

SPARC SOLARIS & HEPPA intercomparison activities: Multi-model comparisons of the sensitivity of the atmospheric response to the SORCE solar irradiance data set

Katja Matthes[†]; Joanna Haigh; Felicitas Hansen; Jerry Harder; Sarah Ineson; Kunihiko Kodera; Ulrike Langematz; Daniel Marsh; Aimee Merkel; Paul Newman; Adam Scaife; Richard Stolarski; William Swartz

[†] Helmholtz Centre Potsdam, GFZ, Germany

Leading author: matthes@gfz-potsdam.de

Uncertainties in the solar irradiance could have a large impact on simulations of the climate system, since the response of the atmosphere strongly depends on the spectral distribution of the solar irradiance. Most (chemistry) climate models today use the standard Lean spectral variability to study the effect of the 11-year solar cycle on climate. However, recent measurements for example from the SORCE-SIM instrument show a completely different spectral distribution than expected, with possible implications for solar heating and ozone chemistry. We compare a number of sensitivity experiments with 2D and 3D chemistry climate models using the SIM spectrally resolved solar irradiance data to study the response of the atmosphere. The response to the standard Lean data set will be compared to the new SORCE/SIM measurements. We will focus in particular on the shortwave heating rates, temperatures, ozone and circulation changes. The comparison of the response in a number of different models allows us to better understand the models' sensitivity to the spectral distribution of the radiation and will help to estimate uncertainties in using the standard solar irradiance data set in the CMIP5 simulations.