

Understanding the long-term trend in stratospheric water vapor

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Chemistry-climate models predict that 1) the TTL warms during the 21st century and 2) the humidity of air entering the stratosphere increases over this same period. It seems reasonable to conclude that the former causes the latter, but to our knowledge no one has actually shown that. We test this hypothesis in two chemistry-climate models (the Goddard Earth Observing System Chemistry Climate Model, GEOSCCM, and the Whole Atmosphere Community Climate Model, WACCM). We find that the warming of the TTL explains only part of the increase in stratospheric water vapor over the 21st century. We demonstrate that the remainder of the trend can be explained by an increase in the flux of ice through the TTL. An analysis of MLS data provides some support that this is occurring in the real world.