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Tropical expansion driven by poleward advancing subtropical front

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Abundance of evidence shows that the tropics are expanding in the past four decades. Despite many attempts to decipher its cause, the underlying dynamical mechanism driving tropical expansion is still not clear. Here, based on observations and multi-model simulations from the Coupled Model Intercomparison Project phase 5 (CMIP5), the variations and trends of tropical width are explored from a regional perspective. We find that the width of the tropics closely follows the meridional displacement of oceanic subtropical front. Under global warming, the subtropical ocean experiences more surface warming due to convergence of surface water. Such enhanced warming, superimposing onto the variation of Pacific Decadal Oscillation, leads to poleward advancing of subtropical front and drives the tropical expansion. Our results, supported by both observations and model simulations, imply that the observed expanding tropics may largely attributed to the anthropogenic global warming rather than the natural climate variability.