

Interactive comment on “Downstream ecosystem responses to middle reach regulation of river discharge in the Heihe River Basin, China” by Y. Zhao et al.

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General comments

This work is an important contribution to the water resource management in arid regions. The authors carried out a detailed and reliable analysis on the changes in vegetation distribution, water bodies and cultivated lands from 1987 to 2015 in a typical inland river basin, the Heihe River Basin. Although this river basin has been well studied, the yearly variation of land cover and its relationship with water resource management at the whole river basin scale has never been quantified. This paper addressed this challenge by producing yearly high-resolution land cover and inundated area maps and analyzing the land cover change from some unique viewpoints. I particularly like the

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following two points. (1) The relationship between vegetation change and streamflow in previous years (Q_{p3} , Q_{p5} , and sum of the streamflow of previous and current years). This lead to an interesting conclusion indicated by the authors "... repeated inflows in consecutive years are required to push water into the terminal lake, and hence support the surrounding environment". I believe this conclusion has important implications for water resource management in the terminal area of inland river basins: the ecosystem restoration is a long-term process in arid region. (2) Vegetation change along the river side using a buffer analysis is interesting (.. a series of buffer zones along river channels (100 m, 400 m and 1000 m away from river channel) were introduced to detect the interactions of vegetation dynamics and river flow). I have seen a lot of studies on the relationship between vegetation and streamflow. But this new analysis provide new insight. It reveals that the streamflow only has impact on vegetation distributed in the narrow belt along the river.

Generally, this paper can be accepted after a minor revision. I would suggest the authors to address the following issues in their revised manuscript.

(1) Change of cropland has a very significant impact on the hydrological cycle in the Ejina oasis area and might lead to some policy change on water diversion in upstream. I would suggest that the authors to provide an in-depth analysis of the impact of cropland expansion on water resource management, not only at the downstream area but also on the whole river basin. For example, $0.1-0.2 \times 10^9 \text{ m}^3 \text{ yr}^{-1}$ of water might have been used by cropland. According to the water diversion agreement (EWDP) of the HRB, all the cropland in the downstream area should be converted to natural vegetation. Therefore, cropland reclamation in the downstream area is somehow illegal. If the cropland can be appropriately managed, I believe the ecosystem restoration in the downstream area of the HRB will be more significant. I would suggest the authors to expand the discussion in the first paragraph of Page 13.

(2) Also for the cropland, I would suggest the authors to compare their mapping results with that by Hu et al., 2015 (Hu, X. L., L. Lu, X. Li, J. H. Wang, and X. G. Lu. 2015. Ejina

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Oasis land use and vegetation change between 2000 and 2011: the role of the Ecological Water Diversion Project. *Energies* 8:7040-7057). An evaluation of the accuracy is suggested to be added to Section 2.4.2.

(3) P7, second paragraph. Actually, some FVC datasets for the Heihe River Basin have been produced (1km: <http://westdc.westgis.ac.cn/data/21d993d3-841a-4d04-9647-82c21601a739> and 30m: <http://westdc.westgis.ac.cn/data/aa9f7e76-363f-4e21-b44c-adf50dd96b0f>). I would suggest the authors to use the datasets in their analysis or validation of FVC products.

Specific comments:

P2, L 28, "since the establishment of new China government in 1949, the Basin has experienced water and ecological stress" → "since the quick population growth in 1940s, the HRB has experienced water and ecological stress".

P3, L13-14, "To our knowledge, this is the first attempt to apply high-resolution images and long term datasets in Ejina Oasis" → "To our knowledge, this is the first attempt to apply long term high-resolution remote sensing derived land cover datasets in Ejina Oasis".

P4, L22, add a reference. Li, X., Z. T. Nan, G. D. Cheng, Y. J. Ding, L. Z. Wu, L. X. Wang, J. Wang, Y. H. Ran, H. X. Li, X. D. Pan, and Z. M. Zhu. 2011. Toward an improved data stewardship and service for environmental and ecological science data in west China. *International Journal of Digital Earth* 4:347-359.

P12, L11, "data not presented here". Why?

References

Lu, L., X. Li, and G. D. Cheng. 2003. Landscape evolution in the middle Heihe River Basin of northwest China during the last decade. *Journal of Arid Environments* 53:395-408.

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Wang, G. X., J. Q. Liu, J. Kubota, L. Chen, G. AF Wang, J. Liu, J. Kubota, and L. Chen. 2007. Effects of land-use changes on hydrological processes in the middle basin of the Heihe River, northwest China. *Hydrological Processes* 21:1370-1382.

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