



Effect of aluminium on dissolved organic matter mineralization in an allophanic and kaolinitic temperate rain forest soil

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Aluminium (Al) and its influence on the mineralization of dissolved organic matter (DOM) and thus on carbon (C) sequestration in forest soils is poorly understood. We hypothesized that an addition of Al to the soil solution beyond a molar Al:C ratio of 0.1, induces precipitation of the organic matter which leads to an excess Al in the soil solution causing an inhibitory effect for growing microorganisms. We investigated the effect of Al concentrations for the potential of C biodegradation at different Al:C ratios from DOM and Ah mineral soil horizons from two temperate rain forest soils from southern Chile. Dissolved organic matter and surface mineral horizons were incubated with initial molar Al:C ratio from 0.08 to 1.38 found under field conditions. Mineralization was quantified by measurement of C-CO₂ evolved during 15 days. Increasing the initial Al:C ratio > 0.12, led to a considerable reduction in mineralization (up to 70%). For Al:C ratio < 0.12, the mineralization rates from DOM and mineral soils were unaffected. Consequently, there would be a considerable reduction in the biodegradation of DOM and thus an increase in the C sequestration in mineral soils with molar Al:C ratio > 0.12. The observed DOM losses in the stream water of pristine southern forests can be explained by increasing the bioavailability of organic C for Al:C ratio < 0.12. Aluminium concentration had a marked effect at the spectral ART-FTIR bands assigned to cellulose-like and aromatic compounds in Ah mineral soil, diminishing the mineralization. The present results were also confirmed by the Al fluorescence using a confocal microscopy.