



A thermodynamic constraint on the depth of the global tropospheric circulation

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The troposphere is the region of the atmosphere characterized by low static stability, vigorous diabatic mixing, and widespread condensational heating in clouds. Previous research has argued that in the tropics, the upper bound on tropospheric mixing and clouds is constrained by the rapid decrease with height of the saturation water vapor pressure and hence radiative cooling by water vapor in clear sky regions. Here the authors contend that the same basic physics play a key role in constraining the vertical structure of tropospheric mixing and cloud incidence throughout the globe. It is argued that radiative cooling by water vapor plays an important role in governing the depth and timescale of large-scale dynamics at extratropical latitudes.