The effect of solar variability on the atmospheric radiation budget as simulated in chemistry climate models (CCMs) depends on the capability of the broad-band radiation schemes used by the CCMs to account for the spectral variations of solar irradiance. Another aspect influencing the amplitude of the simulated solar signal is the spectral solar flux that needs to be prescribed at the top of the model atmosphere. The purpose of this study is to quantify the effects of prescribing different solar flux data sets on the simulated atmospheric response using an improved short-wave (SW) radiation parameterization.

We will present results obtained with the FUBRad SW radiation scheme that was run in offline-mode and as interactive module in the ECHAM5-MESSy (EMAC) CCM. Two different spectral solar flux input data sets have been prescribed at the top of the atmosphere: (a) daily spectral data from UARS/SOLSTICE as recommended by the CCMVal initiative (‘Lean-data’) and (b) daily solar measurements made by the Spectral Irradiance Monitor (SIM) instrument aboard the Solar Radiation and Climate Experiment (SORCE). The two data sets show a different temporal evolution between 2004 and 2007 with up to 10 times larger radiation changes in the ultraviolet (UV) for SIM compared to the Lean data. In contrast, the visible (VIS) and near-infrared (NIR) variations in the SIM data were out-of-phase to the changes in TSI and UV, with increasing irradiance towards solar minimum. In this study SW heating rate differences between May 2004 and the minimum of the solar cycle 24 in November 2007 will be compared. To account for temperature and circulation changes results from corresponding simulations with the CCM EMAC-FUB will be discussed.