Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2021-240

Anonymous Referee #2

Referee comment on "Vegetation greening weakened the capacity of water supply to China's South-to-North Water Diversion Project" by Jiehao Zhang et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-240-RC2, 2021

Zhang et al (2021) coupled the CCW and WaSSI models to study how vegetation greening impacted water yield of the Upper Han River Basin (UHRB). They first simulate water yield change from 2001-2018 to evaluate the model. Afterwards, they run two simulations to isolate the effect of vegetation on water yield and the effect on future potential water yield. Zhang et al (2021) show that vegetation greening significantly reduced water yield. The water yield reduction was stronger during warm or dry years. Furthermore, they show that greening could increase the number of droughts. They discuss their results in relation to the important role of the UHRB to provide water to other regions through a diversion project.

The study has an easy to understand set-up and addresses a relevant subject. The manuscript is clearly written. I listed some (major and minors) comments and suggestions below, both on the content and text.

- The authors show that vegetation greening significantly reduced water yield and streamflow during the last decades. The authors discuss the implications for the SNWDP and other Water Diversion Projects and state that (future) vegetation greening could potentially reduce the annual water yield supply by 7.3 km^3. A few processes are missing in the manuscript that impact streamflow under changing vegetation. These processes could reduce the 'negative' effects of vegetation greening on water yield. First, the extra evaporated water will partly recycle back to the Earth's surface and increase precipitation (P) (potentially within the UHRB catchment). This could have impacted your P during the studied years (therefore, the S2 and S3 scenarios are not entirely independent of vegetation status), and likely has an impact on future water yield. The study cannot separate this effect on increased P, but they could at least be

included in the discussion of the manuscript. Second, the rising CO^2 concentrations are expected to increase the water use efficiency of vegetation, and this could reduce the 'negative' effects of future afforestation.

- L31: For example … hydrological services: this sentence should be rewritten
- L57: Consume instead of consume**s**
- L61: are instead of is
- Please adjust figure 1a (inset) to meet the HESS guidelines (remove the dashed line south of China to depoliticise the manuscript)
- L136: please specify that is the light use efficiency.
- L140: how are the values of the 'environmental scalars' determined? Are they independent of the vegetation data? And how is APAR determined? Is APAR also fixed under de S2 and S3 scenario?
- L161: the streamflow records of **the** reservoir (/ the Danjiangkou Reservoir)
- L173: dynamic greening effects instead of dynamic**s** greening effects
- L179: The Mann-Kendall test is used for trend and change point detection. Could the authors elaborate on the change points you found? Why did they decided to use change-point detection analyses instead of trend analyses only? What extra information do these change-points add to the discussion or results of the manuscript?
- Fig 4a+b legend: km^3 per year / mm per year.
- Fig 4a: the simulated WY seems to show a higher decreasing trend than the measured WY. Was there a negative trend in the measured WY?
  She et al, 2017 (fig 2a) (https://doi.org/10.1002/2016JD025702) fitted an increasing trend through WY at the Danjiangkou Reservoir between 2000 and 2010 (same data). How does this compare to your results?

- L237: why did WY increase due to vegetation greening in high elevation areas? Could it also be a climate-related effect in these high-elevation regions?
- Line 239-240: Did you mean to refer to fig. 5c instead of 5b?
- 8: How is the relative change calculated? Relative to the year 2010, or the S2 scenario? Why is the sign of the absolute WY change opposite of that of the relative WY change. What does this say about the effects of greening versus climate?
- L261: 2001-2018 instead of 2001~2018
- L307: 'Unlike the Loess Plateau … but climate did' seems to contradict with your results. How should this sentence be interpreted?