Extreme Rainfall over Yangtze River-Huaihe River Valleys in Summer and Its Association with the East Asia Westerly Jet

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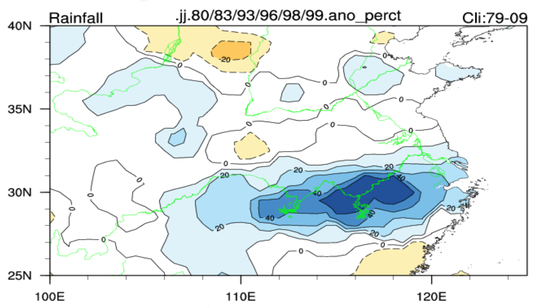
Introduction

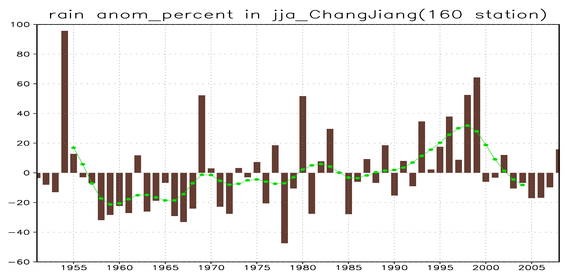
Both the Yangtze River and the Huaihe River lie in mid-latitudes over East Asia, the large-scale circulation and climatic background of weather events in the Yangtze River valley and the Huaihe River valley are similar. However, the interannual variation of extreme rainfall events in summer between the Yangtze River valley and the Huaihe River valley is different. This study will focuses on the circulation in middle to high latitudes over Asia and middle to low latitudes in the southern hemisphere. Both physical and statistical methods were used in this study. The differences of East Asia westerly jet for extreme rainfall events in summer between the Yangtze River basin and the Huaihe River valley were looked.

(1) Data and Methods

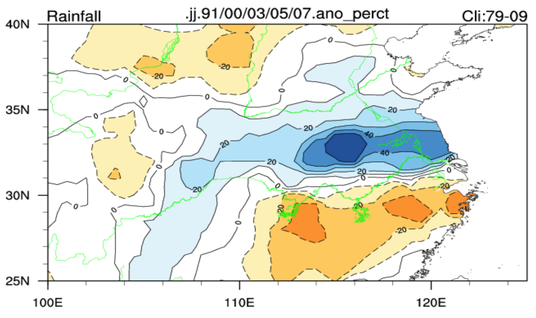
NCEP-NCAR daily and monthly reanalysis data;
The rainfall data from China Meteorological Administration;
TM90:The Blocking index of Tibaldi and Molteni (1990)

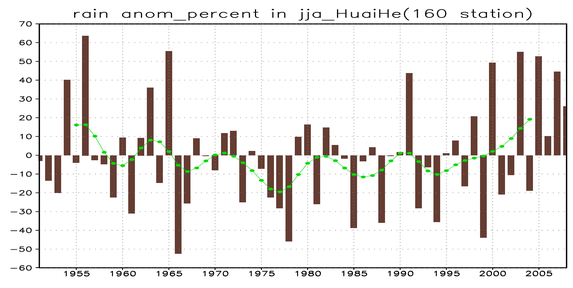
(2)Rainfall in JJ





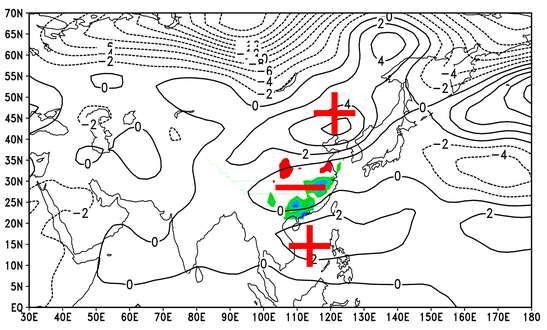
Left:Rainfall composited for more rainfall in Yangtze River valley
Right: Annual rainfall in Yangtze River valley



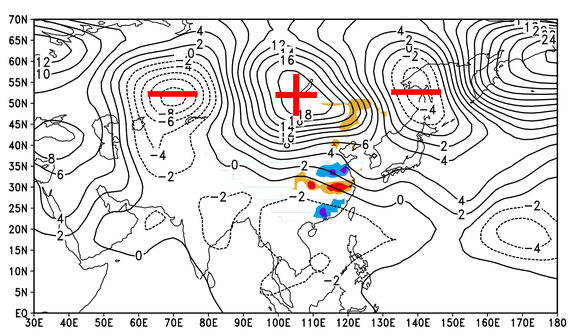


Left:Rainfall composited for more rainfall in the Huaihe River valley
Right:Annual rainfall in the Huaihe River valley

