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Response of South and East Asian summer climate to North Atlantic SST anomalies: sensitivity to SST patterns

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We simulate the response of Asian summer climate to AMO-like (Atlantic Multidecadal Oscillation) sea surface temperature (SST) anomalies using the Intermediate General Circulation Model version 4 (IGCM4). Separate AMO SST patterns are obtained from seven Coupled Model Intercomparison Project phase 5 (CMIP5)/Paleoclimate Model Intercomparison Project phase 3 (PMIP3) global climate models, to explore the sensitivity of the atmospheric response to the SST pattern. Experiments are performed with seven individual and composited AMO SST anomalies globally, and over the North Atlantic Ocean only, for both the positive and negative phases of the AMO. During the positive AMO phase, a Rossby wave train propagates eastward, causing a high pressure anomaly over eastern China/Japan region, associated with a low level anomalous anticyclonic circulation along with warm and dry anomalies. In contrast, the mid-latitude Rossby wave train is less robust in response to the cold phase of the AMO. The circulation response and the associated temperature and precipitation anomalies are sensitive to the AMO SST anomaly patterns. The comparison between global SST and N Atlantic SST experiments indicates that midlatitude East Asian climate anomalies are forced from the North Atlantic region. However, global SST anomaly experiments show that the SST anomalies outside the North Atlantic region, but still associated with AMO, strongly influence South Asian climate as they either strengthen or reduce the precipitation. Experiments with different amplitudes of negative and positive AMO anomalies test the linearity of the response. Over a large region of South and East Asia, temperature has a linear response to the amplitude of North Atlantic SST anomaly associated with both positive and negative AMO conditions, but the precipitation response is nonlinear.