



## **The procedure of calibration of SWAP model in the complexity of vertical soil variability in six Italian cases study.**

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Models need to be calibrated and validated. The calibration/validation procedure is an attempt to find the best accordance between estimated and observed data by variation of some selected parameters. The role of calibration is very important because the models structure does not account each real system detail. This will give values for the parameters slightly different from the real, but the difference may partly account for the influence from the omitted details.

In Soil-Vegetation-Atmosphere models it is crucial the vertical variability expressed through pedological horizons. The horizon is a portion of soil where physical and chemical characteristics are considered reasonably homogeneous. Classically, these models are calibrated retrieving the best agreement between the estimated and collected water content data at different depths, for any predictive application.

The aim of this work is to explore all the problems concerning soil heterogeneity, both in the soil water content and hydraulic properties, during the calibration/validation procedures of the well known SWAP model.

The work is based on the calibration/validation of the SWAP model in six sites located in north and south Italy (Lodi, Mantova, Bergamo, Scafati, Eboli (2)) and cultivated with corn and vegetables where a 2-year data set of variables were available (i.e. water

content at different depths measured by TDR, micrometeorological data, water table depth, LAI, yield, etc. . . ). The hydraulic properties of soils have been measured in the laboratory by the variable head permeameter, evaporation method and pressure plate apparatus.

The study showed: (i) the importance of the pedological description of soil (including the type of boundary between different horizons) aiming to a proper calibration/validation procedures, (ii) the crucial choice of the depths of soil water content to be considered in the calibration phase, (iii) evaluation of making simpler the reality of model (iv) how to reduce the need for adjusting soil hydraulic parameters during the calibration phase and (v) the use of PCA analysis as first screening to analyze the water content measured at different depths in order to determinate the position of different soil horizons in soil profile.

**Keywords:** Calibration, SWAP, vertical heterogeneity