

Manuscript: Influence of atmospheric internal variability on the long-term Siberian water cycle during the past two centuries

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.

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 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?

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.

I suggest accepting the paper for publication after some revisions have been conducted.

I don't wish do stay anonymous, Stefan Hagemann

Minor remarks

In the following suggestions for editorial corrections are marked in *Italic*.

p.1 – line 9

... Ocean, *whereat* the ...

p.1 – line 16

... (AGCM) and *fully coupled atmosphere-ocean GCMs* conducted ...

p.2 – line 11

Regarding the interannual ...

p.2 – line 12

... due to *the* large ...

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.

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.

p.3 – line 24/25

...control simulation *is* theresolution *is* aboutand the vertical *discretization* *comprises* 20 layers ...

p.4 – line 4

... R *comprises* annual values, we ...

p.4 – line 5

... P *has* large ...

p.4 – line 7

Using a similar method *as* Tachibana ...

p.4 – line 9

...2009 *are* ..

p.5 – line 31

... (EOF1) *is* the ..

p.7 – line 9

It is written:

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

Strange sentence/English. Please rewrite

p.7 – line 11

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

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.

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.

Figure 2

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

Figure 4

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