

Seeking Evidence of Preservation and Accumulation of Soil Organic Matter – A Pyrolysis GC/MS Study

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Given that soil organic matter (SOM) represents a continuum of heterogeneously decomposing organic compounds, knowledge of the molecular composition and interaction with soil constituents of these compounds, rather than carbon stock capacity, is critical to fundamentally understand the persistence of SOM under different conditions (i.e., different soil orders, land-use and farming practices). However, at present this information is insufficient, in particular, in New Zealand soils. The overall objective of this study was to investigate the drivers that influence SOM chemistry and persistence in soil. We characterised the molecular composition of SOM of 50 topsoils and 10 subsoils of different soil orders and obtained from different climatic regions and land-uses, using pyrolysis-GC/MS. These soils were also analysed using conventional wet chemical methods. Soil sampling was performed across New Zealand at two depths (0–15 cm and 15–30 cm) and included dominant soil orders (e.g. Allophanic, Brown, Pallic, Gley and Recent) and land-uses (e.g. Pasture, Indigenous/Ungrazed and Cropping). Soils were treated with 2% HF for six times to minimise the interference of mineral composition on the pyrolysis of SOM prior to their pyrolysis-GC/MS analysis. We are currently processing the information gathered in the chromatograms. Once this is finalised, we will conduct multivariate analyses (e.g. Principal Component Analysis and Redundancy Analysis) so that the ordination pattern of SOM molecular composition and its link to SOM content, and other soil properties and environmental factors is understood. The evidence obtained from this study can ultimately help provide recommendations aimed at mitigating CO₂ emissions and/or improving soil services management suitable for common New Zealand scenarios