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SPARC SOLARIS & HEPPA intercomparison activities: Sensitivity of the atmospheric response to idealized spectrally resolved solar forcing in WACCM

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To date, most (chemistry) climate modeling studies of the 11-yr solar cycle effects on climate use the Lean dataset as input for the spectrally-resolved solar forcing. The variations of the spectral solar irradiance (SSI) estimated by others points at a higher solar cycle amplitude in the UV part of the spectrum which is responsible for heating and ozone chemistry. Recent SORCE-SIM measurements also show a different spectral behaviour of the radiation as previously thought. A major limitation of satellite measurements, upon which empirical models of solar variability are based, is that the instrumental uncertainty becomes comparable or higher than the solar cycle variations at wavelengths longer than 250-300nm. We will test the uncertainty in the atmospheric response to idealized solar forcings with NCAR's Whole Atmosphere Community Climate Model, version 3.5 (WACCM3.5). We performed four sensitivity experiments with WACCM-3.5. Two experiments use either constant solar maximum or minimum conditions according to the stantard Lean dataset. The other two include a constant 1% increase in the radiation between 300-400nm for solar maximum and minimum conditions, respectively. All other forcings are kept constant (e.g. SSTs, GHGs), and therefore simulated changes in the model climate can be unambiguously attributed to the imposed changes in the solar forcing. We analyse the changes in several model variables, as e.g. temperature, shortwave heating and ozone production. Furthermore, the analysis of Eliassen-Palm fluxes and residual velocities is done to investigate the dynamical response in the middle atmosphere. The results of these experiments and their implications for future studies of solar cycle impacts on climate will be discussed.