

Dear Authors,

Based on the last referees' appraisals on your revised manuscript and before its final acceptance, I believe that some clarifications are still required with specific reference to the equation you used to model the infiltration excess mechanism. I refer to Lines 13-14 at Page 4 where you state that "The model simulates infiltration excess surface runoff based on the Green-Ampt formula (Heber Green and Ampt, 1911).", and consequently to your Eq.(S1). In the supplement document you state that this equation (S1) "... is inspired by the Green-Ampt formula (Heber Green and Ampt, 1911)".

I refer to the classic Green-Ampt (GA) infiltration equation [for a uniform soil profile and assuming that matric pressure head at the soil surface is near zero (i.e. no ponding, but full saturation)] that can be written as follows:

$$q_0(t) = \left[1 + \frac{\Delta\theta \cdot |h_f|}{I(t)} \right]$$

where q_0 is infiltration rate [flux density of water across the soil surface ($z=0$)], $\Delta\theta=(\theta_{sat} - \theta_{in})$ is soil-water content deficit, with θ_{in} the initial soil-water content in the uniform soil profile (soil moisture, for short), and $I(t)$ is cumulative infiltration.

If one compares the classic GA equation with your Eq.(S1), one may note the following:

- a) Eq.(S1) sets a soil-water content deficit as $(\theta_{sat} - \theta)$, with θ the actual soil-water content during your simulations (if I am right), whereas the GA equation employs the term $(\theta_{sat} - \theta_{in})$, with θ_{in} the initial soil-water content in the uniform soil profile (soil moisture, for short). At Page 6, Eq.(1), you state that θ is soil moisture at time step t . Is this soil moisture meaning the same in both equations (1) and (S1)?
- b) In the brackets of the right-hand side of the classic GA equation, there appears the matric suction head at the wetting front (h_f). This term is very important for modeling an infiltration event, but it does not even appear in your Eq.(S1). One may wonder what are the implications of this choice especially in terms of deviations from the classic GA equation? Actually, it might be also interesting to ascertain the implications of this choice with respect to an infiltration process simulated by the Richards equation.
- c) Moreover, in the brackets of the right-hand side of the classic GA equation, at the denominator of the soil-water content deficit, there appears the cumulative infiltration [$I(t)$]. In your Eq.(S1) there is only the saturated soil-water content. A clear explanation of this choice is required to the benefit of wider readership.
- d) Using Bouwer's approximation ($K_{eff} \approx 0.5 K_{sat}$) might not be appropriate in the case of your Eq.(S1) since this equation differs (quite a lot, I guess) from the classic GA equation. Please, give adequate justifications for your choice.

Finally, additional and more in-depth information is required about the exponent λ . You state that it is a calibration parameter. Information is required about what soil properties mainly affect this parameter and how you have calibrated it in the present study.