Precipitation response to ozone depletion in the Southern Hemisphere

Angela-Maria WYSS[1,2], Julie ARBLASTER[2,3,4], Stefan BRÖNNIMANN[1,5]

[1] *Institute of Geography, University of Bern, Switzerland*
[2] *School of Earth, Atmosphere and Environment, Monash University, Australia*
[3] *National Center for Atmospheric Research, Boulder, USA*
[4] *ARC Centre of Excellence for Climate Extremes*
[5] *Oeschger Centre for Climate Change Research, University of Bern, Switzerland*

A mature body of research examines the influence of stratospheric ozone changes on Southern Hemisphere climate and circulation. Stratospheric ozone depletion, which has its strongest signal over Antarctica in austral spring, is believed to be the dominant driver of austral summer atmospheric circulation changes in recent decades. These changes include a poleward shift of the lower-tropospheric midlatitude jet, the poleward expansion of the subtropical edge of the Hadley Cell, as well as a shift of the Southern Annular Mode (SAM) into its positive phase.

In terms of surface impacts associated with these circulation changes, the latest Ozone Assessment (2014) suggested that observed changes in extratropical and subtropical austral rainfall may be linked to ozone depletion. However, only a few studies have investigated this link and mostly on regional scales. Moreover, most have not been able to clearly isolate the effect of the ozone forcing from other anthropogenic forcings and internal climate variability, due to a lack of appropriate experiments and/or model output.

This study focuses on the isolation of the ozone forcing from other forcings using individual forcing simulations of the CESM1-CAM5 Large Ensemble (CESM-LE) and tries to further identify its impact on austral summer precipitation in the Southern Hemisphere as well as the influence of/on changes in the SAM. The additivity of the precipitation response to individual forcings is explored within this large ensemble, which allows for better quantification of the role of internal variability. Preliminary results from the Chemistry-Climate Model Initiative (CCMI) are also contrasted with the CESM-LE findings.

Key words: ozone, precipitation, SAM, anthropogenic forcings, variability.

References

World Meteorological Organization (WMO), 2014: *Scientific Assessment of Ozone Depletion,* 416.