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Molecular transformation of dissolved organic matter in soils of contrasting tropical rainforest ecosystems is similar to temperate regions suggesting common processes

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The variability of the molecular composition of dissolved organic matter (DOM) in soils is predominantly explained by microbial mineralization and assimilation as well as interactions with mineral surfaces and soil organic matter (SOM). From a temperate site with calcareous soil it is established that the molecular composition of DOM shifts from plant-derived towards microorganism-derived signals in soil depth profiles. This variability is largely explained by microbial activity and only to a minor degree by soil-derived parameters like texture and SOM. Here we analyze the molecular composition of DOM in depth profiles of tropical rainforest soils in order to compare its variability to the temperate site as the tropical ecosystems have larger variability in soil texture and mineralogy and lower SOM content. We collected porewater in soil profiles of four ecosystems belonging to two major Amazon rainforest types, *terra firme* forest on clay soils and white-sand forest on sandy soils. We analyzed the molecular composition of DOM using solid-phase extraction and ultrahigh resolution mass spectrometry.

The concentration and composition of DOM differed strongly between the sandy white-sand and clayey *terra firme* sites. DOM concentration in white-sand soils was much higher and decreased less with depth compared to the *terra firme* forests. Topsoil DOM in white-sand forests was characterized by high abundance of aromatic plant-derived compounds, whereas it reflected a stronger microbial imprint in *terra firme* sites. The molecular composition of DOM changed significantly with depth at all sites. In both *terra firme* and one white-sand forest the transformation was consistent with the expected shift from plant-derived signals towards increasing microbial reworking. The Bray-Curtis dissimilarity between topsoil and greater depth was considerably higher in *terra firme* compared to white-sand soils with values of 0.32 +- 0.06 and 0.14 +- 0.04, respectively, suggesting much slower DOM transformation in sandy soils. The dissimilarity was correlated similarly to pH, clay content and mineralogy (Pearson R^2 = 0.27, 0.21 and 0.23, respectively). The high dissimilarity in the *terra firme* sites that vary strongly in clay

content and mineralogy was only significantly correlated to pH (R^2 = 0.16). This suggests that clay content and mineralogy, likely linked to DOM adsorption, were less important for the observed depth trend, which aligns with results from the temperate site. The significant effect of soil pH on the molecular transformation is in line with the importance of microorganisms for DOM transformation as soil pH is a major control on microbial community structure. Overall, our results suggest that similar processes control DOM transformation in temperate and tropical ecosystems, which are likely linked to microbial processing and formation of DOM.