Possible mechanisms for the coupling between late spring sea surface temperature anomalies over tropical Atlantic and East Asian summer monsoon

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This study investigates about the relationship between the preceding late spring SST over the tropical Atlantic and the East Asian Summer Monsoon (EASM) based on the observational data and CMIP5 historical simulations. The results show that warm (cold) tropical Atlantic SST (TASST) during May tends to be followed by a strong (weak) EASM with positive (negative) precipitation anomalies over the subtropical frontal area. Evidence is also provided that the atmospheric teleconnections propagating in both east and west directions are the key mechanisms linking the EASM with the preceding May TASST. That is, the warm TASST anomaly during late spring can persist through the subsequent summer, which, in turn, induces the Gill-type Rossby wave response in the eastern Pacific, exciting the westward relay of the Atlantic signal, as well as the eastward propagation of the Rossby wave along the jet stream. Furthermore, the westward (eastward) propagating teleconnection signal may induce the anomalous anticyclone in the lower troposphere over the Philippine Sea (anomalous tropospheric anticyclone with barotropic structure over the Okhotsk Sea). The anomalous anticyclonic circulation over the Philippine Sea (Okhotsk Sea) brings warm and humid (cold) air to higher latitudes (lower latitudes). These two different types of air mass merge over the Baiu-Meiyu-Changma region, causing the enhanced subtropical frontal rainfall. To support the observational findings, CMIP5 historical simulations are also utilized. Most state-of-the-art CMIP5 models can simulate this relationship between May TASST and the EASM.

Key words: Tropical Atlantic SST, EASM, CMIP5, Atmospheric teleconnection

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