



DEM resolution effects on multifractal spectra of soil surface microrelief

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Many surface processes, i.e. infiltration, depressional storage, gas exchange, are affected by soil surface microrelief. Conversely, many surface processes, i.e. erosion, deposition also cause changes in soil surface roughness. Therefore, quantification of surface roughness can enhance the understanding of these physical processes. Recent research has shown the usefulness of multifractal analysis in soil surface roughness characterization. Here we analyze, first, to what extent the multifractal spectra of soil surface microrelief are affected by resolution of devices used to measure it and, second the influence of the algorithm used for multifractal analysis.

Low resolution data sets were acquired by pinmeter: sample spacing was 25 mm and each DEM consisted of 3500 data. High resolution data sets were measured with laser scanning: sample spacing was 2 mm and there were 52500 data points per DEM. Singularity spectra and Rényi dimensions of a number of point elevation data sets were obtained based on both a box counting and a gliding box algorithm. Results were analyzed in terms of resolution independence and parameters of the multifractal spectra were compared with traditional surface roughness descriptors.