Impact of climate change on the stratosphere:

GHG-x
fGHG
fODS
REF-B1
RCP 2.6, 4.5, 8.5
compare them to the AC&C / SPARC ozone database and other results.

Arctic (~40 DU by 2100) with divergence mainly in the second half of the 21st century.

scenarios are found to be largest over northern midlatitudes (~20 DU by 2100) and in the play a role in scenarios with higher GHG emissions. Differences among the six GHG reactive nitrogen and hydrogen that lead to additional chemical ozone destruction mainly lower emissions result in smaller increases in tropical upwelling with resultant smaller ozone, 21st century projections from four chemistry-climate models are examined for Tropical Upper Stratosphere

CCMVal-2 SRES A1B, B1

Tropics Lower Stratosphere

Tropics: Larger differences in the future with higher GHG scenarios.

Motivation: Effect of including a realistic stratosphere:

Son et al., JGR (2010)

More impacts of the ozone hole on surface climate have been investigated but have yet to be fully quantified (e.g. observed increase in sea-surface area averaged around Antarctic decreases of carbon uptake over the Southern Ocean.)

2030 WMO-CLIM ozone database assessment

AC&C/SPARC ozone database for CMIP5 models without interactive chemistry

Stratosphere

A multiple linear regression analysis of SAGE I+II satellite observations and polar ozoneondes measurements is used for the stratospheric dataset during 1979 to 2005. The regression includes terms representing equivalent effective stratospheric chlorine (EESC) and the 11-year solar cycle variability. The EESC regression coefficients are used to extrapolate that data back in time, and form a stratospheric ozone time series back to cover the entire historical time period 1850-2009.

The stratospheric ozone projections are taken from the future climate simulations (REB2) of the 13 CCMs that performed a future scenario until 2100 under the SRES A1B GHG scenario and the A1 adjusted halogen future reference simulations (REF-B2) of the 13 CCMs.

Sensitivity of 21st century stratospheric ozone to greenhouse gas scenarios

Figure 2. Decadal averages of stratospheric column ozone from the 1980s to the 2000s for the historical database and three future scenarios.

Both models simulate tropospheric and stratospheric chemistry with feedback to the radiation and were driven by the recently available historical (1950-2000) emission record described in Lamarque et al. (2010).