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Modeling the impact of late 20th century stratospheric ozone changes: Sensitivity to different ozone forcing data sets

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Several climate model studies have addressed the role that 20th century Antarctic ozone depletion has played in observed changes in both stratospheric and tropospheric climate: Polvani et al. (2011) have even suggested that the ozone depletion was the dominant driver of 20th century climate changes in the Southern Hemisphere. However, the great majority of climate model studies have used either the ozone data set of Randel and Wu (2007) or the related one of Cionni et al. (2011), which do not capture the depth of the ozone hole. This issue has recently been addressed by developing a new ozone data set, drawing on the extensive database of observations collated by Hassler et al. (2009): the BDBP. The BDBP data were used to develop a comprehensive statistical model to produces a spatially and temporally continuous data set suitable for global climate models. We will show a series of climate model simulations to illustrate the sensitivity of the modeled ozone-hole signal to the ozone data set employed, comparing the Randel and Wu, Cionni et al., and BDBP-based data. Results will be presented in the context of existing studies to to determine the importance of the climate model ozone data set for studying the impact of 20th century ozone depletion. Cionni, I. et al., 2011. Ozone database in support of CMIP5 simulations: Results and corresponding radiative forcing. Atmos. Chem. Phys. Discuss., 11, 10,875-10,933. Hassler, B., G. E. Bodeker and M. Dameris, 2008. Technical Note: A new global database of trace gases and aerosols from multiple sources of high vertical resolution measurements. Atmos. Chem. Phys., 8, 5403-5421. Polvani, L.M. et al., 2011. Stratospheric Ozone Depletion: The Main Driver of Twentieth-Century Atmospheric Circulation Changes in the Southern Hemisphere. J. Clim., 24, 795-812. Randel, W.J. and F. Wu, 2007. A stratospheric ozone profile data set for 1979-2005: Variability, trends, and comparisons with column ozone data. J. Geophys. Res., 112, D06313, doi: 10.1029/2006JD007339.