

A Comparison of the Western Pacific Subtropical High Indices Described by Four Reanalysis Datasets

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Abstract

The west Pacific subtropical high (WPSH) is one of the most important circulation systems affecting the weather and climate in East Asia. In this paper, four representative WPSH indices at 500 mb level are investigated and compared based on NCEP/NCAR (NCEP1), NCEP/DOE (NCEP2), ERA-40 (ERA) and JRA-25 (JRA) reanalysis datasets, respectively. The four indices includes the WPSH area (defined by the "real area" of WPSH surround by the 5880 gpm contour over western Pacific), the intensity (the "volume" of WPSH over 5880 gpm), the latitudinal axis position and the west boundary (the minimal longitude degree of the 5880 gpm contour) .

Results indicate the distinct differences in the four datasets as follows:

1) As the most primary feature, the annual cycles are revealed in all the datasets. The climatological WPSH area is the least in JRA and the greatest in NCEP2. The climate mean latitudinal axis of the high is more southward in ERA and the west boundary is more westward in NCEP2;

2) All the datasets show significant interannual variations of the high, especially the ERA in August. Compared to the counterpart in ERA and NCEP2, the variances in JRA and NCEP1 are relatively less;

3) As explored by many studies, the intensity of the WPSH has an interdecadal abrupt in the end of 1970s, and this characteristics can be obviously found in both NCEP1 and ERA;

4) Time series of the area and intensity in four datasets show similar multi-time scale variabilities. The correlation coefficients between them are all greater than 0.85, which have exceeded the 99.9% significance t-test level. This result means all the datasets can describe the strength of the high well. But the latitudinal axis positions and the west boundary locations differ quite a lot in some months in different datasets, especially in JRA. Take the high in Feb. 2010 as an example, in this month the high is much southward in JRA while northward in the other three datasets.

5) The latitudinal axis position of WPSH is a good indicator to the locations of summer precipitation belt in China. Close relationship between the axis position and the summer rainfall amount can be clearly seen in the Yangtze River valley and its southern regions in all datasets, especially in June.

6) Next, we will use the radiosonde data as the observations to check the description skills of the four datasets.

Key words: the western Pacific subtropical high (WPSH); reanalysis data; comparison; NCEP1; NCEP2; ERA; JRA

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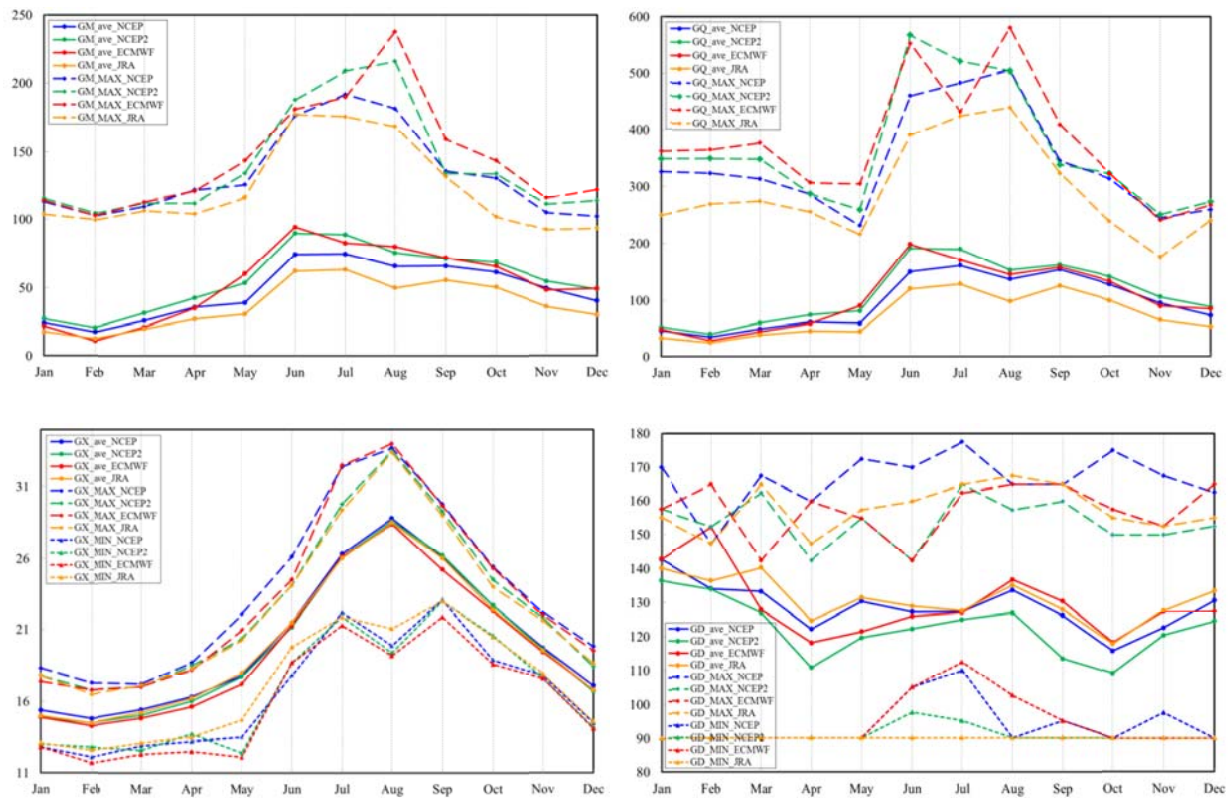


Fig.1 Monthly time series of averaged WPSH indices and their maximum/minimum (blue lines: NCEP1; red lines: NCEP2; green lines: ERA; orange lines: JRA)

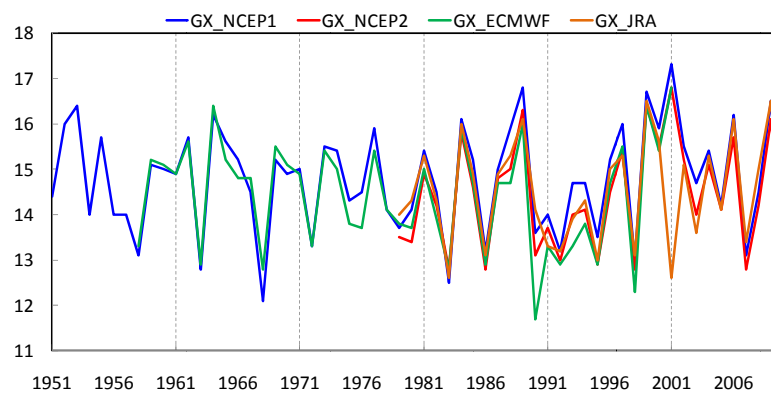


Fig.2 Annual time series of the latitudinal axis position of WPSH in Feb (blue lines: NCEP1; red lines: NCEP2; green lines: ERA; orange lines: JRA)