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Hydrology and Earth System Sciences Discussions

Interactive comment on "Temporal variation of soil moisture over the Wuding River Basin assessed with an eco-hydrological model, in-situ observations and remote sensing" *by* S. Liu et al.

Anonymous Referee #1

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The authors used a vegetation interface processes model and observed long-term climate data to investigate temporal variation especially trend of the soil moisture over Wuding River basin. Understanding long-term change of soil moisture in this basin, a strategically selected basin in a transition zone from farmland and grassland to desert in the China Loess Plateau, is very important, as it may provide early warning on land desertification. The paper would be of interest to the HESSD readership and is suitable for publication in the journal. I have some comments below, but most of them are related to presentation.

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Interactive Discussion

Discussion Paper

1) There might be a room to improve readability as the manuscript does not flow very well. The abstract and the introduction read a bit bumpy.

2) I am concerned about how the trend analysis is conducted. You indicated that there was strong low frequency variability (persistence) in the data. This is an indication of auto-correlation that needs to be addressed in the trend analysis. The trend detection mention you used requires the data being i.i.d. While this method is widely accepted in both hydrology and climate community, if it is applied on auto-correlated data, the trend detection results are not very reliable (e.g. you'd detect more trend than the nominal level if there is no trend in the series). This is because an auto-correlation in the series would make the effective independent sample size much smaller than the actual sample size, leading to a too small critical value. There are different ways to deal with this issue but pre-whitening the time series is perhaps the easiest to do.

3) I am not a hydrologist and am not sure how the VIP model works. I was under an impression that the VIP model uses physical based parameters and thus does NOT need to use runoff data for parameter estimation. However, you indicated that hydrological data were used to validate model (section 3.2.2) but did not clearly show how well the model output compare with runoff later. This needs to be clarified.

4) Section 5.2 Man-made or nature-made north drying. For climatologist, man made change includes a) local changes such as land use, b) large-scale changes that caused by anthropogenic forcing such as global warming. There are also two types of nature-made changes that include a) natural internal variation of the climate system and b) natural forcing external to earth climate system such as changes in solar output. The man-made change you discussed seems to mean regional-local land use change etc. if I understood correctly. We don't know what are the exact causes of the precipitation decrease and temperature increase in the region under study, though there are convincing evidences that temperature increase in China can be attributed to greenhouse gases related warming. It would be useful to spell out what do you mean by man-made and nature-made changes.

HESSD

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Interactive Comment

There is another point you need to be careful. You argued that the soil moisture change you obtained from running model does NOT include changes in land use etc. This in itself is a good thing that you know soil moisture change as simulated by your model is due to changes in climate. Land use change (which is not reflected in the simulation) would have had an important contribution to soil moisture change in the real world, but this contribution is very hard to access as the observation or remotely sensed data are both too short for trend analysis. So it is not clear how representative is the simulated soil moisture change to that in the real world. I am not sure how to address this question. It would be useful to point this out and offer some discussion.

6) In the discussion session (and else where earlier on) you mentioned lower variability in soil moisture, do you have any explanation on this?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 3557, 2008.