

## ***Interactive comment on “What are the key drivers of regional differences in the water balance on the Tibetan Plateau?” by S. Biskop et al.***

### **Anonymous Referee #2**

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What are the key drivers of regional differences in the water balance on the Tibetan Plateau? Authors: S. Biskop, F. Maussion, P. Krause, and M. Fink

This manuscript analyzed the spatiotemporal variations of water-balance components of four lakes in the south-central part of the TP using outputs of the hydrological model J2000g driven with HAR data for the period 2001–2010. Precipitation was found to be the principal factor controlling the water balance in the four studied basins. It is assumed this approach could be used to regions ungauged. The manuscript is well written. However, substantial revisions are necessary before publication.

Major comments:

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1. The title and main point of this manuscript is the regional differences in the water balance among four lakes. Precipitation from HAR is post-processed by a precipitation-scaling factor due to the overestimation in HAR. However, fixed factors are adopted for the four lakes and the results were used to analyze the causes of the regional differences in the water balance. This does not make sense. Given the predominant role of precipitation in the hydrological simulation, the scaling factor will have influence not only on the ratio of snow (glacial) melt and precipitation contribution in runoff at single point simulation; but also the spatial distribution among four lakes would be influenced greatly.

2. Concepts of the climatology and change are kind confused. Which is the target of this manuscript, climatology in water balance or water balance changes? It seems authors refer to the precipitation is the key drivers in the runoff climatology because of the small proportion glacial there. For instance, it says glacial runoff is small due to small glacial coverage in section 4.1. It is self-evident. However, what interested are key drivers of runoff changes response to warming. Unfortunately, not much evidence of relative changes in precipitation, and glacial runoff are demonstrated. In Figure 3a (right), there almost no trend in precipitation in 2001-2010; however, warming is obvious. So, the rising in the lake table in Table 4 should attributes to the glacial runoff change due to warming. Accordingly, the water-balance components in the upper part of Table 4 show relative changes in the water balance components rather than values of ten years climatology. It is kind misleading.

3. As mentioned above, there almost no trends in precipitation in 2001-2010 letting alone the significance test. So, it is not convincing saying precipitation changes are the key drivers of the lake level in such short period. Some previous studies reported a long term lake level changes in recent decades (Yang et al. 2011; Lei et al. 2014). It was demonstrated that the lake level changes are consistent with P-E changes over the Tibetan (Gao et al 2015).

Yang, K., B. Ye, D. Zhou, B. Wu, T. Foken, J. Qin, and Z. Zhou, 2011 Response of hydro-

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logical cycle to recent climate changes in the Tibetan Plateau, *Clim. Change*, 109(3-4), 517-534, doi:10.1007/s10584-011-0099-4. Lei Y., K. Yang, B. Wang, et al. 2014, Response of inland lake dynamics over the Tibetan Plateau to climate change, *Climatic Change*, DOI 10.1007/s10584-014-1175-3 Gao Y, L. Ruby Leung, Y. Zhang, Lan Cuo, 2015, Changes in Moisture Flux over the Tibetan Plateau during 1979-2011: Insights from the high resolution simulation, *J. Climate*, doi: <http://dx.doi.org/10.1175/JCLI-D-14-00581.1>. 28(10), 4185–4197.

4. To show the difference from MÖlg et al. (2014), suggest changing title as “What are the key drivers . . . . Tibetan Plateau, precipitation or galcial melt?” or “What are the key surface drivers . . . .?”

5. P4276 L20-29, why not use the consistent MOD11A2 land-surface temperature products for four lakes? The same as other land characteristics (land cover). These differences could lead to differences in four lake simulation. How these results could be used in regional differences.

6. P4277, MODIS snow cover are used for validation of the snow modeling in the Nam Co basin. Why not do the same validation for other three basins?

7. P4278, non-glacial runoff is generated by snowmelt and rainfall. Glacier runoff is generated by snow and ice melt. There is also rainfall over the glacial area. And, snow usually covers over the glacial area. So, the definition sounds not reasonable.

8. P4285 L9-25, impervious layers might play a role.

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