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

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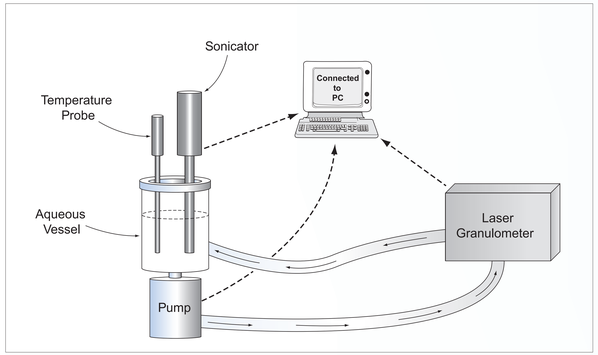
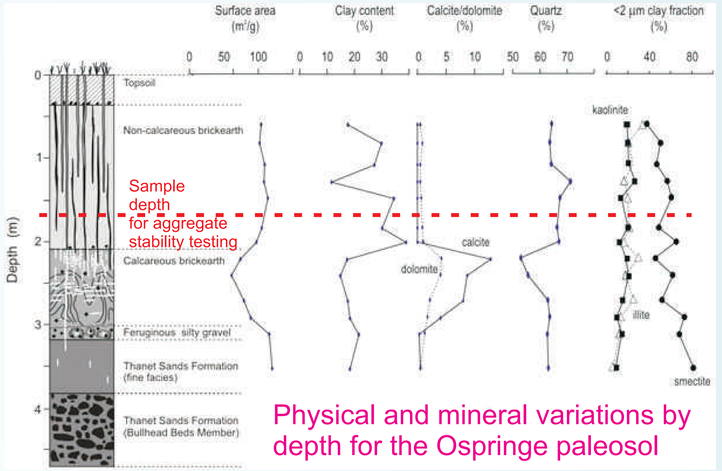
- Aggregate stability is a key indicator of physical soil quality
- We developed a rapid, cost-effective method to measure aggregate stability in water using laser granulometry (Rawlins et al., 2013)
- The mean weight diameter (MWD) is measured for water stable aggregates (WSA) and then compared with the same measure after disruption by sonication.
- The change (disaggregation reduction; DR) is > for soils with more WSA
- There is no commercially available anthropogenic material with consistent disaggregation properties
- Seasonal variations in organic matter turnover (plus wetting and drying cycles) mean that field soils have variable disaggregation properties
- By contrast, a paleosol buried at 1.6m may have consistent disaggregation properties required for use as a reference material



Arrangement of apparatus used for the measurement of aggregate stability. Arrows depict the circulation of water between the aqueous vessel and the laser granulometer.

Ospringe paleosol and analyses

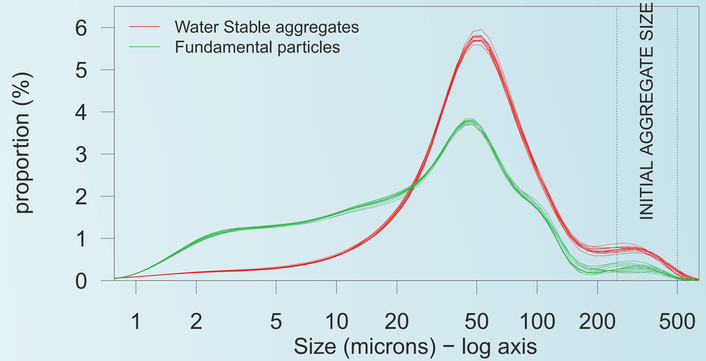
- We collected material from a site in Ospringe in Kent (UK) (see map) - work has shown the material has consistent properties at 1.6m depth (see below)
- Optically stmulated luminesence methods for the non-calcareous material at 2m depth gave an age of 18700 yrs BP± 2300
- We dried and gently disaggregated the material - and made repeated measurements of DR using our aggregate stability test for three size fractions: 250-500 µm, 500 -1000µm and 1000 - 2000 µm



Physical and mineral variations by depth for the Ospringe paleosol

Results

- Coefficients of variation of DR for the three fractions (250-500 µm, 500 -1000µm and 1000 - 2000 µm) were 6.0, 15.9 and 15.4% respectively
- The 250-500 µm fraction has the most reproducible disaggregation properties.
- The 250-500 µm fraction has a mean SOC concentration of 1.4%.
- The graph below show the results of 12 analyses on subsamples of the 250-500 µm fraction
- We have homogenised a large quantity of this fraction (which we can provided to other scientists) for use as a standard material for this stability test



References: Rawlins, B.G. et al. 2013. Application of a novel method for soil aggregate stability measurement by laser granulometry with sonication. European Journal of Soil Science, 64,92-103.