



Stratospheric O₃ changes during 2001-2010: The small role of solar flux variations in a CTM

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Solar spectral fluxes (or irradiance) measured by the SOlar Radiation and Climate Experiment (SORCE) shows different variability at ultraviolet (UV) wavelengths compared to other irradiance measurements and models (e.g. NRL, SATIRE-S). Some modelling studies have suggested that stratospheric O₃ changes during solar cycle 23 (1996-2008) can only be reproduced if SORCE solar fluxes are used. We have used a 3-D chemical transport model (CTM), forced by meteorology from the European Centre for Medium-Range Weather Forecasts (ECMWF), to simulate stratospheric O₃ using 3 different solar flux datasets (SORCE, NRL-SSI and SATIRE-S). Simulated O₃ changes are compared with Microwave Limb Sounder (MLS) and Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) satellite data. Modelled O₃ anomalies using all solar flux datasets show good agreement with the observations, despite the different flux variations. A notable feature during this period is a robust positive solar signal in the tropical middle stratosphere. The CTM reproduces these changes through dynamical information contained in the analyses. Changes in the upper stratosphere cannot be used to discriminate between solar flux datasets due to large uncertainties in the O₃ observations. Overall this study suggests that the UV variations detected by SORCE are not necessary to reproduce observed stratospheric O₃ changes during 2001-2010.