

Interactive comment on “Evolution of Vegetation System in Heihe River Basin in the last 2000 years” by Shoubo Li et al.

Anonymous Referee #1

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General comments:

This study aims to understand the evolution of vegetation system in Heihe River Basin over the past 2000 years, by reconstructing the spatio-temporal distribution of natural vegetation and crop vegetation from those previous study results and Landsat images. Because of the challenging problems in the human-environment interaction in this region, long-term change in vegetation system in the study area should be much appreciated. This research has made some advancement in the evolution of vegetation system with long-term scale, by synthesizing remote sensing data and results from previous researches. It will promote the understanding of the ecosystem health in the region and how to achieve a sustainable management in the Heihe River Basin. Overall, this is a solid and well documented contribution that can be accepted after some moderate revisions.

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Specific comments:

1) Spelling and grammar should be improved in general. Sometimes the sentence construct is not concise enough. e.g. Page 1, line 15-17. 2) P2, Lines22, there were some references about the historical landscape changes about this research area, and please cite these literatures, for example, "Nian, Y. Y., X. Li, and J. Zhou. 2017. 'Landscape changes of the Ejin Delta in the Heihe River Basin in Northwest China from 1930 to 2010.' International Journal of Remote Sensing 38 (2): 537-57. doi: 10.1080/01431161.2016.1268732". 3) Page 2, line 38. Please add the newly published papers about the historical landscapes or cultivated area, especially in river basin scale. e.g. Xie et al., 2016. Assessing the evolution of oases in arid regions by reconstructing their historic spatio-temporal distribution: a case study of the Heihe River Basin, China. *Frontiers of Earth Science*; Hu and Li, 2014. Spatial distribution of an ancient agricultural oasis in Juyan, northwestern China. *Frontiers of Earth Science*, 8(3): 338-350. 4) P3, Line20, the moving and semi moving dunes should be revised as the words of the mobile dune and semi-mobile dune. 5) P3, Line21-22, when did these percent happen? please give more descriptions. 6) P4, Figures1, please mark the name of the meteorological stations. 7) P5, Line8, the Juyan Lake started to retain water again in 2002, please make sure this is correct or maybe you shall cite other reference about the lake restore. 8) P5, Line22, please use a table to list the data sources about Landsat iamges (path/row). 9) P5, Line25, pease delete the words of "during late summer and early autumn", and retain the words of "from June to October". 10) Yingluoxia Station is a key point to divide the upstream, midstream and downstream, but it is hard to identify the position of this station. Please change the symbol and color in the Figue1. Furthermore, Heihe River Basin is your study area, so I would suggest to draw out the upstream area in figure 1 as well. 11) Page 5, line 17. The study area has a long history and many human activities took place during different periods. The ancient study periods given in this manuscript is incomplete. First, historical documents support evidence that there are human activities in the Heihe River Basin in Sui Dynasty, and this should be included. Also, you can combine those two dynasties in

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Sui and Tang Dynasties. Second, there were prosperous human activities performed in the study area more than 150 years during Xia Dynasty. I think the history of the Heihe River Basin should include the Xia Dynasty. It is incomplete to ignore the above two important historical periods for HRB. Recommend to refer to some papers to get the information about the human activities developed in the downstream of the Heihe River Basin during the Xia Dynasty. e.g., Hu and Li, 2014. Spatial distribution of ancient agricultural oasis in Juyan, northwestern China). 12) Page 6, line 9-14. In the method part of 2.3.1, you use the MODIS NDVI profile 2013 to calibrate the Landsat NDVIs to obtain annual maximum NDVI. Why do you chose the year of 2013, but not other years? 13) P 6, Figures 2, the equation in the figure should be separated from the figure. 14) Page 7, line 14-24. Please clarify when did you use the model established by Zhao to calculate the biomass based on NDVI. 15) P7, Lines 20 and Line 21, Please list the reference "Zhao et al. 2006 and Zhao et al. 2010" in your references list. 16) Page 8-9, line 39-line 1. In the section of 3.1, the reconstructed natural and crop vegetation distribution after 1987 were interpreted from Landsat images. How to distinguish the natural and crop vegetation from Landsat images? And how about the accuracy? Please clarify the methods you used accordingly. 17) P10, from your results and Figure 3, how to interpret (forcing mechanism) the vegetation change in the west river of the lower reaches of the Heihe River from Yuan Dynasty to Ming Dynasty, also how to interpret the vegetation change in the Gurina area from RC to 1987. 18) Page 14, line 17-19. You divided the natural and crop vegetation development in the study area into three stages. Why the period of the Republic of China (RC) is included into the Pre-development stage? Because the results of the pre-development stage was conducted from the previous studies, while that of the Republic of China (RC) is interpreted from Landsat imageries. Meanwhile, I think there were some common features of the ancient periods from the Han Dynasty to the Qing Dynasty, exclusive the period of Republic of China (RC). So, so it could be better to category RC period as as a rapid development period. 19) I think the discussion will be more convincing if the authors can further discuss the relationships between the climate change and human

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activities and the evolution of vegetation system. For example, how the climate influence the trend of vegetation changes can be analyzed according to the meteorological data or the previous studies. There is enough space to improve the discussion in the manuscript.

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