Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC3
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Comment on hess-2021-531

Anonymous Referee #3

Referee comment on "The relative importance of antecedent soil moisture and precipitation in flood generation in the middle and lower Yangtze River basin" by Qihua Ran et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-531-RC3, 2022

I enjoyed reading this manuscript and believe the results presented here are very convincing – showing the dependence between soil moisture, rainfall, catchment area and flood magnitude. Although previous studies have attempted in parts to show this interplay (e.g. looking at trends), I feel this manuscript probably shows the most convincing and comprehensive results to date.

Some general comments:

Line 178-187: I must admit I am having a bit of trouble with the S'/P' ratio. Maybe the wording could be changed a little bit; in line 181 it isn't the contribution of rainfall but really just the relative magnitude; in Line 186 it is not that one is more dominant than the other, it is just a relative measure. The demarcation on "1" is arbitrary and not helpful.

I am not convinced by Section 4.3 or Lines 411-423 for the flood warning because any SPR (low or high) could cause a flood because it is just a relative measure and has no measure of magnitude. You could have low rainfall and low soil moisture and get the same SPR as a high rainfall and high soil moisture. I don't think this can be used for forecasting.

Also, I would concur with the other reviewer on the colour choice

Line by line comments:

Line 42: “frequency and intensity”?

Line 43: And hence understanding the drivers of change becomes more and more important

Villarini, G., Wasko, C., 2021. Humans, climate and streamflow. Nat. Clim. Chang. 11, 725–726. https://doi.org/10.1038/s41558-021-01137-z

Line 61: remove “except Yang et al 2019” because in the next paragraph you demonstrate there are more studies than just this one.

Line 76: I think there is an opportunity here to state what has been performed in terms of understanding the balance between soil moisture and rainfall as flood drivers (e.g. dependence on magnitude, catchment size, region etc). I appreciate these papers are quite recent and may not have come to the authors attention when writing their manuscript. Examples include:

Brunner, M.I., Swain, D.L., Wood, R.R. et al. An extremeness threshold determines the regional response of floods to changes in rainfall extremes. Commun Earth Environ 2, 173 (2021). https://doi.org/10.1038/s43247-021-00248-x

Wasko, C., Nathan, R., Stein, L., O’Shea, D., 2021. Evidence of shorter more extreme rainfalls and increased flood variability under climate change. J. Hydrol. 603, 126994. https://doi.org/10.1016/j.jhydrol.2021.126994

Bennett, B., Leonard, M., Deng, Y., Westra, S., 2018. An empirical investigation into the effect of antecedent precipitation on flood volume. J. Hydrol. 567, 435–445. https://doi.org/10.1016/j.jhydrol.2018.10.025

Bertola, M., Viglione, A., Vorogushyn, S., Lun, D., Merz, B., Blöschl, G., 2021. Do small and large floods have the same drivers of change? A regional attribution analysis in Europe. Hydrol. Earth Syst. Sci. 25, 1347–1364. https://doi.org/10.5194/hess-25-1347-2021

Line 93: “The Yangtze River”

Line 106: The ‘s’ is a typo.

Section 2: I am not sure Figure 1 was referenced anywhere? The caption says: “climate stations and hydrological”, the legend “hydrological and precipitation stations” and the text in Section 2.2 “meteorological and streamflow”. As a result, I am not actually sure what stations have what data.

Figure 3 caption: Rather than saying “the green ones” you could say “the green circles” or “the green dots”

Line 231: “Dominant driver” – again, this is subjective and I would remove this sentence altogether.

Figure 4 y-axis: please label with normalized precipitation like you did in Figure 3.

Figure 5: What are the slope units? The size of the dots needs a scale too. Figure 5 needs more explanation in the text to justify its place in the paper.

Line 275: Remove “the influential factors of”

Figure 6: Units of drainage area?

Line 286: What is the practical implication of the TWI? Is it just dominated by the area? Not sure about the value or physical interpretation of Figure 6c. Okay – this comes in the discussion – but I think more should be mentioned in the results to point to this.

Figure 7: Again, more discussion is needed in the text, the authors may consider a log scale for the y-axis.

Line 375: Remove “for sure”

Line 377: “be used”