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The future of subtropical rainfall

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The subtropics encompass many of the world's driest regions and climate models robustly predict a large-scale decline in subtropical precipitation from anthropogenic forcing. This projection has become popularly related to the dry-get-drier paradigm. The expectation that climate change will generally exacerbate the rainfall deficiency of the subtropical regions has excited great concerns. On the other hand, some studies have attributed the subtropical precipitation decline to the pole ward expansion of the Hadley cell. In this talk, I will show that neither the dry-get-drier nor pole ward expansion mechanism is relevant to the large-scale subtropical precipitation decline. It is found that the subtropical precipitation decline forms primarily from the fast adjustment to CO_2 forcing in which neither of the two proposed mechanisms exists. Permitting the increase in moisture and the Hadley cell expansion does not substantially change the characteristics of the large-scale subtropical precipitation decline. This precipitation change should be interpreted as a response to the land-sea warming contrast, direct radiative forcing of CO_2 and in certain regions, pattern of SST changes. In addition, a careful examination of the spatial patterns of the projected precipitation change shows that the subtropical precipitation decline is primarily located over ocean. Over subtropical land regions, the precipitation decline is muted or even reversed by the land-sea warming contrast.

Biography

Jie He has studied changes in hydro-climate and atmospheric circulation from anthropogenic forcing. His research focuses on understanding the physical mechanisms of the climate system using model simulations. His presentation is about the subtropical precipitation has recently been published in *Nature Climate Change*. He has also worked on understanding and reducing uncertainties in climate projections on both global and regional scales. One of his current research projects involves the dynamics of tropical air-sea interactions. The goal is to quantify various coupling feedback processes in order to build a simple and practical framework for understanding model biases and future changes in air-sea interaction. He has also started working on the connection between transient climate sensitivity and regional ocean heat uptake.

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