

Direct Impact of El Niño on East Asian Summer Precipitation in the Observation

Na WEN¹, Zhengyu LIU², Yinghui LIU³

¹ *School of Atmospheric Sciences, Nanjing University of Information Science &
Technology, Nanjing, China*

² *Center for Climate Research, University of Wisconsin-Madison, Madison, Wisconsin*

³ *Space Science and Engineering Center, University of Wisconsin-Madison, Madison,
Wisconsin*

This study investigates the direct impact of El Niño in the tropical Pacific on the East Asian summer precipitation. Generalized equilibrium feedback assessment (GEFA) is used to isolate this direct impact from interrelated ocean forcings in the observations. Results indicate that the El Niño can directly influence the summer precipitation in East China significantly. The precipitation response presents a tri-pole pattern, with anomalous wet in the Southeast and the Northeast China and anomalous dry in the northern China. Amplitude of the precipitation response is around 20 % of the total precipitation for 1°C El Niño forcing in most area of the East China, with maximal response up to 30 % / °C .

The tri-pole precipitation response is attributed to an El Niño-induced cyclonic anomaly in the Northeast Asia and an anticyclonic anomaly in the western North Pacific (WNP). The anomalous cyclone deepens the East Asian trough southwestward, favoring an air ascending in front of the trough in the Southeast and the Northeast China, and an air descending at the rear of the trough in the northern China. The anomalous anticyclone in the WNP strengthens the WNP Subtropical High northeastward, providing adequate water vapor to the Southeast China. The anomalous cyclone and anomalous anticyclone work together to generate the tri-pole precipitation response pattern in the East China. Further investigation suggests that these two key anomalous circulations are part of a northwestward propagating Rossby wave, which is excited by the El Niño warming-induced convection over the subtropical west-central Pacific. This study can serve as a reference for the prediction of the East Asian precipitation in both the developing and decaying summer of El Niño.

Key words: Direct Impact, El Niño, East Asian Summer Precipitation, GEFA