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A model study on the stratospheric and tropospheric response to the 11-year solar signal

A. Kubin (1), U. Langematz (1), K. Nissen (1), K. Matthes (1,2) and P. Jöckel (3)

(1) Institut für Meteorologie, Freie Universität Berlin, Germany, (2) NCAR, Boulder, Colorado, USA, (3) Max-Planck-Institut für Chemie, Mainz, Germany

We present a model study to show the stratospheric and tropospheric response to the 11-year solar signal. We conducted 11-year solar maximum and minimum experiments, using the new ECHAM5/MESSy climate model system. The extended radiation code FUBrad was included enabling the model to better represent UV changes associated with the solar cycle. Spectral irradiance and solar cycle induced ozone changes were prescribed. We used the T42L39 model resolution to perform a 25 year solar maximum and minimum equilibrium simulation, respectively. The model simulates an improved poleward-downward movement of zonal wind anomalies during northern winter. The 11-year solar signal was found to be transferred downward from the upper to the lower stratosphere via dynamical processes involving a modulation of the polar night jet and the mean meridional circulation thus confirming the transfer mechanism proposed by Kodera and Kuroda (2002). This improvement in the new model is found to be due to enhanced interannual variability in the subtropical mesosphere associated with the parameterization of gravity wave dissipation. An AO-like response pattern in January occurs which extends from the stratosphere to the troposphere leading to changes in temperature and circulation in the troposphere during northern winter.