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Multiresolution Analysis of Soil Physical Properties in a Long-Term tillage experiment

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Soil management induces changes in soil physical and chemical properties. However, soil variation observed in tillage experiments is not only a consequence of tillage, but also of underlying natural variation. To illustrate this, a multiresolution analysis of soil apparent electrical conductivity (EC_a), gravimetric moisture content and clay percentage has been carried out along a transect, in a long-term tillage experiment where four randomly distributed replicates of Conventional Tillage, Minimum Tillage and Direct Drilling are being evaluated. Although point-to-point comparisons showed low correlation coefficients, similar spatial patterns where observed for the different variables. Therefore a multiresolution analysis scheme to discern short and long scale variability was used. In this work, wavelets are used to analyze low-cost signals such as EC_a. The corresponding spatial scale decomposition is then used to estimate different scale patterns of other soil variables, say, moisture or texture, based on the high correlation between them when decomposed and reconstructed at certain levels. Multiresolution decomposition elucidates relationships between soil variables at high and low spatial resolutions, in a time-free framework, hence helping to evaluate the real effect of long-term management on water storage in soil.