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The role of ozone forcing on climate models

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Fourteen coupled Atmospheric Oceanic Global Circulation Models (AOGCMs) and seven Chemistry Climate Models (CCMs) are compared to radiosonde and satellite observations to assess model performance and to study the connection between ozone forcing and model temperature trends during the last two decades. Overall, CCMs and AOGCMs that include time-varying ozone forcing agree reasonably well with observations in the lower stratosphere for both annual and seasonal averages, but models without time-varying ozone forcing (fixed) are statistically different from observations between $\sim$ 150 hPa and 10 hPa. Both CCMs and those AOGCMs with time-varying ozone forcing capture the seasonality of the observed southern hemisphere extratropical lower stratospheric temperature trends. In the tropical lower stratosphere, only a few models show seasonal temperature trend variations that resemble the observations. In the middle troposphere (500 hPa), significant differences between models and observations were found, both in the tropics (during DJF and JJA) and in the southern hemisphere extratropics (during MAM and JJA). These differences are difficult to reconcile, although our analyses indicate that the inclusion of stratospheric ozone forcing may affect trends from the stratosphere down into the troposphere.