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Statistical description of a structured clay soil using dye infiltration experiments

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The spatial variability of preferential pathways in a field soil with native grasses and after a sorghum crop, as visualized through dye infiltration experiments, was studied by applying configuration entropy and correlation functions. After dye infiltration into a 3m x 3m plots located on a soil classified as fine, mixed, superactive, thermic Chromic Haplusterts, near to Collage Station, TX; 2m x 2m horizontal planes in the subsoil were exposed at 25, 45 and 75 cm , and dye stained patterns were photographed. Each of the digitized high-resolution dye images obtained were analyzed calculating the maximum configuration entropy (H(L)) and the characteristic length (L). A correlation function (C(r)) was defined between horizons to study its behavior in an up-scaling process, where r is the box size in which the horizontal section is subdivided, ranging from the minimum L of both sections up to 2m, the width of the plot.

The results indicate that H(L) and L are two useful descriptors that give an optimal scale of discrimination in the spatial arrangement of the dye tracer at each horizontal section. The function C(r) versus r reveal how correlation will change with the scale observed. All the results are discussed as how it could be useful for statistically describing preferential flow path geometry and crop's influence on it.