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Zonal structure of tropical Pacific surface salinity anomalies affects the two types of El Niño

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Abstract

Many previous efforts have been made in understanding mechanisms of eastern Pacific El Niño (EPEN) and central Pacific El Niño (CPEN). Sea surface salinity (SSS) anomalies are found in the central Pacific during EPEN while more westward during CPEN, but whether these different zonal structures of SSS affect the two types of El Niño remains unclear. Here, based on ocean general circulation model simulations, results show that both El Niño intensities are highly sensitive to the zonal locations of SSS anomalies and have the largest amplitude when the SSS anomalies are in 180 – 170°W. Temperature budget analysis reveals that vertical mixing and entrainment determine this temperature sensitivity, which is strongest in response to SSS anomalies in the central Pacific. The SSS anomalies in the central Pacific increase the EPEN warming by 0.15°C while the westward SSS anomalies only enhance the CPEN by 0.03°C. Therefore, the different zonal structures of SSS anomalies clearly facilitate stronger EPEN than the CPEN, enlarging their difference in intensity by 12%.

Keywords

salinity, El Niño, ENSO, tropical Pacific