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Influences of different solar irradiance spectra on the simulated mean state of the stratosphere

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The sensitivity of the stratospheric mean state to four different reference solar irradiance spectra describing a quite Sun (year 2008) is investigated using a chemistry climate model. Simulations show that the mean thermal state of the stratosphere depends considerably to the specified spectrum given that the annual mean temperature in tropical stratopause varies by more than 3 K, in some cases. Temperature anomalies are stronger in boreal winter and the polar night westerlies strengthen by about 15%. The simulated ozone climatology is also influenced by the choice of the reference spectrum and our model simulates concentration changes up to 6-7% in the middle stratosphere. Given that net effect of the ozone response is to dump temperature anomalies, we find an amplified temperature perturbation of about 20-30% in twin simulations without interactive chemistry coupling. Using a 2-D chemistry climate model we identify the spectral regions that contribute the most to the sensitivity of the stratosphere to the specified reference spectrum.