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How do DOM Quality and microbial Respiration alter with Soil Development? A Volcanic Approach

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Mount Aso, a partially active volcano in the centre of Kyushu, had a major eruption about 90,000 years BP. This resulted in similar soil parent material in its immediate surroundings, which has and is being developing differently, depending on its position on the slope (e.g. aspect, steepness, altitude). In order to determine how this development affected DOM quality and microbial respiration samples were taken on the same slope within the top 5 cm at different altitudes. All sites were composed of meadows and were not anthropogenicly used. They were within 10 km of each other.

A significant negative hyperbolic relationship was found between soil organic carbon (23.1 to 60.6 mg C g^{-1} dw) and altitude (850 to 1140 m), confirming different stages of soil development. Total nitrogen followed a similar patter, and the C/N ratio did not change significantly with altitude. It was postulated that the DOM, being the mobile component of soil humus, would reflect any pronounced differences in humus processes. It was extracted from the samples by the relative gentle procedure of shaking with a 10 mM $CaCl_2$ solution. The resulting water extractable organic matter (WEOM) is an estimate of the in situ DOM. It was characterised with its DOC content, UV absorption, and fluorescence emission. Some of the luminescence spectra showed patterns, which differed significantly from those obtained from German meadows, but no altitude related pattern could be determined. Also, all the other parameters showed no relationship to the stage of soil development. This implies that humus sources and sinks tend to be similar after a certain stage of soil development has been reached.

In order to determine the effect of soil development on microbial respiration patterns, samples were placed in a device, which was capable of monitoring CO_2 emission con-

tinuously. The basal rates were low (average of 1.3 μg CO_2 min^{-1}) and independent of soil development. The addition of substrate (glucose and nutrients) resulted a total CO_2 respiration, which was linearly significantly inverse to altitude. However it was minor in that the difference was at most 12%. A positive regression between both lag time and respiration peak kurtosis and altitude, implied different metabolism patterns, which were a function of soil development.