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Stratospheric moistening after 2000

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The significant climate feedback of stratospheric water vapor (SWV) necessitates quantification of changes in the SWV budget. Model simulations driven by the newest ECMWF reanalysis ERA5, satellite observations from the Microwave Limb Sounder (MLS) and in-situ frost point hygrometer observations from Boulder consistently show substantial stratospheric moistening after the year 2000, following a drop in water vapor at the turn of the millenium. The time evolution of the simulated SWV anomalies is in excellent agreement with that derived from MLS. We find strong positive SVW trends in the Northern Hemisphere and weakly negative trends over the South Pole, mainly during austral winter. Moistening of the tropical stratosphere after 2000 occurs mainly during late boreal winter/spring, reaches values of □0.2 ppm/decade, is well correlated with a warming of the cold point tropopause by □0.4 K/decade and is partially caused by volcanic eruptions and ENSO.