

1. Introduction

The West Pacific pattern (WP) is one of the most prominent atmospheric circulation pattern in the Northern hemisphere in all months, especially in winter (Wallace and Gutzler, 1981; Mo and Livezey, 1986, Aru et al, 2020). It consist of a dipole of anomalies with one center over Kamtschatka and the opposite-sign center over the Southeast Asia/west-subtropical North Pacific (Fig. 1).

2. Data and Methods

Monthly averaged Geopotential Heights from NCEP/DOE AMIP-II Reanalysis (Reanalysis-2), at 500 hPa pressure level for the Northern Hemisphere: 20°-90°N, 0°-360°E, from 01.01.1979-01.05.2023.

After removing the seasonal cycle and the linear trend, the fourth mode of the Empirical Orthogonal Function (EOF4) was computed for all months and for the winter months December-February (Fig. 1).

The EOF4 can explain 8.1% of the variance in the Northern hemisphere if all months are considered and 9.3% if only the winter months are analyzed. The Principal Component (PC) of the EOF4 shows the time series of the positive and negative phases of the WP (Fig. 2).

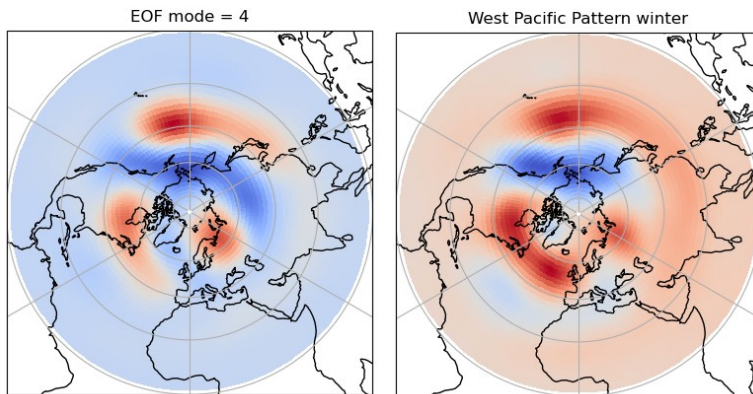


Fig. 1: EOF4 of geopotential height anomalies at 500 hPa in the Northern hemisphere, for a) all months and b) winter.

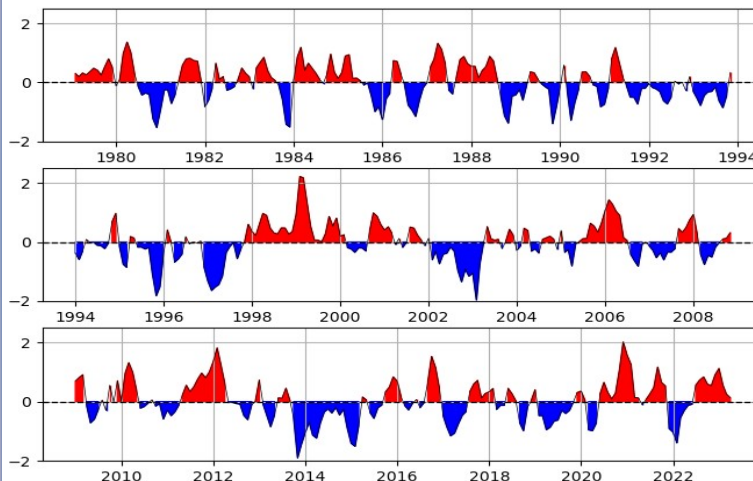


Fig. 2: West Pacific Pattern Index from the PC time series, 3-month running mean

3. What are the impacts of the WP?

The positive phase (Fig. 2, red) is associated with above-average temperature in West Pacific regions and the East coast of the U.S. during winter/spring, and below-average temperatures in eastern Siberia during all seasons (Fig. 3). Precipitation is above average in the high latitudes of the North Pacific and below average over central North Pacific. The WP influences the location of the Pacific Jet stream.

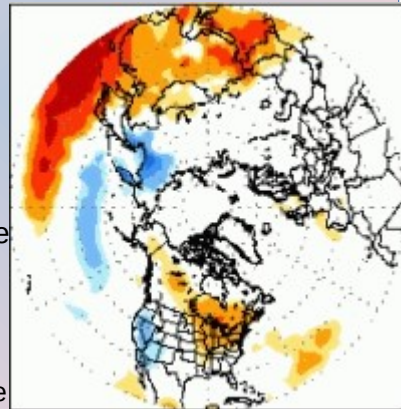


Fig. 3: WP correlation with surface temperature

4. WP and climate change

Climate change (warmer surface temperature) can mask a negative phase of the WP Index. A positive phase of the WP Index on the other hand can mask global warming, e.g. in Siberia.

References: Aru et al., 2020: Comparisons of the different definitions of the western Pacific pattern and associated winter climate anomalies in Eurasia and North America. Python code from Marco Schulz: <https://github.com/mschulzie/climAPCREGION>; Fig.3: https://www.cpc.ncep.noaa.gov/data/teledoc/wp_tmap.shtml