Dear Dr. Stefan Hagemann,

Major remarks

The authors analyse the different long-term behaviour of precipitation and river runoff over the Lena and Ob catchments. Their analysis uses observations, GCM simulations and reconstructed discharges based on tree rings. They could link the anti-correlated behaviour during some periods to an east-west seesaw pattern that seems to be a feature of the general large-scale circulation and the atmospheric internal variability. The study is interesting and provides robust results due its combination of various observation and model data sources.

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

I only miss some more embedding of the results into the present day climate research. What is the reason for the seesaw pattern? Is there a larger scale process that creates this pattern? Is the seesaw pattern, e.g., related to the circumglobal wave train found by Ding and Wang (2005) in the northern hemispheric during boreal summer? They pointed out that this pattern can favour co-varying patterns of rainfall anomalies over South and East Asia.

Ding, Q., and B. Wang (2005), Circumglobal teleconnection in northern hemisphere summer, J. Climate, 18, 3482-3505.

As mentioned in the manuscript, the reason for the east-west seesaw pattern is a summertime atmospheric internal variability over Siberia. The AGCM control simulation demonstrated the seesaw pattern over Siberia in summer. Thus, without external forcing like changes in SST, sea ice, greenhouse gases and solar activity, the seesaw pattern often emerges by chance.

In addition, we discussed about other reasons for the large-scale atmospheric circulation associated with P variability over Siberia. In the last part of Section 4, we described that the remote influence of Atlantic multidecadal variation, quasi-stationary Rossby waves over Eurasia and Arctic dipole anomaly affect the Siberian P based on the previous studies. As you pointed out, the circumglobal wave train may be another candidate. However, those specific effects are not clear in our analysis and future work is needed. We described about these in the last two paragraphs of Section 4.

As the seesaw pattern and the anti-correlation is a real climate feature, do you it can be used as an index to evaluate the performance of GCMs or ESMs? If yes, you may suggest how in the conclusions section?

Yes. In this study, we evaluated the seesaw pattern and negative correlation in the AGCM and CMIP3 simulations on the basis of three ways. As for the negative correlation, we calculated the two statistics of median and skewness for the 15-year running correlations (Sub-subsection 3.1.2). As for the seesaw pattern, we performed an EOF analysis to identify the dominant pattern of large-scale circulation, and then calculated the pattern correlation of EOF2 between the JRA-55 and each of the simulations (Subsection 3.2). As for the relationship between the negative correlation and the seesaw pattern, we defined two indices of $\Delta Z500_{WE}$ and ΔP_{LO}, and calculated the correlation between them (Subsection 3.2).

Our explanations were insufficient and we described about these in the corresponding sections.

In section 3, skewnesses are shown in Fig. 3b and Table 2, but it is motivated neither why they are shown nor what the skewness results mean in the context of the present study. If there is not a clear benefit for the study, they may be removed.

As you know, the skewness is a measure of asymmetry of probability or frequency distribution. Here, we examined the frequency distribution of correlations of P between the Lena and Ob. So, when the correlation is distributed in the negative side, the skewness has positive value. We added this explanation in the second paragraph of Sub-subsection 3.1.1.

I suggest accepting the paper for publication after some revisions have been conducted.
I don't wish do stay anonymous, Stefan Hagemann
Thank you, Stefan.

Minor remarks

In the following suggestions for editorial corrections are marked in *Italic*.
Thank you for the careful review.

p.1 – line 9
… Ocean, *whereat* the …
We corrected as suggested.

p.1 – line 16
… (AGCM) and *fully coupled atmosphere-ocean GCMs* conducted …
We corrected as suggested.

p.2 – line 11
Regarding the interannual …
We corrected it.

p.2 – line 12
… due to *the* large …
We corrected it.

p.3 – line 5
… 3 (CMIP3*; Meehl et al. 2007*).
Meehl, G. A., Covey, C., Delworth, T., Latif, M., McAvaney, B., Mitchell, J. F. B., Stouffer, R. J., and Taylor, K. E.: The WCRP CMIP3 multi-model dataset: A new era in climate change research, Bull. Amer. Meteor. Soc. 88, 1383-1394, 2007.
We added this reference.

p.3 – line 10

It is written:

"Because of limitations on the time period …"

This statement is probably not, what you really mean. In my opinion, the period 1936-2009 of the discharge observation is already quite long. It is probably more that you would like to have even more data to reduce the noise to find significant patterns of variability. Then, you should write this more clearly.

The 74-year record (1936-2009) of observed R is not long enough for this study. As in Figure 2a, we could find the negative correlation period of the Lena and Ob Rs during 1980s to mid-1990s and the positive correlation period during 1960s to 1970s, one by one. But we couldn't judge whether there is a certain tendency of the correlation based on the 74-year record. On the other hand, we could reveal the tendency of frequent negative correlation based on the 191-year record of reconstructed R. The 111-year record of observed P also show the similar tendency of negative correlation. The time period of negative correlation seems one or two decades. To detect such a tendency of the correlation on decadal timescale, the usage of long-term record is desirable. In addition, to detect a robust tendency of the correlation, we made subset of 150-year records and increased sample size of data. We added some explanation in the first paragraph of Section 2.

p.3 – line 24/25

…control simulation *is* the … …resolution *is* about … …and the vertical *discretization comprises* 20 layers ...

We corrected them.

p.4 – line 4

… R *comprises annual values*, we …

We corrected as suggested.

p.4 – line 5

… P *has* large …

This is not corresponding. The sentence was changed.

p.4 – line 7

Using a similar method *as* Tachibana ...

We corrected as suggested.

p.4 – line 9

…2009 *are* ..

We corrected it.

p.5 – line 31

… (EOF1) *is* the ..

We corrected it.

p.7 – line 9 It is written:

“The results in simulations give us several more implications for …”

Strange sentence/English. Please rewrite

We revised this sentence.

p.7 – line 11

What do mean with “dumping”? Please rewrite more clearly.

We made a mistake and “damping” is correct. We added some explanation in the second paragraph of Section 4.

p.7 – line 24/25

… warming *(Solomon et al. 2007; IPCC 2013)*.

Solomon, S., D. Qin, M. Manning, M. Marquis, K. Averyt, M. M. B. Tignor, H. L. Miller Jr., and Z. Chen, Eds. (2007), Climate change 2007: The physical science basis, Cambridge University Press, 996 pp.

IPCC (2013), Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324.

We corrected these references.

Figure 1

I cannot really see the thick gray lines. Please improve figure. Actually, the figure looks quite busy. I suggest making two panels out of it.

As the first reviewer of Dr. Arpe pointed out, we deleted vector and remade it simple.

Figure 2

I suggest adding lines to show the 95% level of significance.

We added the lines of the 95% significant level.

Figure 4

Green dashed inset boxes are hard to see. Please improve figure.

We changed the color of inset boxes.