How Large-Scale Circulations Integratedly Influence Precipitation in the Source Region of the Yangtze River,China

*Yiheng Du[1], Dong An[1], Ronny Berndtsson[1]

1. Lund University

Precipitation patterns are highly sensitive to climate change. During recent years, researchers have made significant progress in the understanding of vapor transport by large-scale atmospheric circulation patterns (teleconnections). However, previous research has mainly focused on the influence of individual teleconnection patterns, regardless of joint impact. In our study, the combined influence from large scale circulations on precipitation are examined. Monthly precipitation data at regular grids of 0.5˚ ×0.5˚ derived from observations during June-August 1961-2016 were used to reveal characteristics of large-scale circulations associated with rainy season precipitation over the source region of the Yangtze River (SRYR). A comprehensive analysis of relationships between SST anomalies as well as large-scale circulation including ENSO and PDO and spatiotemporal patterns of rainy season precipitation in SRYR was presented. Our analysis indicated that the leading modes of rainy season precipitation variability can be explained by the variability of SST together with an integrated effect of ENSO and PDO with an explained variance of about 64.2%. It was shown that the influence of ENSO and PDO will enhance/decrease when they are in-/out-of-phase. Negative PDO induces more precipitation in La Niña years than in El Niño years for the SRYR, especially over central and eastern parts of the basin. Positive PDO induces precipitation decrease, and El Niño enhances the decrease. The mechanism behind this pattern is atmospheric circulation affecting the strength of westerlies that transport moisture to the inland areas and as well local convergence conditions. Our results have implications for predicting the rainy season precipitation for coming decades over the SRYR. If the current negative PDO phase continues together with more frequent extreme La Niña events, as suggested in previous research, more abnormal precipitation during rainy season is expected over the SRYR.

Keywords: PDO, ENSO, precipitation, moisture flux, SRYR

