

## Generalized Explicit Models for Estimation of Wetting Front Length and Potential Recharge

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**Abstract** Determination of length of advancement of wetting front is prerequisite for estimation of potential recharge. The advancement of wetting front is a time varying function governs by depth of ponding and suction head. Use of the Green-Ampt (GA) model for determining time varying length of wetting front involves a trial and error iterative method and hence, a tedious procedure. Replacing the logarithmic term of the GA model by sequential segmental second order polynomial, generalized algebraic equation based models for estimating time varying length of advancement of wetting front and potential recharge rates have been developed. Unlike following a trial and error method as involve in the GA model, the proposed model provides an explicit equation with no restriction to infiltration time period and depth of ponding. The universal values of the models coefficients for different ranges of  $L_f / (H + \psi_f)$  [ $L_f$  = length of advance of wetting front,  $H$  = depth of ponding, and  $\psi_f$  = suction head at the wetting front] have been determined with the help of the GA model by numerical experiments. Validity of the model has also been tested with the published laboratory experimental data. Analyzed results showed, the proposed models have similar responses as that of the GA model within a maximum relative error of 0.5 % for length of wetting front and 1.2 % for potential recharge estimate, and the corresponding percent bias has been found 0.20 % and 0.12 %, respectively. The proposed models can