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Interactive comment on "Middle atmosphere response to different descriptions of the 11-yr solar cycle in spectral irradiance in a chemistry-climate model" *by* W. H. Swartz et al.

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Interactive comment on "Middle atmosphere response to different descriptions of the 11-yr solar cycle in spectral irradiance in a chemistry-climate model" by W. H. Swartz et al,

This is an interesting study discussing the effect of SORCE-based SSI and modelled NRL SSI fluxes on the stratospheric ozone and temperatures using GEOS CCM simulations. The simulated solar response in stratospheric ozone is compared with the estimated solar response from satellite data sets. However, the authors seems to have missed the discussion of solar response using a 3-D CTM (SLIMCAT) in Dhomse et al.

(2011). The GEOS modelled solar response using NRL-SSI in the tropics (Figure 4 in current manuscript) seems to be consistent with our results (Figure 4 and 5 in Dhomse et al). We would suggest the following points are considered.

1. Page 7052 line 1 and Page 7056. The authors argue that the ozone and temperature responses are additive and independent, which is true in the lower stratosphere. However, in Dhomse et al, (Fig-3) we clearly show that there is strong anti-correlation between T and O3 in the upper stratosphere especially near 40-50 km, where GEOS (as well as SLIMCAT with ECMWF meteorological fields) shows nearly negligible solar response. This is consistent with HALOE measurements (Remsberg 2008). However, our modelled simulations with fixed dynamics (RUN D in Dhomse et al) shows nearly 4% solar response at this altitude similar to SBUV and SAGE measurements (Soukharev and Hood, 2006). The authors should discuss the differences in solar response derived from satellite measurements.

2. Another interesting result is the lower stratospheric solar response. As lower stratospheric ozone is the primary contributor to the total column, the observed solar response in total ozone is thought to be of dynamical origin. Various studies argue that a weakened B-D circulation during solar minimum leads to less ozone transport to high latitudes, giving rise to a significant positive solar response in tropical total ozone.

However, in our earlier study (Dhomse et al, 2006) we have shown that mid-high latitude total ozone increases during solar cycle 23, were the combined effect of a stronger B-D circulation (or planetary wave driving) and solar cycle. In that sense the GEOS simulated solar response in total ozone (shown in Figure 6) seems to be consistent with those results highlighting that photochemistry plays a major role in determining in solar response in total ozone at all latitudes. A discussion on this point could be added.

Dhomse, S; Chipperfield, MP; Feng, W; Haigh, JD (2011) Solar response in tropical stratospheric ozone: a 3-D chemical transport model study using ERA reanalyses, Atmos. Chem. Phys., 11, pp. 12773-12786.

Dhomse, S; Weber, M; Wohltmann, I; Rex, M; Burrows, J (2006) On the possible causes of recent increases in northern hemispheric total ozone from a statistical analysis of satellite data from 1979 to 2003, Atmos. Chem. Phys., 6, pp. 1165-1180.

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