Hydrology and Earth System Sciences Discussions

Interactive Comment

Interactive comment on "Temperatures and precipitation totals over the Russian Far East and Eastern Siberia: long-term variability and its links to teleconnection indices" *by* V. V. Krokhin and W. M. J. Luxemburg

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Dear Sir/Madam
We appreciate your effort for improvement of the article and have changed the paper at quite some points. On other points clarification is added or a justification is provided.

1916/19-1917/2:
You state that linear methods can not be used, but the method you subsequently use (PCA and coherency) are as well as methods used by others are all linear.
REPLY: It is a true remark. The phrase was removed from the paper.

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1917/3-6:

Is that the methodology you use? Then, shouldn't 'spectral analysis' and principal component analysis' be swapped? Also explain in detail why this is superior to other methods.

REPLY: Our methodology is explained in detail in the reworked section 3 (Methods). Our methodology is one of the many methods in climate studies. We do not persist that our methodology is superior to other methods. It is our choice only.

1917/17-22:

A more extensive description of the data is needed, e.g.: missing data and homogeneity.

REPLY: In sections 2 and 3, we describe the precipitation and temperature data, include more extensive description of the data, e.g.: presence of missing data and homogeneity.

1917/23-1918/12:

For readers (like myself) not familiar with the geographical region under investigation, you must justify, e.g. by referring to other autors' work, that the two circulation indices chosen are the relevant ones.

REPLY: In Section 1, we explained why two teleconnection indices were chosen. We choose the geographical region under investigation, since the many details of the timescale and long-term dynamics of the AO and NP Oscillations are not well understood.

1918/5:

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It is usually termed the Pacific Decadal Oscillation (PDO). Since this is defined in terms of the SST field, it is strictly spoken not a 'circulation index'.
It is a true remark. In Section 1 we described the NP Oscillation in PDO terms.

1920/18-20:
Please elaborate on this sentence, which I don't understand.
REPLY: this sentence is removed.

1921/15:
it What does 'low pass' mean here.
REPLY: phrase 'low pass' is removed.

1921/14;
Selection of significant CPCA modes must be done objectively, e.h. by. Preisendorfer's rule-N.
REPLY: Only complexity of the spatial modes increase beyond several propagating features of irregular form, the easy interpretations are generally no longer possible, although some useful information can still be derived from the analysis (cf. Barnett, 1983). Note, however, that all first dominant modes are statistically significant, according Preisendorfer's rule-N (Preisendorfer, 1988). Problem of determination of all statistically significant modes was not considered.

1922/12:
What is the 'Arctic Circumpolar Wave' and how is its connection with precipitation anomalies?
REPLY: We used the term "Arctic Circumpolar Wave" as synonym of Arctic

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Oscillation. The term "Arctic Circumpolar Wave" was substituted by the term "Arctic Oscillation".

1922/17:
Some sort of significance test of these values must be performed.
REPLY: Significance test of these values was performed. The sentence: "The real components of the temperature and precipitation anomaly time series for dominant complex principal modes lags the imaginary components by approximately 2-3 yr (appox. 23-34 months) with coherence levels 0.91 and 0.87, respectively (Fig. 4)." is changed to (defined more accurately) "The real components of the temperature and precipitation anomaly time series for dominant complex principal modes lags the imaginary components by approximately 2-3 yr (approx. 23-34 months) with significant coherence levels 0.91 and 0.87, respectively (Fig. 4)."

1922/22-1923/1:
I don't understand this bit, please elaborate.
REPLY: We described the results of our visual analysis of the temporal phases of the dominant complex principal components for the precipitation and temperature anomalies only. The temporal structure of the dominant complex principal components for the precipitation and temperature anomalies was studied numerically by means of cross-spectral analysis in section 5.

1923/13-15.
In section 4 you identified a period of 2-3 years in the leading mode of temperature and precipitation.
REPLY: In paper: "The real components of the temperature and precipitation anomaly time series for dominant complex principal modes lags the imaginary

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components by approximately 2-3 yr (61627;23-34 months) with significant coherence levels 0.91 and 0.87, respectively (Fig. 4)."
I.e. In section 4 we identified a period of 2-3 years between the real and imaginary components of the temperature and precipitation anomaly time series for dominant complex principal modes.

Is it from these leading modes you calculate the power spectrum shown in fig 5a and 6a?
REPLY: Yes, it is these modes which were used for power spectrum estimation shown in fig 5a and 6a. More precisely, we estimate the power spectrum for dominant principal components (as temporal amplitude of CEOF).

Then, why is the 2-3 year peak not more distinct and why was the 6-8 year period not identified in the previous analysis? Please explain this controversy.
REPLY: The presence of 2-3 year peak in spectra of the real and imaginary components of the temperature and precipitation anomaly time series for dominant complex principal modes did not contradict the 6-8 year period in the temporal amplitude of CEOF. See equation (6). The temporal amplitude of CEOF is the square root from the sum of the real and imaginary parts.

1924/4:
The 'Quasi biennial oscillation' (QBO) is a stratospheric phenomenon. You have found a 2-3 year variability. Whether this is related to the QBO or not is a different question, which you have not answered.
REPLY: It is a true remark. The phrase, as it is debatable was removed from the paper.

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1925/14-19:
Explain, why you bring in the concept of 'long time memory'.
REPLY: As shown by Hasselmann (1976), Majda et al., (2001) and many others, research of the mechanism of long time memory is the further basis for climate modeling and, subsequently, forecasting.

Figures 5a, 6a, 7a: Can you explain how the significance levels are calculated?
REPLY: We inserted the description how the significance levels were calculated.

Is the null-hypothesis a white noise process?
REPLY: "In order to establish the significance of periodic signal components in the analyzed time series in the presence of white noise, Siegel's test has been used." Schultz and Stattegger (1997) present a detailed description, which we show only in summary in the paper.

And why is the 95 perc significance level almost always below the calculated spectrum.
REPLY: We disagree. It means nothing. Our task was finding physically significant peaks. Therefore, we analyzed power spectra and cross-spectra simultaneously. "when two time series have significant peaks at particular frequencies and the peaks are coherent, the local and global information constitutes a true climate signal" (citation from: Rodriguez-Puebla et. al., 2001).

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