

A Predictive Model based on Soil Organic Carbon Content for Water Content Dependant Soil Water Repellency

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Soil water repellency (WR) is a significant problem worldwide effecting natural and agricultural ecosystems, with important environmental consequences WR is a particle-water interphase phenomenon for which the primary causes and mechanisms are poorly understood. The water repellency appears in organic carbon rich soils over range of water contents whereas soils with low organic matter content express only slight to moderate water repellency over a narrow range of water content. We first characterized the degree of water repellency of soils from a single soil profile at different depths by Molarity of Ethanol Droplet (MED) test. Furthermore, we investigated the relationship among water repellency, soil organic carbon content and soil water content for a variety of soil samples to develop a model that express the water repellency - soil water content relationship at various soil organic carbon contents. Although few previous studies have examined the relation-ship between water repellency and soil organic carbon content in combination with other soil properties, this study aims to develop a straightforward link between water repellency and soil organic carbon by a comprehensive analysis. The water repellency verses water content relationship implied that soil organic carbon can increase the degree of water repellency as well as cause to develop water repellency over a wide range of soil water content. The trapezoidal area below the water repellency curve was expressed as a form of sigmoid growth curve where the first derivative of the sigmoid curve gives the water content dependant water repellency. The proposed sigmoid curve function showed a good fit with observed data, however derived water repellency curve slightly underestimate the actual water content dependant water repellency for soils containing high soil organic carbon content. This suggest that the water repellency of a soil can be expressed using the single variable of soil organic carbon, irrespective of other soil physical and chemical properties.