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Trends in upper stratospheric temperatures and in the stratopause from satellite limb instruments

Stratospheric cooling and contraction are projected to occur in response to increasing anthropogenic greenhouse gas emissions. However, temperature changes in the upper stratosphere, particularly above ~45 km, are difficult to quantify and model due to a deficit of observational data in this region. The recently developed v7.3 upper stratospheric (35-60 km) temperature data product from the Optical Spectrograph and InfraRed Imager System (OSIRIS) includes over 22 years of observations that can be used to estimate temperature trends. The trends in OSIRIS temperatures over 2005–2021 are compared to those from two other satellite limb instruments: Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) and the Microwave Limb Sounder (MLS). We find that the stratosphere cooled by ~0.5–1 K/decade during this period. Results from the three instruments are generally in agreement. We also consider trends at the stratopause: both SABER and OSIRIS observations suggest that the tropical stratopause moved lower during 2005–2021, a sign of middle atmospheric contraction.

Topic

Atmospheric composition (Earth and planets), chemistry and transport

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