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# Stratospheric water vapor: an important climate feedback

Antara Banerjee (1), Gabriel Chiodo (1), Lorenzo Polvani (1,2)

(1) Department of Applied Physics and Applied Mathematics, Columbia University, New York, USA, (2) Department of Earth and Environmental Sciences, Lamont Doherty Earth Observatory, Palisades, New York, USA

The importance of stratospheric water vapor (SWV) as a climate feedback remains highly uncertain. Here, we calculate the climate feedback of SWV under an abrupt quadrupling of $CO_2$ for 24 CMIP5 models. All models robustly show a moistening of the stratosphere. This is associated with a multi-model, global mean net stratospheric adjusted radiative forcing (RF) of $0.89 \pm 0.26$ $Wm^{-2}$ and a climate feedback of $0.18 \pm 0.12$ $Wm^{-2}K^{-1}$, with the stratospheric temperature adjustment playing an important role. These effects are important for climate: the global mean SWV-driven RF represents $\sim$10% of the $CO_2$-driven RF, and the feedback is on the same order of magnitude as the surface albedo and cloud feedbacks. On regional scales, the radiative effects of SWV can be even greater: the SWV-driven RF can reach 30% of the $CO_2$ value in the northern extratropics, and can be even higher in individual models. We also find that the majority ($\sim$70%) of the SWV-RF results from its increases in the extratropical lowermost stratosphere. These results highlight the importance of SWV for climate and call for further efforts in understanding drivers of water vapor variability in the extratropical lowermost stratosphere.