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Can a paleosol be used as a reference material for monitoring soil aggregate stability?

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An important physical indicator of soil quality, which regulatory authorities may wish to monitor, is aggregate stability. In a recent study, Rawlins *et al.* (in press) presented a novel method for determining the stability of aggregates in water using a laser granulometer (LG). The LG is used to make two measurements of the continuous size distribution (<2000 μm) within a sample of aggregates. The first measurement is made on water stable aggregates after these have been added to circulating water (initial air-dried aggregate size range 1000 to 2000 μm). The second measurement is made on the disaggregated material after the circulating aggregates have been disrupted with ultrasound (sonication). The difference between the mean weight diameters of these two size distributions is referred to as the disaggregation reduction (DR; μm). Soils with more stable aggregates, which are resistant to both slaking and mechanical breakdown by the hydrodynamic forces during circulation, have larger values of DR. Rawlins *et al* showed that for two soil types, the DR values had coefficients of variation of 12.1 and 19% suggesting the DR value is reproducible based on the small mass of soil used. If such a test is to be applied for soil aggregate monitoring, it will be necessary to analyse a reference material (RM) with consistent disaggregation properties (DR value) to demonstrate that the procedure is consistent over the period of monitoring.

To our knowledge no one has previously attempted to use or apply a RM for testing soil aggregate stability. We know of no commercially available anthropogenic material which has consistent disaggregation properties. Field soils, which are exposed to seasonal variations in organic matter content plus wetting and drying cycles, are unlikely to have sufficiently consistent disaggregation properties for use as an aggregate RM. Paleosols are likely to be less reposnosive to seasoanl cycles because they are often buried at depths (>1 m) beyond the most active hydrological and biogeochemical cycles, and so they are likely to disaggregate more consistently over time. They are also sufficiently abundant for bulk samples to be collected repeatedly. We present analyses of DR for a paleosol (brickearth) material collected from a site at Ospringe in Kent (southern England) at a depth of 1.6 m to determine whether it has properties that indicate its potential for use as a RM for monitoring soil aggregate stability based on the method presented by Rawlins *et al.*. We discuss the implications of our initial findings.

Rawlins, B. G., Wragg, J. Lark, R. M. *in press*. Application of a novel method for soil aggregate stability measurement by laser granulometry with sonication. *European Journal of Soil Science*.