

Impacts of tropical tropopause warming on the stratospheric water vapor

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We investigate the impact of the tropical tropopause temperature (TTT) on the stratospheric water vapor using the Specified Dynamics version of the Whole Atmosphere Community Climate Model. It is found that the tropical tropopause warming results in significant moistening in the lower stratosphere and a strengthening of the Brewer-Dobson circulation (BDC). The strengthening of BDC, induced by a warming of tropical tropopause within 12°, propagates more dry air from the tropical tropopause layer into the stratosphere and thus causes a decrease of water vapor in the stratosphere above 60 hPa. On the contrary, a broader warming (within 25°) leads to an increase of water vapor in both the lower and middle stratosphere. The results suggest the control of the stratospheric humidity by the TTT could be significantly offset by the associated BDC changes.

Key words: stratospheric water vapor, tropical tropopause temperature, Brewer-Dobson circulation, Specified Dynamics WACCM