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Soil surface roughness and porosity under different tillage systems

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Both soil porosity and surface elevation can be altered by tillage operation. Even though the surface porosity is an important parameter of a tilled field, however, no practical technique for rapid and non-contact measurement of surface porosity has been developed yet. On the contrary, the surface elevation of tilled soil can be quickly determined with a laser profiler.

Working under the assumption that the surface elevation of a tilled field is a complicated superposition of the soil terrain profile at a larger-scale and the roughness at a fine-scale, this study included three aspects: (i) to establish an index (Roughness Index, RI) at a fine-scale to associate the surface roughness with porosity; (ii) to examine the correlation between surface porosity and the proposed RI by three types of tillage treatment in the field; and (iii) to check the scaling/multiscaling behavior among different grid sizes of calculating RI on predicting surface porosity. Consequently, the statistical results from each tilled plot show a strong correlation between the surface porosity and the defined RI in an early stage (ca. 2 days) after tillage.

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