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Relationships between aggregates size classes and SOC content using aggregate settling velocity measurements in interrill areas

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Soil aggregate stability is one of the main factors of soil physics and structure. Formation and stabilization of soil aggregates facilitates soil carbon sequestration and reduces the susceptibility of soil to erosion. The gain or loss of C in agricultural systems is largely influenced by aggregate–associated soil organic carbon that affects the settling velocity and C content of soils. Settling velocity measurements are useful to provide direct information on soil aggregate size distribution that can be used as indicators of the potential soil erodibility.
This study aims to analyze the effect of settling velocity on soil aggregate dynamics and the relationships between the particle size distributions and the associated carbon in a cultivated field of typical Mediterranean agroecosystems in mountain landscapes.
Calcisol topsoil samples (n=10) were collected in an interrill area within the field at two contrasting slope positions (i.e. upslope and downslope). Furthermore, a total of ten Calcisol soil samples were collected in an adjacent area under forest vegetation cover and stable conditions. According to Stokes's Law, the fine soil fraction <2 mm was fractionated into five velocity settling classes: > 0.045, 0.045-0.015, 0.015-0.003, 0.003-0.001 and < 0.001 m s-1 using a settling tube procedure followed by the analysis of the SOC content of each settling size classes.
The results evidenced the inverse correlation between grain size and SOC content, smaller and lighter settling size classes were enriched in SOC and the effect of cultivation on soil aggregation by the lower proportion of macroaggregates compared to forest soils. Moreover, it was found a preferential transport of fine particles from upslope to downslope during interrill erosion processes.
In this study, settling velocity measurements provide a useful tool for assessing changes in soil aggregation under different land uses and for identifying the relationship between aggregates size classes and SOC content in Mediterranean agroecosystems.