

Tightening of Tropical Ascent and the Implications for Global and Regional Hydrological Cycle

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Climate model simulations show that the Hadley Circulation undergoes significant structural changes in response to surface warming associated with the increase of greenhouse gases. These changes include the tightening and strengthening of equatorial ascent, weakening of subtropical descent, and poleward shift of descent boundary. These structural changes are closely related to the changes of top-of-atmosphere cloud radiative effects and atmospheric radiative cooling rates, which in turn affect global and regional precipitation changes. In this talk, I will present observational evidence of the tightening of Hadley ascent and related hydrological responses, and an investigation of the primary driver for large inter-model spread in the Hadley Circulation changes and hydrological sensitivity.