Supporting Online Material for

The Impact of Stratospheric Ozone Recovery on the Southern Hemisphere Westerly Jet

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This PDF file includes:

Supplementary Material: CCMVal Model Evaluation

by Son et al.

The performance of CCMVal models is evaluated by comparing zonal-mean zonal wind trends as simulated by CCMVal models with those in reanalyses data. Figure S1a shows the linear trend of December-February zonal-mean zonal wind between 1979 and 2000 in the ECMWF reanalysis data (ERA40): as indicated in the paper, the SH westerly jet has been accelerated on the poleward side. This poleward acceleration is well captured by the CCMVal models, as seen in Fig. S1b. Although some discrepancies are found in the tropics, the simulated trend in the extratropics is quantitatively similar to one in the ERA40.

Figure S2 shows the December-February zonal-mean zonal wind trend at 850 hPa for both reanalyses and the CCMVal models. Since the location of westerly jet is slightly different among the models, trends are shown with respect to the jet center in each model integration. It can be seen that the CCMVal models successfully reproduce near surface wind change with only one exception.

The CCMVal models reproduce not only the spatial pattern of zonal wind change but also its temporal evolution. The temporal variability of near surface zonal wind is quantified by the 850-hPa Δ[u] as described in the paper, and shown in Fig. S3. Since four CCMVal models were integrated starting from 1960 (AMTRAC, CMAM, GEOSCCM, and WACCM), a separate composite time series for those long-term integrations is also shown (dashed line). It is clearly seen that the CCMVal models faithfully reproduce the interannual variability and long-term trend of SH westerly jet in the observations.

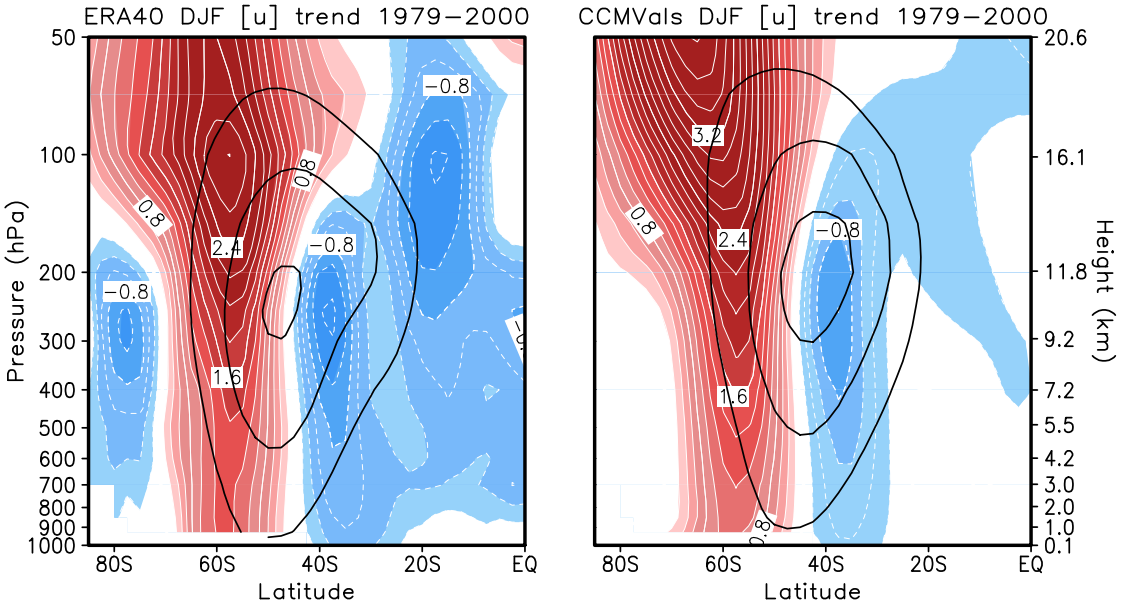

Figure S1: Trends in December-February zonal-mean zonal wind between 1979 and 2000: (left) ERA40 and (right) CCMVal models. Shading and contour intervals are 0.2 ms^{-1}/decade. Deceleration (acceleration) is indicated with blue (red) colors, and trends weaker than 0.2 ms^{-1}/decade are omitted. Superimposed black solid lines are December-February zonal-mean zonal wind averaged from 1979 to 2000, with a contour interval of 10 ms^{-1} starting at 10 ms^{-1}.

