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Tropical Pacific warming patterns modulates future hydroclimatic changes and extreme events on five continents

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Abstract

The eastern tropical Pacific region is projected to warm at a faster rate than other tropical ocean regions in the 21st century. This projected trend, however, is in stark contrast to the observed central Pacific cooling and strengthened Pacific trade winds in the satellite era. Whether this current trend is transient, and if/when we can expect a reversal of warming trends in the eastern Pacific has been a much-debated topic among scientists, yet no consensus has emerged owing in large part to the discrepancies between historical model simulations and observations. Meanwhile, less focus has been paid to the potential impacts a future eastern Pacific warming could have on land. Here, I address this knowledge gap through a series of A-GCM model simulations with a range of tropical Pacific warming pattern scenarios - some which resemble the observed pattern and some which show an enhanced eastern Pacific warming, and I show how the tropical Pacific can modulate the future hydroclimatic response to global warming - both in terms of mean state changes and effects associated with ENSO. Hydroclimatic changes influenced by the tropical Pacific warming pattern can be found across North, Central and South America as well as the Indo-Pacific region and Africa. These results place the debate of projected Pacific climate in a framework of adaptation and mitigation relevance, enabling policy-makers to gauge climate impact uncertainty associated with tropical Pacific warming.

Keywords

Sea-surface temperature, rainfall, global warming, pattern-effect