5.059 Transport from the Northern Hemisphere Midlatitude Surface: A Comparison Between the CCMI Models.

Early Career Scientist

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Abstract:

Future changes in tropospheric ozone (and its precursors), aerosols, greenhouse gases, and ozone depleting substances will reflect the complex interplay between changes in species' emissions, chemistry and transport. Here we present an analysis of tropospheric transport using idealized age tracers that probe different aspects of the transport circulation, based on simulations subject to present-day and future greenhouse gases and ozone depleting substances. A comparison between simulations of the Goddard Earth Observing System Chemistry Climate Model and the Whole Atmosphere Community Climate Model, wherein the large-scale flow is constrained to MERRA meteorology, reveals large (30%) differences in the mean transit time since air in the Southern Hemisphere last contacted the Northern Hemisphere (NH) midlatitude surface. This is interpreted largely in terms of differences between models' representations of convective transport, particularly over the oceans. Shifts in the location and strength of tropical convection and changes in isentropic transport out of the NH midlatitude surface layer are used to interpret future changes in transport over the twenty-first century. Comparisons with other models in the Chemistry Climate Modeling Initiative (CCMI) are used to further elucidate how intermodel differences in large-scale dynamics and convection translate to differences in the variability and long-term trends in transport.