Modelling the influence of the Antarctic Ozone Hole on Southern Hemisphere surface climate variability

Zoe GILLETT[1,2], Julie ARBLASTER[1,2,3], Andrea DITTUS[1,4], and CCMI Coauthors

[1] *School of Earth, Atmosphere and Environment, Monash University, Australia*
[2] *Australian Research Council Centre of Excellence for Climate Extremes, Australia*
[3] *National Center for Atmospheric Research, Boulder, USA*
[4] *NCAS-Climate, Department of Meteorology, University of Reading, UK*

Studies have recently reported statistically significant relationships between observed year-to-year spring Antarctic ozone variability and the summer Southern Hemisphere Annular Mode (SAM) and surface temperatures over Australia (Son et al. 2013; Bandoro et al. 2014). This study investigates whether current chemistry-climate models (CCMs) can capture these relationships. The interannual teleconnection between ozone and Australian temperatures is examined over the historical period in the observations and simulations from the Whole Atmosphere Community Climate Model (WACCM) and nine other models participating in the Chemistry-Climate Model Initiative. Some CCMs could capture the observed connection between November total column ozone (TCO) and Australian summer temperatures, where years with anomalously high TCO over the Antarctic polar cap tend to be followed by warmer summers, and vice-versa. There is a systematic difference between the WACCM experiments forced with prescribed observed sea surface temperatures (SSTs) and those with an interactive ocean. Strong correlations are only obtained for the uncoupled experiment, suggesting that the SSTs could be driving both Australian temperatures and the ozone hole variations, with little link between the two. However, model biases could also impact the response, and likely contribute to over-predicted correlations in some models and no relationship in others. The role of observational uncertainty is also discussed. The results indicate that Antarctic spring ozone variability could potentially be used as a predictor of Australian summer temperatures.

Key words: ozone variability, stratosphere-troposphere coupling, seasonal forecast

References

Bandoro, J., and Coauthors, 2014: *J. Climate*, **27**, 6245-6264.

Son, S.-W., and Coauthors, 2013: *Geophys. Res. Lett.*, **40**, 6231-6235.