Interactive comment on "Dominant climatic factor driving annual runoff change at catchments scale over China" by Z. Huang and H. Yang

Response to Anonymous Referee #3

This study investigated the dominant climatic factors driving annual runoff change in basins of mainland China. The story is interesting and the overall organization is clear. Three main concerns need to be addressed though before the paper reaches publishable standard.

Response:

We are very grateful for your positive evaluation and detailed comments. And we are revising this manuscript following your suggestions. I believe that it will lead to a great improvement in this manuscript.

1. The authors used the climate elasticity method to identify the influence of climate factors on runoff at basin level. The climate elasticity method essentially is a statistical method, which gives results based on data analysis. The method itself is not novel and I didn't see any revision or improvement. So the scientific contribution of this paper is little from the methodological perspective.

Response:

Thanks for your comments. The climate elasticity was general estimated according to a statistical method based on data analysis. Differently, in this manuscript, we estimated the climate elasticity according to the differential of the Budyko hypothesis (Yang and Yang, 2011), which has a physical basis and only requires the mean annual precipitation and potential evaporation. Though no improvements in methodology, we think that the contributions of this manuscript are: (1) to separate the contribution to runoff from precipitation, temperature, wind speed, net radiation and relative humidity; and (2) to detect the dominant climatic factor driving annual runoff change, which shows a dramatic regional variation, i.e. precipitation in most of the 207 catchments, net radiation in the lower reach of Yangtze River Basin and the southeast, and wind speed in part of the northeast.

2. Elasticity maps showing the impacts of climate parameters on runoff were presented but not analyzed in depth. For example, why net radiation is the dominant player in the lower reach of Yangtze River Basin and why wind speed is important in part of the northeast China? Implications and reasons behind the maps would be much more meaningful than simply showing the map.

Response:

Thanks for your comments. It is a very valuable suggestion for us, and points out the direction in the revision. We will make a deeper discussion in the revision.

3. Grammar and spelling errors affect reading experience. The authors should do a thorough check to improve the writing. Therefore, I would suggest a major revision based on the concerns.

Response:
Thanks for your comments. In the revised version, we will improve the English and the figures to make the manuscript better.

Specific comments:
Page 12912, 2nd paragraph: the authors didn't explain why chose the climate elasticity method over others.
Response:
Thanks for your comments. This method has the advantage of requiring only mean and trend of climate and basin variables, and not requiring extensive historical measurements. And we will explain it in the revision.

Page 12915, line 2: "abvious" should be obvious
Response:
Thanks for your comments. We are sorry for the spell mistake. We amended it as "obvious" in the revision.

Page 12917, line 12-17: it is not clear how the authors processed the data. Is the first step interpolating station data to grid level? How was that performed?
Response:
Thanks for your comments. Yes, the first step was interpolating station data to grid level. Firstly a 10 km grid which covers the study area was prepared and then we interpolated observations data of the meteorological stations to grid. The interpolation method for climatic factors was an inverse-distance weighted technique, except air temperature which must consider the influence of elevation. In the revision, we will add more explanations.