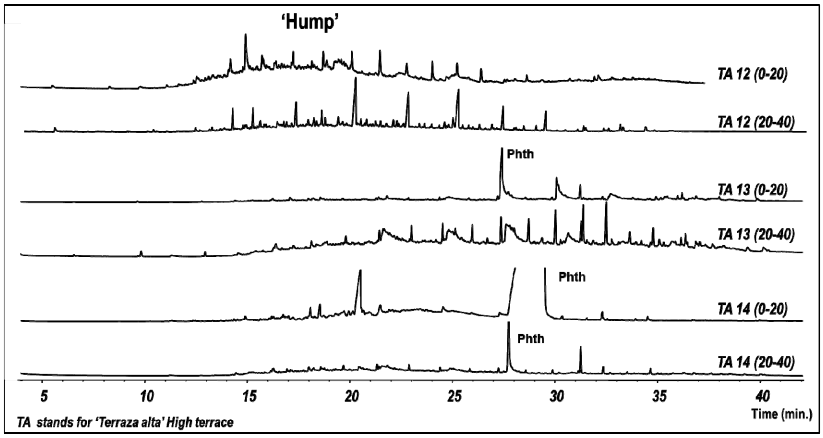

Fig. 1. Total ion chromatogram of High Terrace samples (neutral subfraction).

Management practices seem to play a role in the accumulation mechanisms of organic matter in the Amazonian soils studied, which is particularly reflected by the high subsoil C content. This is an interesting environmental feature and an indication of the C sequestration potential of deep soil horizons in specific ecosystems. The enrichment of high C-range homologues of signature lipid families retaining the natural abundance observed in subsoils may be an indication of the interest of the current agro-forestry practices in high terraces, which would lead to accumulation of relatively unaltered and stable C forms in deeper horizons (selective preservation of plant and microbial macromolecules favored by local hydromorphic conditions).

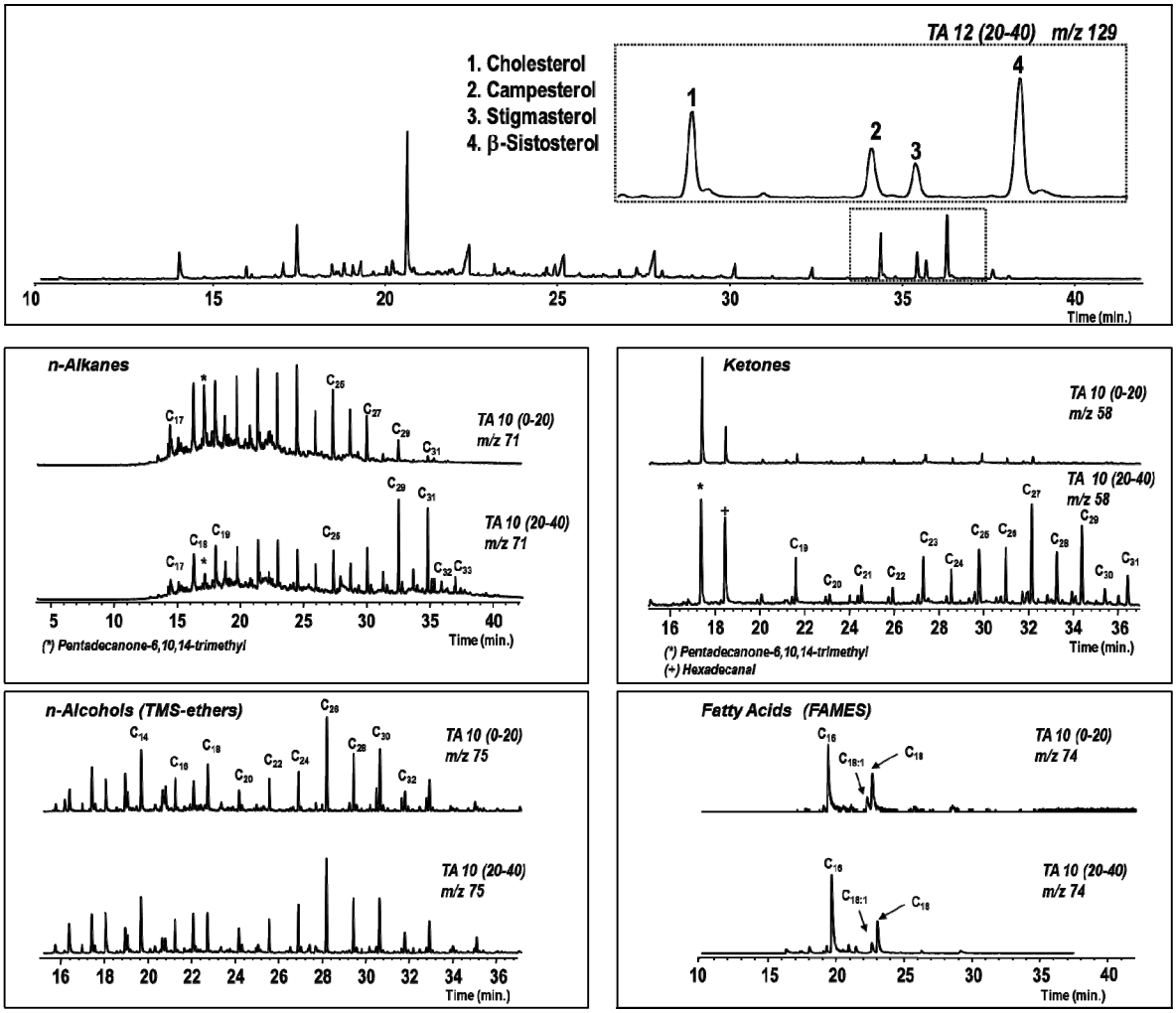

Fig. 2. Distribution of different lipid families displayed by diagnostic ions.

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