ENTROPY-BASED PARAMETRIZATION OF SOIL TEXTURE, FRACTAL MODELS AND TOOLS

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Particle-size distribution (PSD) is a fundamental soil physical property. The PSD is commonly reported in terms of the mass percentages of sand, silt and clay present. A method for generating the entire PSD from this limited description would be extremely useful for modeling purposes.
In Martin & Taguas, 1998 a mass-size distribution μ is proposed as a model for PSD in the basis of the simple knowledge of the clay, silt and sand contents together with hypothesis on the scale invariance of PSD. Classification of soil texture is usually carried out by considering different textural classes which group together soils with mass percentages of clay, silt and sand within certain ranges. Soil samples of diverse composition, however, become indistinguishable from each other under the grouping that these classes establish. A parametrization of soil texture based on the entropy dimension is proposed. Following Martin & Taguas (1998), a fractal modelling allows us to compute the entropy dimension of the modelled particle-size distribution (PSD) from readily available textural data. The fractal model is applied to compute the value of the entropy dimension for a large number of soils from SCS. Soil textural classes can be characterized by the average value of the entropy dimension of soils belonging to each textural class. Soils with entropy dimensions between prescribed limits are located within a well determined region of the textural triangle. Thus, entropy dimension, via the fractal model, provides a continuous parameterwhich is suitable for a fine quantitative characterization of soil textures using conventional textural data. The model plus theoretical results from fractal geometry show that, in a self-similar PSD, the entropy dimension is given by the simple formula.

Key words: Fractals, entropy, particle soil distribution