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Impact of infiltration process modelling on soil water content simulations for irrigation management

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The uncertainty in a hydrological model, due to its structure or implemented inputs, affects the accuracy of simulations that are usually used for important applications such as drought predictions, flood risk assessment, irrigation scheduling, groundwater recharge, and contamination. Several models describing soil infiltration processes have been developed. Some are analytical, while others implement numerical solutions of the Richards equation. The objective of this work is to assess the effect of the selection of the infiltration equation on soil water content simulations. For this study, different infiltration models were included within FEST-WB distributed hydrological model (SCS-CN, Green, and Ampt, Philip and Ross solution (2003)). Performances of implemented infiltration models in simulating soil water content were assessed against observations acquired in the experimental site located in a maize field in northern Italy. Soil water content was monitored together with continuous measurements of meteorological data.
A sensitivity analysis was performed in order to assess the most important parameters governing infiltration process in the different models tested. A comparison of soil water content simulations show that Ross solution allowed the description of soil moisture variation along the vertical, but simpler lumped models provide sufficient accuracy when properly calibrated.
Keywords: infiltration, Green and Ampt, Philip equation, Richards equation, soil moisture