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# Mineralogical impact on long-term patterns of soil nitrogen and phosphorus enzyme activities

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Soil chronosequences provide a unique opportunity to study microbial activity over time in mineralogical diverse soils of different ages. The main objective of this study was to test the effect of mineralogical properties, nutrient and organic matter availability over whole soil pro-files on the abundance and activity of the microbial communities. We focused on microbio-logical processes involved in nitrogen and phosphorus cycling at the 120,000-year Franz Josef soil chronosequence. Microbial abundances (microbial biomass and total cell counts) and enzyme activities (protease, urease, aminopeptidase, and phosphatase) were determined and related to nutrient contents and mineralogical soil properties. Both, microbial abundances and enzyme activities decreased with soil depth at all sites. In the organic layers, microbial biomass and the activities of N-hydrolyzing enzymes showed their maximum at the intermediate-aged sites, corresponding to a high aboveground biomass. In contrast, the phosphatase activity increased with site age. The activities of N-hydrolyzing enzymes were positively correlated with total carbon and nitrogen contents, whereas the phosphatase activity was negatively correlated with the phosphorus content. In the mineral soil, the enzyme activities were generally low, thus reflecting the presence of strongly sorbing minerals. Sub-strate-normalized enzyme activities correlated negatively to clay content as well as poorly crystalline Al and Fe oxyhydroxides, supporting the view that the evolution of reactive sec-ondary mineral phases alters the activity of the microbial communities by constraining sub-strate availability. Our data suggest a strong mineralogical influence on nutrient cycling par-ticularly in subsoil environments.