Dear Xiangdong Zhang,

This manuscript presents a statistical analysis on the relationship of river discharges and precipitations between the Lena and Ob river basins using the reconstructed data sets, AGCM simulation, and CMIP3 fully coupled climate model outputs. The results show a time varying correlations in all three data sets, consistent with previous results using shorter observational data set. The variability of sea-saw pattern between the west and east Eurasian continent is responsible for the decadal variation of the correlation coefficients. The research result is important for understanding Eurasian Arctic water cycle and its decadal variability and long-term changes. The manuscript could be publishable after a revision as described below:

Thank you very much for your review comments on the original manuscript. We have revised the manuscript according to your comments. Our point-by-point replies are as follows.

1. The authors attribute the sea-saw pattern is internal variability, but state it is important for long-term changes. Variability and long-term change are two different concepts, with latter generally describing externally forced trend. I would suggest the authors to separate them in the manuscript.

As you pointed out, the long-term change is also important for P and R variabilities. While Fukutomi et al. (2003) and MacDonald et al. (2007) discussed about the long-term variations on decadal timescale, it seems that the long-term changes do not affect the time series of 15-year running correlation in Figure 2. In fact, as replied to Dr. Klaus Arpe's comment, when we remove the 19-year running mean from the raw time-series of P and R in Figure 2a-c, the correlations do not change so much. We added this result in the last part of Section 3.1.1.

2. Throughout the manuscript, the authors simply mention negative or positive correlations of R and P. This causes confusion of correlation between R and P or correlation of R or P between Lena and Ob. I suggest the authors to provide complete description on this.

I agree with you. That point was confusing and we revised the expression clearly throughout the manuscript.

3. The authors analyzed the AGCM and CMIP3 climate model outputs to examine the correlation relationship of R and P between the Lena and Ob rivers. To help readers

to better understand the modeling results, I suggest the authors to provide full description which AGCM was used and how surface boundary conditioned were defined, as well as how long time the model simulation was carried out. I also suggest the authors to provide information which CMIP3 models were used in 20C3M and PICTL.

While the description of the AGCM control simulation was shown in the third paragraph of Section 2, we added further explanation about the 20C3M and PICTL simulations in the fourth paragraph of Section 2.

4. When comparing the AGCM and CMIP3 climate model results, the authors state that air-sea interaction acts as a damping factor of sea-saw pattern. It is hard for me to understand this. From my understanding, when the modeled P is closer to the reconstructed R, there should be better correlations between P and R. I suggest the authors to clarify this.

We examined the relationship between R and P based on the observation and reconstruction. On the other hand, in the AGCM and CMIP3 simulations, we examined the relationship between the P and atmospheric circulation and did not analyze simulated R. While the AGCM control simulation is forced by the fixed boundary conditions, the CMIP3 simulations are based on ocean-atmosphere coupled model and have the effect of air-sea interaction. If possible, it is better to simulate the P and large-scale circulation over Siberia with the same kind of AGCM and coupled GCM. But, unfortunately, we don't have a coupled model and cannot do that. Our discussion in this study is only based on the CCSR/NIES AGCM and CMIP3 simulations. We added further discussion in the second paragraph of Section 4.

5. In line 6 (P. 2), the authors mention "these variables". It is not clear which variables are. In fact, P has been already included in P-E.

We specified the variables (i.e., R and P-E).

6. In line 13 (P. 2), "terrestrial processes" should be specified.

The discharge control via dams, permafrost condition associated with runoff process, distributions of lake, wetland and vegetation associated with evapotranspiration are included in the terrestrial processes. We added these in the text.

7. In line 11 (P. 3), it would be better to discuss why analyzing the 5 subsets of the data.

As in Figure 2, the negative correlations were frequently seen during the past two centuries (Figure 2c) and the time period of the negative correlation seems one or two decades. To detect a robust tendency of the correlation, we made subset of 150-year records and increased sample size of data. We added that explanation in the first paragraph of Section 2.

8. In line 16 (P. 3), it needs to be clarified what time period was used to do correlation analysis between GPCC P and R.

The time period of the correlation is from 1901 to 2010. We described it.

9. In line 25 (P. 3), the AGCM resolution of about 300 km seems very low to describe water cycle in the river basins. I suggest authors to provide evidence that such a low resolution still can correctly capture P in the river basins.

As you pointed out, the resolution of our simulation is lower than in the recent AGCM/GCM's studies. In the previous studies, however, Numaguti 1999 and Kurita et al. 2005 examined precipitation recycling and source of precipitating water over Eurasia using an AGCM with T42 spatial resolution same as in our simulation. They indicated that the spatial pattern and seasonal cycle of simulated P and P-E over Eurasia are generally consistent with the observed features in the seasonal timescale. In this study, observed features of the negative correlation of P between eastern and western Siberia, the east-west seesaw and the relationship between the negative correlation and seesaw pattern were reproduced in the AGCM simulation. Therefore, this resolution of about 300km is enough for the purpose of this study. We added this explanation in the third paragraph of Section 2.

Numaguti, A. (1999), Origin and recycling processes of precipitating water over the Eurasian continent: Experiments using an atmospheric general circulation model, J. Geophys. Res., 104(D2), 1957–1972, doi:10.1029/1998JD200026.

Kurita, N., A. Sugimoto, Y. Fujii, T. Fukazawa, V. N. Makarov, O. Watanabe, K. Ichiyanagi, A. Numaguti, and N. Yoshida (2005), Isotopic composition and origin of snow over Siberia, J. Geophys. Res., 110, D13102, doi:10.1029/2004JD005053.

10. In line 30 (P. 4), what specific discrepancy occurs between P and R?

There are some error and uncertainty for both the observed P and reconstructed R and they result in the discrepancy between the P an R. The observation stations of P are sparse in Siberia and there is difficulty in the P measurement such as wind-induced undercatch, wetting, and evaporation losses. These make an error and uncertainty for the P. The long-term R during the past two centuries is reconstructed based on the tree-ring width. While the tree-ring width has an indirect relation with the R, the both are mainly related through the P. There are also other influences such as SAT, solar radiation, nitrogen and so on. In addition, the tree-ring width is affected by meteorological conditions during the growing season in summer and there must be less contribution from the P during winter. As a result, the reconstructed Rs could explain 43% of the observed variability for the Lena and 51% for the Ob (MacDonald et al. 2007). We added some explanation in the second paragraph of Sub-subsection 3.1.1.