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Difficulties in the evaluation and measuring of soil water infiltration

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Soil water infiltration is the most important hydrological parameter for the evaluation and diagnosis of the soil water balance and soil moisture regime. Those balances and regimes are the main regulating factors of the on site water supply to plants and other soil organisms and of other important processes like runoff, surface and mass erosion, drainage, etc, affecting sedimentation, flooding, soil and water pollution, water supply for different purposes (population, agriculture, industries, hydroelectricity), etc. Therefore the evaluation and measurement of water infiltration rates has become indispensable for the evaluation and modeling of the previously mentioned processes. Infiltration is one of the most difficult hydrological parameters to evaluate or measure accurately. Although the theoretical aspects of the process of soil water infiltration are well known since the middle of the past century, when several methods and models were already proposed for the evaluation of infiltration, still nowadays such evaluation is not frequently enough accurate for the purposes being used. This is partially due to deficiencies in the methodology being used for measuring infiltration, including some newly proposed methods and equipments, and in the use of non appropriate empirical models and approaches. In this contribution we present an analysis and discussion about the main difficulties found in the evaluation and measurement of soil water infiltration rates, and the more commonly committed errors, based on the past experiences of the author in the evaluation of soil water infiltration in many different soils and land conditions, and in their use for deducing soil water balances under variable and changing climates. It is concluded that there are not models or methods universally applicable to any soil and land condition, and that in many cases the results are significantly influenced by the way we use a particular method or instrument, and by the alterations in the soil conditions by the land management, but also due to the manipulation of the soil before and during the measurement. Direct “in situ” field evaluations have to be preferred in any case to indirect deductions from other soil characteristics measured under laboratory conditions in the same soils, or in other soils, through the so called “pedo-transfer” functions, or through the use of stochastic models such as the SCS Curve Number Method, or of other models using empirical or physical approaches, which have demonstrated to be of limited value in most of the cases.

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