

## ***Interactive comment on “A Unique Vadose Zone Model for Shallow Aquifers: the Hetao Irrigation District, China” by Zhongyi Liu et al.***

**Anonymous Referee #3**

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**Summary** This manuscript describes the development of a new model that simulates soil water dynamics under shallow groundwater conditions. The model results are substantiated using field measurements. The modelling approach presented in this manuscript is good and could potentially be useful for water management purposes given its simplicity. The manuscript is well-written in general. The topic fits well within the scope of the journal. However, there are some issues that need attention before this manuscript can be considered for publication.

**Major comments - L78-100:** The introduction discusses about Darcy based and simplified models for soil moisture simulations. In which class does the model developed in this manuscript belong? Assuming the latter (simplified), why is this class chosen for this work? “The disadvantage is that each landscape type has a different set of re-

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gionalized landscape parameters (L88-89)” is not very clear and explicit. Please make the motivation of choosing the specific modelling approach clearer for the broad readership of the journal. - L108-113: The modelling approach in the manuscript assumes that lateral groundwater flow is negligible (i.e., groundwater dynamics is based on water input at the land surface and ET). This is a very strong assumption and should be discussed clearly in the manuscript. This is especially important because the authors mentioned “This is curious and could be due to water originating from irrigation in a nearby field (L331-332)”, which gives an impression that lateral flow affects hydrology over the study area. Despite that, only vertical movement of water is considered in this study. - How is evaporation calculated? Please make that clear in Section 2. Under section 2.3.2, maximum and potential evaporation are mentioned. How are they calculated/represented? Without this information, the results presented in the manuscript are not reproducible. - The conclusion section of the manuscript is very weak. It is basically an incomplete summary of the work and fails to present the necessary elements that a conclusion section requires (e.g., usefulness and limitations). “This model is simplified, so it can be used for management purposes” is vague and does not add value.

**Minor comments -** I would suggest replacing physical-based with either physics-based or physically-based. - Please use “groundwater” consistently throughout the manuscript. Currently, both groundwater and ground water have been used. - L74-77: This paragraph (just one sentence!) does not fit with the previous or next one. Please re-structure and merge. - L264: “the groundwater will be recharged and increase in depth”. Generally, recharge decreases the depth to groundwater table from the surface.

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