Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-629-AC2, 2019

Hydrology and Earth System Sciences
Discussions
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Interactive comment on "The influence of wind and land evapotranspiration on the variability of moisture sources and precipitation of the Yangtze River Valley" *by* Astrid Fremme and Harald Sodemann

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Received and published: 1 April 2019

We would like to thank the referee for their helpful comments and suggestions, which we have implement as detailed below.

(1) The authors divided the Section 3 into eight subdivisions, which makes the key points in the results not highlighted. The readers may what is the focus of this study when reading through these eight subdivisions. I suggest the authors to highlight the key points in Section 3, where the number of sub-divisions in Section 3 may be needed.

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For instance, if the focuses of this study are the continental recycling the interannual variability, the main body of Section 3 should be associated with these two issues. The subsection 3.1 "precipitation seasonality" is a background knowledge, which could be combined with the subsection 3.2 "moisture sources of YRV precipitation". In addition, the title of this paper is "the influence of wind and land evapotranspiration. . .". However, only section 3.6 and 3.7 gave a discussion on the influence of wind, while the other six subdivisions in Section 3 did not mention wind at all. It makes the reader wonder whether the wind speed is a key factor in this study.

- As suggested by the reviewer, the title of the manuscript has been changed to "The role of land and ocean evaporation on the variability of precipitation in the Yangtze River Valley" to better reflect the overall contents. The sections of the manuscript have been rearranged, with two revised section titles (3. Data and method validation, and 5. Discussion). This limits the number of subsections in the Results section, and provides an overall more logical structure. In addition, some of the subsections have been given new titles to better reflect what we want to convey through each of them. The subsections under Results are now: 4.1 Climatological mean moisture sources of YRV precipitation, 4.2 Mean seasonal cycle of YRV moisture sources, 4.3 Continental recycling and regional evaporation recycling in the YRV, 4.4 Second-order moisture sources of recycled precipitation, 4.5 Factors governing local recycling, and 4.6 Interannual variability of local recycling and distant contribution in summer. The total number of subsections has been kept the same, as we think they provide the best way to make our findings accessible to the readers.

(2) In section 3.7, the authors concluded that the Indian Ocean play an important role for the interannual variability of YRV moisture sources and precipitation, and the South China Sea and Western Pacific contribute less to the interannual variability. According to Fig. 10, the moisture contribution changes from 3.1 to 5.1x10$^{11} kgday^{-1}$ between dry and wet summers for South China Sea. This change is just slightly smaller than the change of moisture contrition for the Arabian Sea, which suggests that the South China

Sea is also an important moisture source for the interannual variability. In addition, in Fig. 10, the pattern of South China Sea is distinct from the pattern of Western Pacific. It is not reasonable to put the two source regions into the same category.

- This is an interesting observation. The role of the South China Sea variability, which is slightly lower than for each of the Indian Ocean sources is now included in former section 3.7. Page 12, line 12-13:" The South China Sea is next (3.2 to 5.2 $\times 10^{11} kg day^{-1}$). The Indian Ocean sources therefore seem to play the largest role for the interannual variability of YRV moisture sources and precipitation, with the South China Sea following slightly behind."

(3) I tried to understand Fig. 8 and the discussion on Fig. 8, but it seems difficult to understand the information in Fig. 8b and 8c. I suggest to clarify what is "the fraction of continental recycling to a larger section of Asia" (Fig. 8b).

- A clarification of "the fraction of continental recycling" has been added. A new paragraph in the method section (Page 4, Lines 20-29) now reads: "The WaterSip diagnostic tool is also used to obtain the so-called second-order moisture sources. This measure gives us more information on the number of times moisture goes through precipitation and re-evaporation over land before reaching the target region. Obtaining the second-order moisture sources is a three step process in addition to obtaining the YRV moisture sources. Firstly, the moisture sources to a larger region of Asia are calculated, and the land fraction to the Asian region is obtained. This land contribution fraction is found by analyzing each trajectory separately. Knowing the moisture sources and relative contribution to each precipitation event, the land fraction is calculated. Secondly, the monthly mean land fraction over the Asian region is obtained by weighting by the contribution from each trajectory to precipitation over the region. For the third step we assume that continental moisture originates from precipitation in the same region within the same month. Folding the YRV land moisture sources by the fraction of land contribution to the source regions then gives the second-order moisture source land fraction to the YRV."

(4) "Sources for precipitation over the ocean are excluded with a minimum threshold of 25m elevation." What does this mean?

- The sentence concerning the minimum threshold of 25m elevation is changed to: (now Page 5, line 8):" The target region is limited to land areas with a threshold of 25m minimum elevation". What we mean by this is that oceanic regions within the 27°–33° N and 110°-122° E definition are excluded as part of the target region.

(5) "Other thresholds for . . ..and relative humidty >80% for precipitation over YRV". Does this mean that only the air parcels with a relative humidity>80% were traced back? Why not trace back all the air parcels that have a release of moisture within the YRV region?

- The relative humidity threshold is necessary for the WaterSip method to provide meaningful results. Without a threshold in relative humidity for precipitation over the target region, the precipitation estimate found using changes in specific humidity in the trajectories over the target region (as described in the methods section) will be heavily over-estimated by including humidity changes that are due to interpolation errors. Sensitivity tests have shown that a threshold of >80% gives reasonable results for the YRV.

(6) "for the YRV% Zhao et al. (2016)". I think the "YRV%" is a typo.

- corrected.

(7) In the end of section 3.6, the authors concluded that "Decreasing winds. . .and strong solar forcing in combination lead to a sharp rise in local recycling. . .". But there is no discussion on the influence of solar forcing in the previous discussion.

- The reference to "strong solar forcing" has been changed to "high evaporation rates", and the sentence (Page 11, line 13-14) now reads: "Decreasing winds, high soil moisture, high green leaf area and high evaporation rates in combination lead to a sharp rise in local recycling and a slowed decline in rainfall seasonality in August."

(8) In section 4, the first term of the key results, "Although land contributions were large, the moisture supplied by land sources was well within the evapotranspiration rates at the source regions." I don't quite understand the meaning of this sentence. The land source regions contribute moisture to atmosphere via evapotranspiration. I think this is a well-understood process. Why the authors said "Although land contributions were large, . . . was well within the evapotranspiration rates. . ." ?

- The first term of the key results in the conclusions has been rephrased (Page 14, Line 9-11): "Continental moisture sources supplied a large part (58.4%) of the moisture for the YRV precipitation. At first sight this number might seem high. However, comparing with reanalysis evapotranspiration rates at the source regions we showed that results were in a reasonable range." For readers more accustomed to methods focusing on oceanic moisture sources, the high land contribution might be in contrast to expectations.

(9) In section 4, the fifth term of the key results, ". . .17.6% was recycled on land once, 40.8% was recycled on land more than once." 17.6%+40.8% = 58.4%. In the first term of the key results, it is mentioned that the continental moisture sources supplied 57.8% of the moisture for the YRV precipitation. 58.4% and 57.8% are not consistent, although they are two close numbers.

- The referee is right in that the percentages of land contribution did not exactly add up. This was due to differences in weighting the averages. A consistent way of weighting the averages are now used across the whole manuscript, and the method of averaging was stated as (Page 30, Table 1) "Averages are weighted by monthly contribution". This changes the last decimal of many of the percentages given in the manuscript. The new values can be seen in the updated Table 1.

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