Drought over southwestern Tibetan Plateau triggered by ocean warming more than 10,000 miles away

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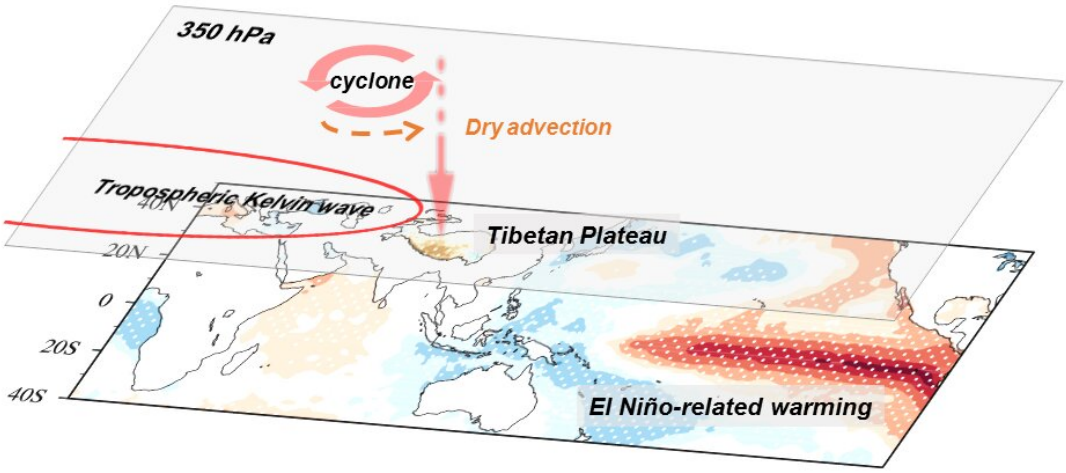

Schematic of the mechanisms responsible for the influence of developing ENSO on the southwest TP summer rainfall. Credit: HU Shuai

The El Niño-Southern Oscillation (ENSO) is a recurring climate phenomenon involving changes in the temperature of waters in the central and eastern tropical Pacific Ocean. It is one of the most important climate perturbations on the Earth because it can change the global atmospheric circulation, which in turn influences temperature and precipitation around the globe.

Scientists have found that ENSO has an impact on hydroclimate over the Tibetan Plateau, but how it works, or its physical mechanism, remains unclear.

In a recently published study in *Journal of Climate*, Hu Shuai, Zhou Tianjun and Wu Bo from the Institute of Atmospheric Physics (IAP) of the Chinese Academy of Sciences explored the dynamical processes that cause the year-to-year variation of summer rainfall over the Tibetan Plateau during the developing ENSO events.

They found that the summer rainfall over the southwestern Tibetan Plateau was more sensitive to the ENSO forcing. During a developing El Niño event occurred on the tropical eastern Pacific, the southwestern Tibetan Plateau located at the Inner Eurasia usually suffered a serious drought, despite a vast distance between the two regions (about 18,000 km).

According to data from different sources and the process-based analysis, the researchers revealed that the anomalous advection of climatological moist enthalpy (mainly dry advection) by anomalous zonal wind induced by ENSO was responsible for the anomalous descending motions and the suppressed rainfall over the southwestern Tibetan Plateau. In this process, the suppressed Indian summer monsoon precipitation and the tropical tropospheric Kelvin wave played a key role of intermediate bridge.

"I hope our study may help improve the prediction of rainfall changes on the Tibetan Plateau, and understand the complicated ENSO-related air-sea interaction responsible for the hydroclimate of the Tibetan Plateau," said Hu.

More information: Shuai Hu et al. Impact of developing ENSO on the Tibetan Plateau summer rainfall, *Journal of Climate* (2021). DOI:

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