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A comparison of soil organic matter physical fractionation methods

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Selecting a suitable physical fractionation to investigate soil organic matter dynamics from the plethora that are available is a difficult task. An initial investigation of four different physical fractionation methods was conducted (i) Six et al. (2002); (ii) Zimmermann et al. (2007); (iii) Sohi et al. (2001); and (iv) Plaza et al. (2013). Soils used for this were from a long-term organic matter field plot study where a sandy loam soil was subjected to the following treatments: Peat (Pt), Horse Manure (H), Garden Compost (GCf), Garden Compost at half rate (GCh), and a bare plot control (BP).

Although each of these methods involved the isolation of unique fractions, in the interest of comparison, each fraction was categorised as either being (i) physically protected (i.e. in aggregates); (ii) chemically protected (such as in organo-mineral complexes); or (iii) unprotected by either of these mechanisms (so-called 'free' organic matter).

Regardless of the fractionation method used, a large amount of the variation in total C contents of the different treated soils is accounted for by the differences in unprotected particulate organic matter. When comparing the methods to one another there were no consistent differences in carbon content in the physically protected, chemically protected, or unprotected fractions as operationally defined across all the five organic matter treatments. Therefore fractionation method selection, for this research, was primarily driven by the practicalities of conducting each method in the lab.

All of the methods tested had their limitations, for use in this research. This is not a criticism of the methods themselves but largely a result of the lack of suitability for these particular samples. For example, samples that contain a lot of gravel can lead to problems for methods that use size distribution for fractionation. Problems can also be encountered when free particulate organic matter contributes a large proportion of the sample, leaving insufficient sample for further fractionation. This highlights the need for an understanding of the nature of your sample prior to method selection.