El Niño Modoki I and II Classified by Different Impacts on Rainfall in Southern China, Typhoon Landfall Activity and the Indian Ocean Dipole

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El Niño events have been separated into canonical El Niño and El Niño Modoki because of different locations of maximum SST anomalies. Based on the opposite influence on rainfall in southern China during boreal fall, this paper classifies El Niño Modoki into two groups: El Niño Modoki I and II which show different origins and patterns of SST anomalies. The warm SST anomalies originate in the equatorial central Pacific and subtropical northeastern Pacific for El Niño Modoki I and II, respectively. Thus, El Niño Modoki I shows a symmetric SST anomaly distribution about the equator with the maximum warming in the equatorial central Pacific, whereas El Niño Modoki II displays an asymmetric distribution with the warm SST anomalies extending from the northeastern Pacific to the equatorial central Pacific. Additionally, the warm SST anomalies in the equatorial central Pacific extend further westward for El Niño Modoki II than El Niño Modoki I. Similar to canonical El Niño, El Niño Modoki I is associated with an anomalous anticyclone in the Philippine Sea which induces southwesterly wind anomalies along the south coast of China and carries the moisture for increasing rainfall in southern China. For El Niño Modoki II, an anomalous cyclone resides east of the Philippines, associated with northerly wind anomalies and a decrease in rainfall in southern China. Canonical El Niño and El Niño Modoki I are associated with a westward extension of the western North Pacific subtropical high (WNPSH), whereas El Niño Modoki II shifts the WNPSH eastward. Differing from canonical El Niño and El Niño Modoki I, El Niño Modoki II corresponds to northwesterly anomalies of the typhoon steering flow which are unfavorable for typhoons to make landfall in China. Canonical El Niño and El Niño Modoki I are accompanied with a weakening of the Walker circulation in the Indo-Pacific region, less precipitation and surface easterly wind anomalies in the eastern tropical Indian Ocean, and the opposite is true for El Niño Modoki II. Under the Bjerknes feedback, Canonical El Niño and El Niño Modoki I tend to induce a positive Indian Ocean dipole (IOD), whereas El Niño Modoki II is favorable for forming a negative IOD.