(3) The composited geopotential height anomalous at 500hPa averaged by JJ (units: gpm) (climatologic mean: 1979–2009)

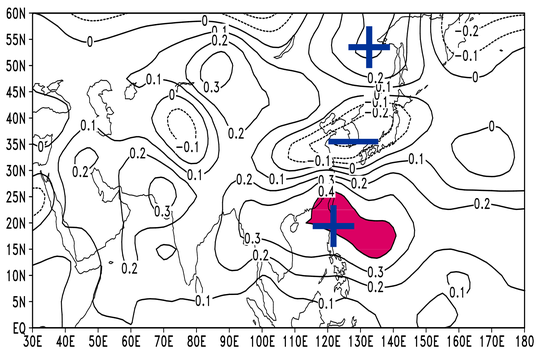


(a) 1993–1999

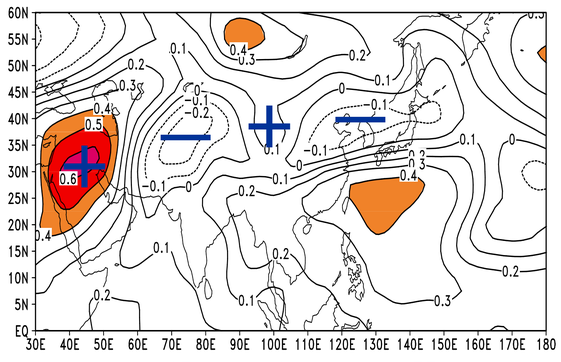


(b) 2000–2007

(4) The correlation between 500hPa height and Rainfall in JJ during 1979-2008

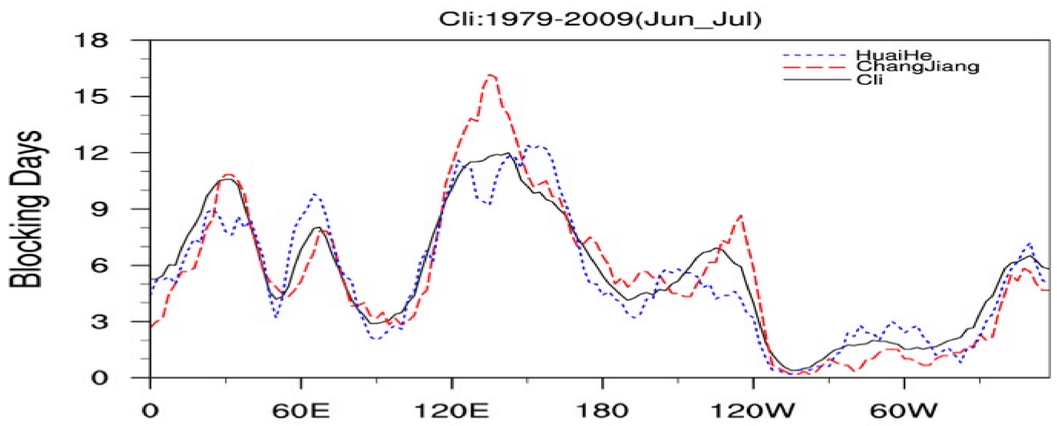


Yangtze River valley



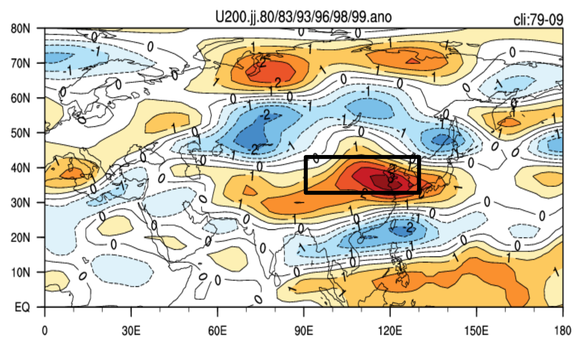
Huaihe River valley

(5) The frequency of block occurred in middle～high latitude over north hemisphere in JJ during 1979～2008.

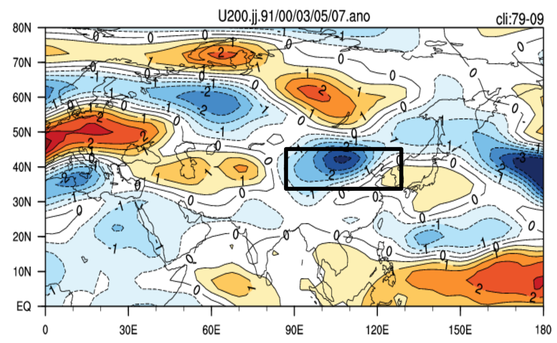


unit:day,solid line: climatologic mean, red dashed line: more rainfall over Yangtze river valley, blue dashed line: more rainfall over HuaiHe river valley.

