

Indian Ocean warming and East Asian atmospheric river activity in post El Niño summer

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During springs and summers after strong El Niño winters, warm sea surface temperature (SST) anomaly is widely observed in the Indian Ocean and South China Sea. In addition to the Pacific SST forcing, the warm SST over the Indian Ocean and South China Sea is another key for an anomalous northwestern Pacific anticyclone. The half-year lagged ocean-atmosphere response mediated by the Indian Ocean capacitor effect attracts much attention because of its great importance on the East Asian summertime climate and its seasonal predictability.

Atmospheric rivers (ARs), intense water vapor transport bands in the mid-latitudes, are critically important for water resources and natural disasters over western North America and Europe. Recently it is found that ARs are also frequently observed over the western North Pacific and are related to warm-season heavy rainfall events over East Asia. This study shows that preceding winter's El Niño greatly modulates summertime AR activity over East Asia through the Indian Ocean capacitor effect. The western North Pacific AR activity is consistently enhanced in a global atmospheric reanalysis and atmospheric GCM simulations forced by observed SST in the post El Niño summers. During El Niño-decaying spring and summer, the Indian Ocean warming favors eastward propagating Kelvin wave and anomalous northwestern Pacific anticyclone. The enhanced moist southwesterly facilitates more-frequent ARs over eastern China, Korea and Japan. The results of this study suggest potential predictability of natural disaster risk associated with AR-related heavy rainfall over East Asia at seasonal leads.

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