

**Table 1** Model parameters involved in the simulation.

Parameters	Symbol	Unit	Value
Hydraulic conductivity	$K$	m/d	2.99
<u>Effective porosity</u>	$n_e$	-	<u>0.35</u>
<u>Specific storage</u>	$S_0$	1/m	<u>0.000075</u>
<u>Maximum saturation</u>	$S_s$	-	<u>0.94</u>
Residual saturation	$S_r$	-	0.146
Retention curve fitting parameter	$\alpha$	1/m	7.5
Aperture Distribution Index	$n$	-	1.95

\*this table is originated from Liu et al. (2019). Underlined parameters are re-calibrated in this study due to the improvements of the model.

**Table 2** Influences of  $A$ ,  $T$ ,  $r$  and  $t_p$  on HE characteristic variables.

	$\int h$	$v_1$	$v_2$	$q^+_{\max}$		$ q^- _{\max}$		$Q_{\max}$		$RT$	$t_R/t_F$
				Value	Occur. time	Value	Occur. time	Value	Occur. time		
$A(\nearrow)$	$\nearrow$	$\nearrow$	$\nearrow$	$\nearrow$	0	$\nearrow$	0	$\nearrow$	0	$\nearrow$	$\nearrow$
$T(\nearrow)$	$\nearrow$	$\searrow$	$\searrow$	$\searrow$	+	$\searrow$	+	$\nearrow$	+	$\nearrow$	$\searrow$
$r(\nearrow)$	$\searrow$	$\nearrow$	$\searrow$	$\nearrow$	+	$\searrow$	-	$\searrow$	-	$\searrow$	$\nearrow$
$t_p(\nearrow)$	$\nearrow$	$\searrow$	$\nearrow$	$\searrow$	+	$\nearrow$	+	$\nearrow$	+	$\nearrow$	$\searrow$

\* $\int h$  denotes the integral of the flood wave over time;  $v_1$  and  $v_2$  denote the change rate of water level at the time just before the wave peak and initial water level;  $q^+_{\max}$  and  $|q^-|_{\max}$  denote the maximum flux in positive and negative directions;  $Q_{\max}$  denotes the maximum aquifer storage;  $RT$  denotes the residence time;  $t_R/t_F$  denotes the return time/infiltration time ratio; “ $\nearrow$ ” and “ $\searrow$ ” denote an increase and a decrease; and “+”, “-” and “0” denote a postponed, earlier, and unchanged occurrence time.

**Table 3** Influence of  $T/A$  and  $N$  on HE characteristic variables under CUFV condition.

			$q^+_{\max}$		$ q^- _{\max}$		$Q_{\max}$		$RT$	$t_R/t_F$
	$v_1$	$v_2$	Value	Occur. time	Value	Occur. time	Value	Occur. time		
$T/A (\nearrow)$	$\searrow$	$\searrow$	$\searrow$	+	$\searrow$	+	$\searrow$	+	$\nearrow$	$\searrow$
$N (\nearrow)$	$\nearrow$	$\nearrow$	$\nearrow$	-	$\nearrow$	+	$\searrow$	+	$\searrow$	$\searrow$

\*Symbolic meanings are the same as Table 2