

Quantifying Stratospheric Water Vapor Feedback in GEOSCCM

We use a feedback suppression method to quantify the stratospheric water vapor feedback in GEOS CCM. The results show that the stratospheric water vapor climate feedback parameter is $0.11 \text{ W m}^{-2} \text{ K}^{-1}$, contributing to 0.5 K, or 10%, of global mean surface warming under abrupt CO_2 quadrupling.

The advantage of our new approach is that we can quantify the impact of stratospheric water vapor increase on temperature and circulation. The stratospheric water vapor feedback plays a role in Arctic amplification. It causes poleward shift of tropospheric midlatitude jet.

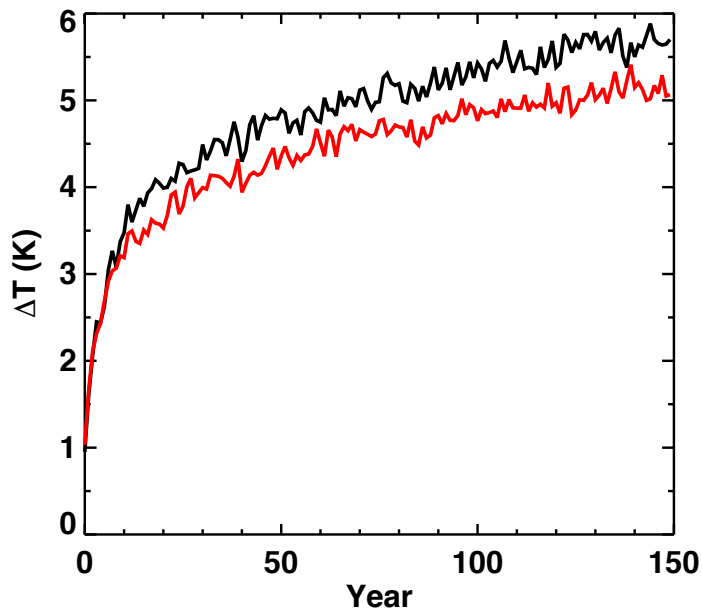


Figure 1: Time series of annual and global mean surface air temperature anomalies for abrupt $4\times\text{CO}_2$ simulations with (black) and without (red) stratospheric water vapor feedback.

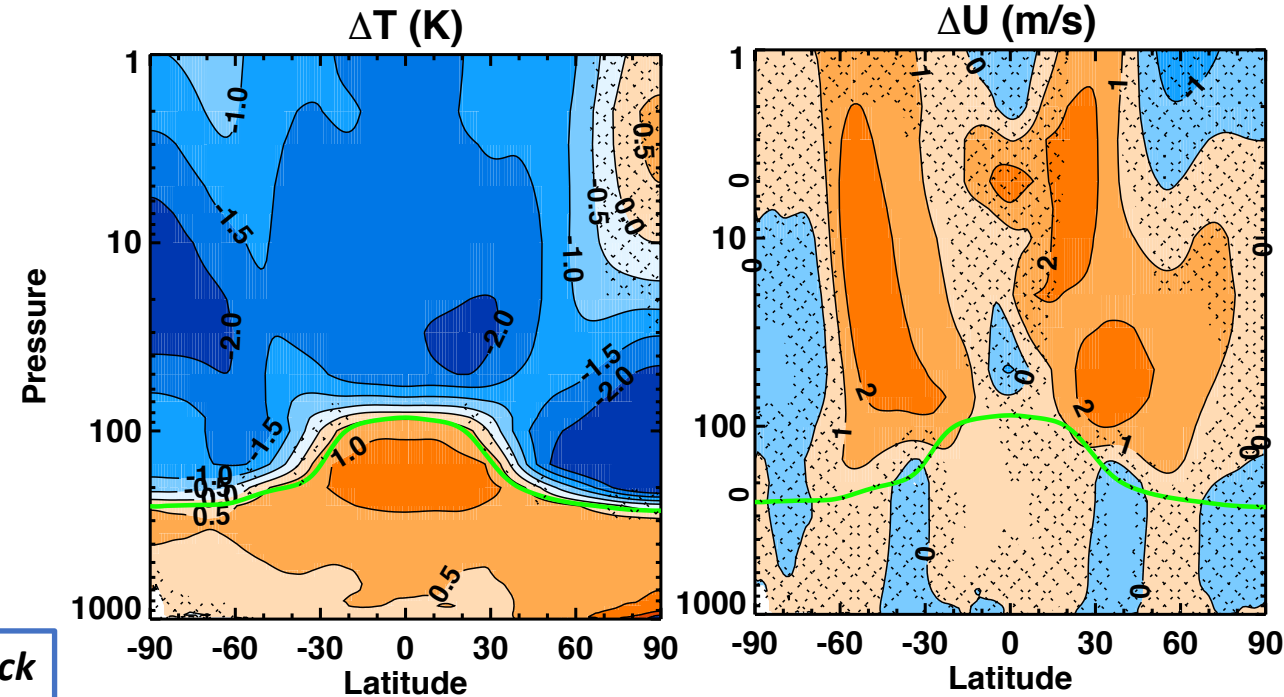


Figure 2: Changes in (left) temperature and (right) zonal wind caused by the stratospheric water vapor feedback.

Li, F., and P. A. Newman (2020), Stratospheric water vapor feedback and its climate impacts in the coupled atmosphere-ocean Goddard Earth Observing System Chemistry-Climate Model, Climate Dynamics, 55(5), 1585-1595, doi:10.1007/s00382-020-05348-6