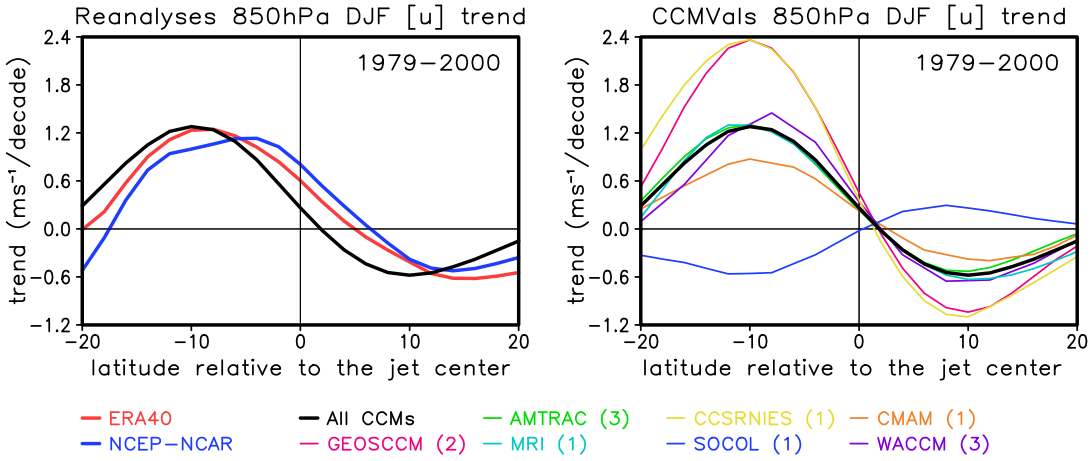

Figure S2: Trends in December-February zonal-mean zonal wind at 850 hPa between 1979 and 2000: (left) for the ERA40, NCEP-NCAR reanalyses, and CCMVal multi-model mean, and (right) for the individual CCMVal models. All trends are shown with respect to the location of jet center in each model integration. Parenthesized numbers in the legend denote the number of ensemble members used for each model.

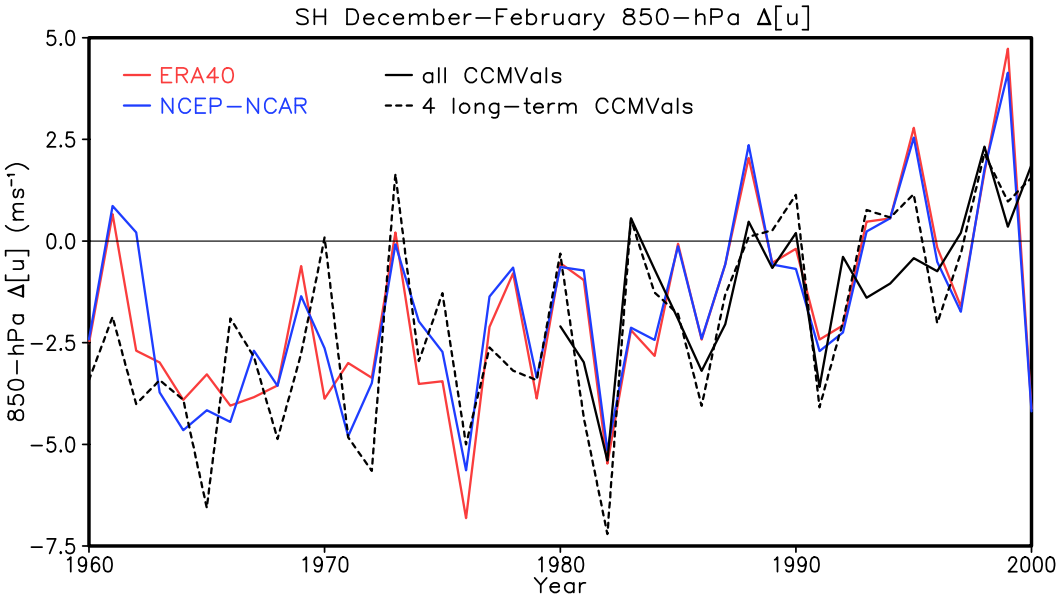

Figure S3: Time series of 850-hPa Δ[u] for the ERA40, NCEP-NCAR reanalyses, and CCMval models. Dashed line denotes composite of 4 CCMVal models with long-term integrations (AMTRAC, CMAM, GEOSCCM, and WACCM).