Testing of soil aggregate stability by means of laser diffractometer Mastersizer 3000

Jan-František Kubát, Michal Vrána, David Zumr, and Petr Kavka
Czech Technical University in Prague, Faculty of Civil Engineering, The Department of Landscape Water Conservation, Czechia (jan.f.kubat@gmail.com)

Good stability of soil aggregates is an essential characteristic that positively affects soil health, increases agronomic productivity, decreases susceptibility to soil erosion and can improve carbon sequestration. The most common laboratory procedure for determining soil aggregate stability is a water resistance index (WRI) which is based on a wet sieving method. Within this contribution we introduce a newly developed method which utilizes laser diffraction for estimating the water resistance index of soil aggregates (WRI_{LD}). Recently, this newly introduced method has been tested and compared with the Kemper & Rosenau equation. This new method was developed with an emphasis on comparability to the standard sieving procedure performed with the Eijkelkamp wet sieving apparatus. The water stability of the aggregates was tested across five different soil types (haplioc Luvisol, Chernozem, Regosol, Fluvisol, Cambisol). The pH of each sample was measured and according to this value, either hexametaphosphate or sodium hydroxide was used to disrupt the stable aggregates along with ultrasound. The resulting WRI_{LD} is determined based on a fraction of undisturbed aggregates recorded for each fictitious sieve size. Initial results show promising agreement between the standard sieving and laser diffractometer methods. The advantage of the latter is a much faster processing time of a large number of samples and their replicates. This new method has a lower variability of results. However, further measurements are needed to validate the method.