

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
<https://doi.org/10.5194/hess-2022-47-RC1>, 2022
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Comment on hess-2022-47

Anonymous Referee #1

Referee comment on "Spatiotemporal dynamics and interrelationship between soil moisture and groundwater over the Critical Zone Observatory in the Central Ganga plain, North India" by Saroj Kumar Dash and Rajiv Sinha, Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-47-RC1>, 2022

Review of "Spatiotemporal dynamics and interrelationship between soil moisture and groundwater over the Critical Zone Observatory in the Central Ganga plain, North India" by Dash et al.

In this study, different methods (empirical orthogonal function, random combination and temporal stability method approach) are applied to soil moisture and depth of 10 water tables of Critical Zone Observatory in Ganga Basin to understand their spatio-temporal variability and optimal sampling strategies. The topography and clay content of the soils are considered the most important factors determining the spatial pattern of the two quantities.

Unfortunately, I see the following fundamental problems with the study:

This a regional study that uses only existing methods, both in terms of measurement and methodology, so the results have no fundamental scientific added value outside the study area. Therefore, this work does not fit in this journal. Alternatively, there are many journals where regional studies like this can be published.

The temporal resolution of the data is rather poor. This is outdated nowadays, when sensors and data loggers can be acquired and operated for relatively little money.

The evaluation of groundwater levels with statistical methods is problematic because groundwater level measurements are usually not independent of each other, since they observe the same groundwater body. Unless the measurements took place in clearly delimited aquifers, but this was not explained in the text.

The statement that topography and the clay content of the soils are considered the most important factors determining the spatial pattern is not tenable, as the study area consists of irrigated agricultural fields. Therefore, the spatial pattern will strongly depend on the amount of water applied locally and the crops. Without taking this into account, the general statements cannot be made.

Finally, strategies for efficient irrigation water management are proposed that not based on the statistical analyses in this paper.