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Decadal Modulation of Precipitation Patterns over Eastern China by Sea Surface Temperature Anomalies

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Annual precipitation anomalies over eastern China are characterized by a south-north dipole structure referred to as the southern flood/northern drought (SF/ND) pattern fluctuating on decadal timescales. A sign shift from one phase to another alters climatic conditions over the entire eastern China region with enormous impact on society, one of which took place around 1976/1977. This paper investigates the driving mechanism of this decadal precipitation pattern and its climate shifts using both observations and idealized climate model experiments conducted by the U.S. CLIVAR Drought Working Group. Observed sea surface temperature (SST) anomalies are projected onto three leadings patterns of climate modes and a group of models are forced with different combinations of these climate modes. We find that the Pacific SST dominates the precipitation patterns over eastern China at decadal scales and its influence is enhanced by the Atlantic SST anomalies of the opposite sign. During a warm phase of the Pacific Decadal Oscillation (PDO) and the cold phase of Atlantic Multi-decadal Oscillation (AMO), large-scale atmospheric circulation favors increased moisture convergence and upward motion over South China, while the opposite occurs over North China, resulting in more precipitation over the South and less precipitation over the North (SF/ND). The opposite pattern occurs during the cold phase of PDO in combination with a warm phase of the AMO. The findings from this paper could be used to predict precipitation pattern shifts over this region using climate information of the PDO and AMO.