



## **Sensitivity of the photolysis rate to the uncertainties in spectral solar irradiance variability**

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The state of the stratospheric ozone layer and temperature structure are mostly maintained by the photolytical processes. Therefore, the uncertainties in the magnitude and spectral composition of the spectral solar irradiance (SSI) evolution during the declining phase of 23rd solar cycle have substantial implications for the modeling of the middle atmosphere evolution, leading not only to a pronounced differences in the heating rates but also affecting photolysis rates. To estimate the role of SSI uncertainties we have compared the most important photolysis rates ( $O_2$ ,  $O_3$ , and  $NO_2$ ) calculated with the reference radiation code libRadtran using SSI for June 2004 and February 2009 obtained from two models (NRL, COSI) and one observation data set based on SORCE observations. We found that below 40 km changes in the ozone and oxygen photolysis can reach several tenths of % caused by the changes of the SSI in the Harley and Huggins bands for ozone and several % for oxygen caused by the changes of the SSI in the Herzberg continuum and Schumann-Runge bands. For the SORCE data set these changes are 2-4 times higher. We have also evaluated the ability of the several photolysis rates calculation methods widely used in atmospheric models to reproduce the absolute values of the photolysis rates and their response to the implied SSI changes. With some remarks all schemes show good results in the middle stratosphere compare to libRadtran. However, in the troposphere and mesosphere there are more noticeable differences.