Assessment of the robustness of recent lower stratospheric ozone trends and their reproduction by models

Sean DAVIS[1,2], Karen ROSENLOF[1], Nicholas DAVIS[1,2], Pengfei YU[1,2], Robert PORTMANN[1], Dale HURST[2,3]

[1] *NOAA Earth System Research Laboratory Chemical Sciences Division, Boulder, CO, USA*
[2] *Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO, USA*
[3] *NOAA Earth System Research Laboratory Global Monitoring Division, Boulder, CO USA*

A recent analysis of satellite-based ozone measurements has reported that near-global lower stratospheric ozone has continued to decline since the late 1990s, despite declining amounts of ozone depleting substances (ODSs) in the stratosphere. This result is supported by a recent analysis of in situ measurements of lower stratospheric ozone by balloon-borne ozonesondes [Hurst et al., submitted]. In contrast to the ozone decline revealed by satellite and sonde measurements, specified dynamics Chemistry-Climate Model (CCM) simulations with historical ODSs indicate flat or increasing ozone trends over the same time period. This presentation explores several possible explanations for this apparent discrepancy between models and observations, including the robustness of the observed trends and the representation of dynamical changes in specified dynamics model simulations. We assess the robustness of the satellite trends through comparisons to independent ozonesonde data, and by quantifying the sensitivity of satellite-derived trends to endpoints and to potential data drift and inhomogeneity issues. We also assess the ability of specified dynamics CCM simulations to reproduce the dynamical trends present in the reanalysis used as their input. We find that under a commonly-used specified dynamics configuration, CCMs fail to reproduce the underlying tropical upwelling changes present in reanalyses, which can significantly impact the simulated ozone trends.

Key words: lower stratosphere, ozone, ozone trends, modeling, CCM

References

Hurst, D.F., B.J. Johnson, P. Cullis, R.R. Querel, C.W. Sterling, E.G. Hall, and A.F. Jordan, submitted: Balloon-borne, in situ measurements of lower stratospheric ozone show post-1998 decline, *Atmos. Chem. Phys.*.