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Impact of the Intraseasonal Oscillation on the Taiwan Climate

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It is known that the eastward moving Intraseasonal Oscillation has impact on the tropical to subtropical climate over the Asian-Australian monsoon region. This study reveals that (1) the Tropical Intraseasonal Oscillation (TISO) can have the impact on the Taiwan climate in the winter, and (2) the boreal summer intraseasonl oscillation (BSISO) also have influence on the typhoon activity and the summer Taiwan rainfall.

During the winter, Taiwan has larger rainfall when TISO reaching the Indian Ocean and the western part of the Maritime Continent, and less rainfall when it moves to the western Pacific warm pool area. The mechanisms suggested by this work are: (1) Tropics to mid-latitude wave train: When the TISO moves to the middle Indian Ocean, a Matsuno-Gill type pattern is induced. The feature of this tropical atmospheric response to the TISO diabatic heating is a pair of upper-level anomalous anticyclones symmetric about the equator to the west of the heating. The northern anomalous anticyclone over the Arabian Sea and northern India induces a northeastward propagating wave train to the middle latitudes. The wave pattern consists of a cyclonic anomaly centered at the East Asia which enhances the winter rainfall in Taiwan. (2) Increase of moisture supply from South China Sea: When the TISO convection approaches the Sumatra and Java of the Maritime Continent, the eastward penetration of equatorial convection enhances a low-level southerly flow which transports the moisture northward to Taiwan and the southern China. As a consequence, with the increase of moisture supply from the south, more winter rainfall is observed in Taiwan.

On the other hand, during the summer season, this study found that the active/inactive periods of the BSISO and the associated horizontal patterns of the western North Pacific typhoon frequency are closely related. Taiwan has larger rainfall when the major BSISO convection moves northwestward from Philippine Sea to the Taiwan area. The anomalous low-level cyclonic flow and the increased typhoon frequency directly result in the larger rainfall in Taiwan. The enhanced low-level southwesterly flow which transports the moisture to Taiwan is responsible for more summer rainfall in Taiwan as well.

The present study demonstrated the locality of the impacts of ISO on the Asian monsoon and Taiwan climate. The results in this work are informative for the weather forecasters to project the possible wet or dry condition during the winter and summer seasons. The mechanisms provided by this study can be used for the intraseasonal weather prediction as a conceptual model.