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The anomalous water vapor circulation in an extreme drought event in the middle reaches of the Lancang-Mekong River Basin

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In 2019, a record-breaking drought happened in the middle reaches of the Lancang-Mekong River Basin (M-LMRB), which brings about 650 million dollars in economic loss and affected 17 million residences. As climate change evolves, the LMRB is suffering from increasingly frequent and intensive drought with the mechanisms remaining unclear. This study analyzed the water vapor circulation of the drought event in 2019 based on the land-atmosphere water budget and backward trajectory model. Results show that the precipitation of the M-LMRB from May to October 2019 was 71.9% of the climatological mean (1959-2021). The moisture transported from the Indian Ocean, Bay of Bengal, and Pacific Ocean, which are the main moisture sources of the region, was found to decrease through the backward trajectory model. From the comparison of the atmospheric circulation of 2019 and the climatology, the anomalous anticyclone in the BOB, the anomalous westerlies in the Northeast Indian Ocean, and the anomalous cyclone in the Western Pacific Ocean were found to facilitate the stronger export of water vapor jointly. Therefore, the dynamic processes should be more responsible for the extreme drought event of the LMRB in 2019 than the thermodynamics processes. The findings of this study provide new insights into understanding mechanisms of climate change affecting extreme drought events through the atmospheric circulation and are helpful to the risk management of droughts under climate change.