(6) The composited anomalous zonal wind (m/s) at 200 hPa

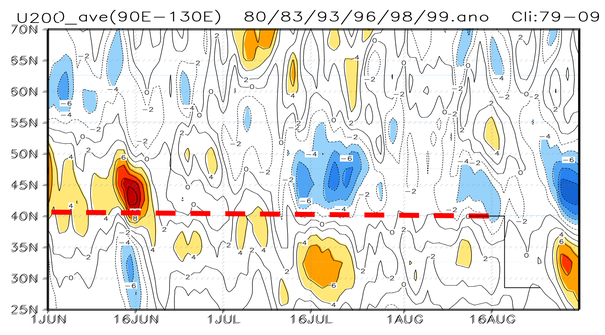


more rainfall in JJ over the Yangtze River valley;

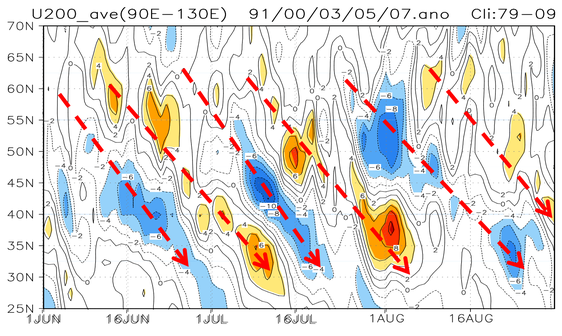


more rainfall in JJ over the Huaihe River valley

(7) Time–latitude cross sections of anomalous zonal wind (m/s) at 200 hPa averaged by 90°E–130°E

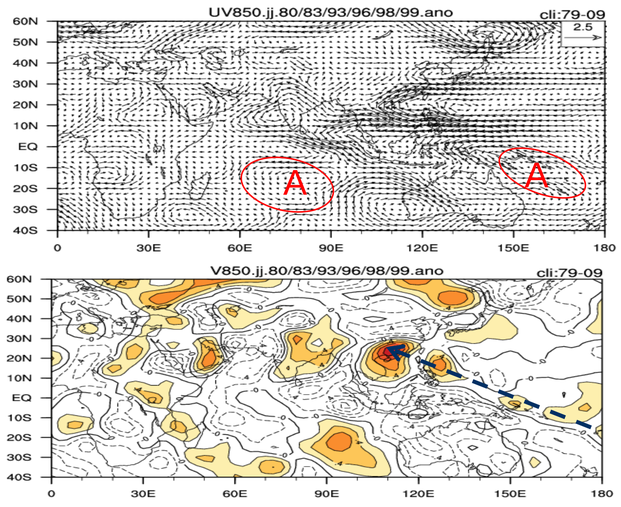


more rainfall over the Yangtze River valley in JJ

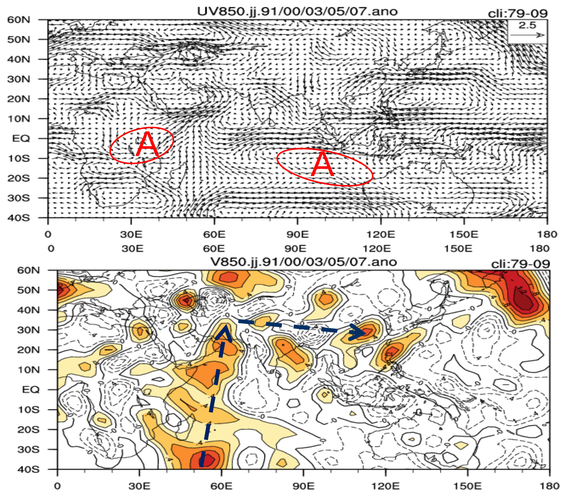


more rainfall Over the Huaihe River valley in JJ

(8) Composited anomalous wind vector at 850 hPa averaged by JJ (climatologic mean: 1979–2009)



more rainfall over the Yangtze River valley in JJ



more rainfall over the Huaihe River valley in JJ

(9) Conclusions:

The anomalous rainfall in JJ occurred in the Yangtze River valley (the Huaihe River valley) with east Asian subtropical westerly jet at 200 hPa strengthened (weakened) and occurred a longitudinal (zonal) pattern in middle to high latitudes over East Asia for geopotential height anomalous at 500 hPa, and meanwhile the locations of both the Australian anticyclone and the Mascarene anticyclone shifted further east (west), respectively, than normal; the cross-equatorial flow strengthened in the areas 150°E to 180° and weakened in the areas 50°E to 60°E (weakened in the areas 150°E to 180° and strengthened in the areas 50°E to 60°E.