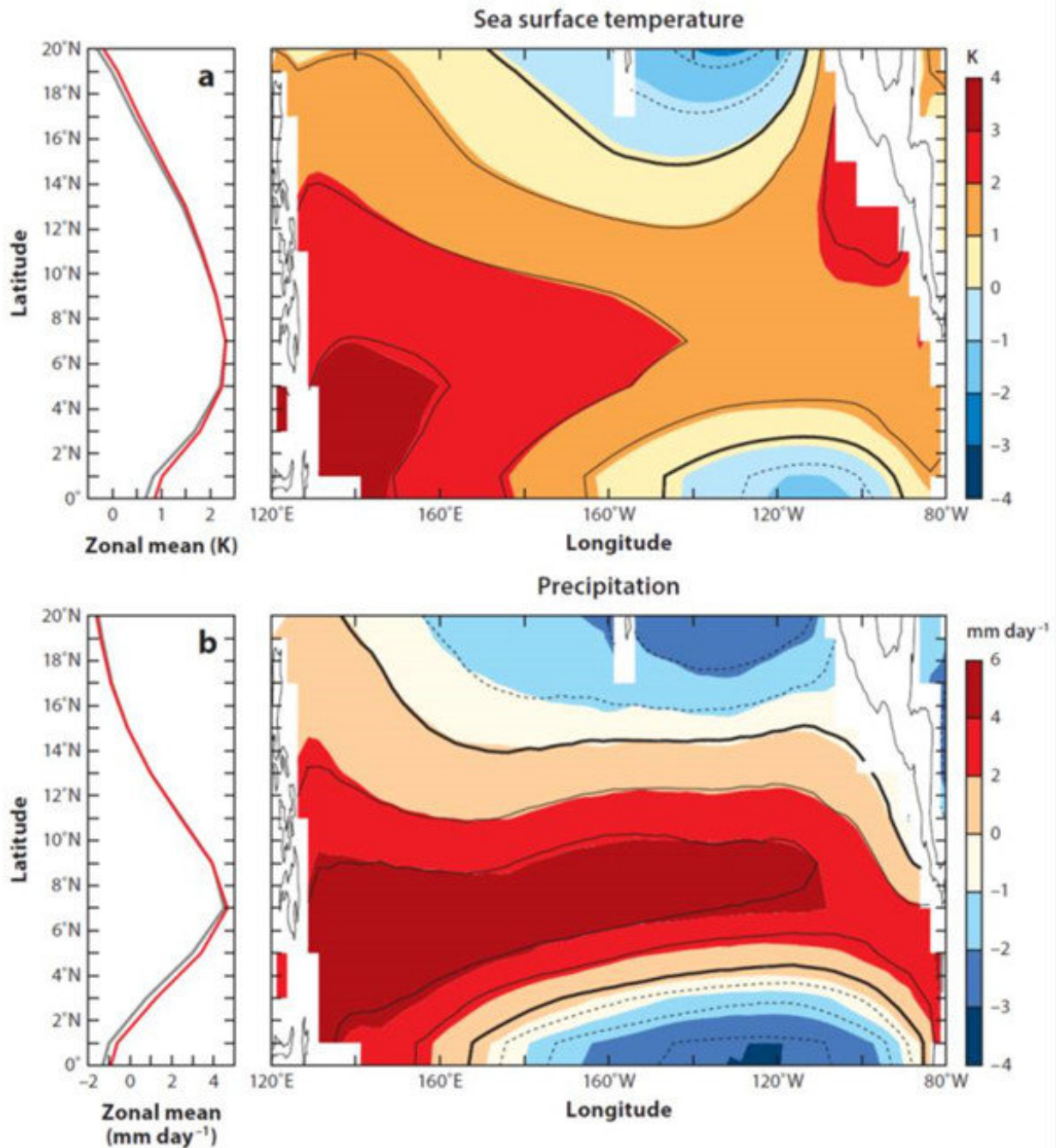


Responses of the tropical atmospheric circulation to climate change

June 20 2018



Multimodel ensemble and long-term mean of the sea surface temperature and precipitation in the Pacific intertropical convergence zone. The patterns show the deviations from the tropical Pacific (30°S-30°N, 120°E-80°W) mean. Credit: Ma et al.

The tropical circulation change under global warming has been a growing subject of research in recent decades. It has a close relationship with the tropical precipitation change, and the uncertainty in making projections is one of the difficulties in climate science.

A special review by MA Jian, a professor at the college of marine sciences in Shanghai Ocean University, Prof. HUANG Gang from the Chinese Academy of Sciences and international collaborators have published an article in *Annual Review of Earth and Planetary Sciences* describing the climate change-induced responses of the tropical atmospheric [circulation](#) and their impacts on the hydrological cycle. It also depicts the theoretically predicted changes and diagnoses physical mechanisms for observational and model-projected trends in large-scale and regional climate.

For the large-scale circulation, the tropical circulation slows down with moisture and stratification changes, connecting to a poleward expansion of the Hadley cells and a shift of the intertropical convergence zone. Redistributions of regional precipitation consist of thermodynamic and dynamical components, including a strong offset between moisture increase and circulation weakening throughout the tropics. This allows other dynamical processes to dominate local circulation changes, such as a surface warming pattern effect over oceans and multiple mechanisms over land. To improve reliability in [climate](#) projections, the authors suggest that more fundamental understandings of pattern formation, circulation change, and the balance of various processes redistributing land rainfall are needed.

More information: Jian Ma et al, Responses of the Tropical Atmospheric Circulation to Climate Change and Connection to the Hydrological Cycle, *Annual Review of Earth and Planetary Sciences* (2018). [DOI: 10.1146/annurev-earth-082517-010102](https://doi.org/10.1146/annurev-earth-082517-010102)

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