

***Interactive comment on* “Space-time variability of soil moisture droughts in the Himalayan region” by Santosh Nepal et al.**

Anonymous Referee #3

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The paper aim is an estimation of spatial and temporal variability of a soil moisture deficit index (MDSI) in the transboundary Koshi River basin, located partly in China, India and Nepal. The aim is achieved by applying the process based J2000 hydrological model. The authors follow a standard procedure of calibrating and validating the model using the available observations of precipitation, temperature and flow data at three sub-regions, trans-Himalaya, plains and the mountains. In addition, model estimates of evapotranspiration was validated using the available PET measurements from three meteorological stations located at each region considered.

General comments

The novelty of the paper consists in an application of J2000 model to simulate soil moisture in the basin. The approach is standard and the comparison with observations

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is limited to temporal scale, whilst spatial scale is widely discussed. The paper is written reasonably well. The material is interesting to a wide scientific community. The division of the basin into three characteristic sub-regions was very useful and made the discussion of the results more clear. The authors identified 18,557 HRUs within the Koshi River basin. As each HRU requires a number of specific parameters to be identified, there is no surprise, that the model can reproduce well the discharge. Still it is not sure if the identified HRU's give physically sound performance. The authors are asked to give an information on the number of parameters that needed to be set in the model and a number of parameters that were calibrated. A discussion on data quality and uncertainty of the model results should be provided. The discussion also should be extended by a presentation of spatial variability of the resulting soil moisture deficit patterns and their comparison with the SPI and, additionally, SPEI indices for different sub-regions and specific time periods.

Specific comments

Line 301-302: sentence starting with Due to lack of consistency ... is not necessary here (message repeated further down)

Line 352 should be: Supplementary Figure 1

Line 437: Figure number is missing

Figs 8-10 are not easy to read. It is a pity, as a comparison of those figures gives the answer to the research questions.

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