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Determining the impact of lower stratospheric ozone depletion on Southern Hemisphere climate

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There has been strong stratospheric ozone depletion in the Southern Hemisphere since the 1980s. Ozone losses in the Southern Hemisphere occur from 250-20 hPa and are seasonally dependent, with the maximum losses occurring during October. Sonde measurements taken from different Antarctic stations have shown that the ozone depletion occurs later at lower altitudes.

Over the same period as the ozone depletion there has also been an observed downward trend in the geopotential height and temperature over Antarctica in the spring and summer months. The stratospheric trends peak in November, whereas the tropospheric trends are largest in December and January. Surface temperatures are most sensitive to ozone loss near the tropopause, therefore we hypothesise that the observed tropospheric response is forced mainly by ozone depletion in the lower stratosphere (below 160 hPa).

In this study the climate response to ozone depletion is simulated using the higher vertical resolution, 64 level, Hadley Centre atmosphere model coupled to a slab ocean. We have considered changes in the ozone concentration limited to the region near the tropopause to determine the impact of summer ozone radiative forcing in the lower stratosphere. Preliminary results suggest that changes in the lower stratospheric ozone concentration do not have a large impact on the tropospheric climate. This suggests that the tropospheric response is forced mainly by the depletion in the mid-stratosphere.