

## Reviewer's report

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Title: Using Long Short-Term Memory networks to connect water table depth anomalies to precipitation anomalies over Europe

Authors: Yueling Ma, Carsten Montzka, Bagher Bayat, and Stefan Kollet

### **Recommendation: Major Revisions**

In this manuscript, the authors tried to connect the water table depth anomalies to precipitation anomalies over Europe using Long Short-Term Memory networks based on the daily terrestrial simulations of the Terrestrial Systems Modeling Platform (TSMP) over Europe. The proposed method has the ability to reproduce the TSMP-G2A  $wtd_a$  maps. The authors also hypothesize that the proposed networks could simulate the high-frequency components of  $wtd_a$ . This manuscript is clear in construction and easy to follow. However, there are several concerns which need to be well addressed before the paper could be accepted.

### **Major Concerns:**

1. What are the advantages of LSTM networks over TSMP, since TSMP could generate daily  $wtd_a$  time series. The authors need to give more justifications on LSTM networks.
2. The LSTM networks were trained based on the simulated outputs rather on the observed results. In my opinion, the authors should train the networks using observed data and compared the simulated results with other numerical models to demonstrate the capability of the proposed method.
3. The authors hypothesize that the proposed networks could simulate the high-frequency components of  $wtd_a$  by comparing the results from cross-wavelet transform analysis made on the outputs from both LSTM and TSMP. I am confused why the authors use cross-wavelet transform analysis to evaluate the performance, I don't think the XWT is a good method for evaluation. The authors could provide more explanations. Meanwhile, the main concern may be the ability to simulate low frequency variations of  $wtd$  caused by extreme events such as long-term drought.

**Minor coments:**

1. Line 113-114: no confined aquifer?
2. For Figure 5, the authors may provide a anomaly map between  $wtd_a$  from TSMP-G2A and LSTM as it is really hard to see the difference.
3. The legend of Figure 6 should be put at right position.