Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 6, 4093-4100, 2006
www.atmos-chem-phys.net/6/4093/2006/

Long-memory processes in ozone and temperature variations at the region 60° S–60° N

C. Varotsos[1,2] and D. Kirk-Davidoff[2]
[1]Department of Applied Physics, University of Athens, Athens, Greece
[2]Department of Atmospheric and Oceanic Science, University of Maryland, USA

Abstract. Global column ozone and tropospheric temperature observations made by ground-based (1964–2004) and satellite-borne (1978–2004) instrumentation are analyzed. Ozone and temperature fluctuations in small time-intervals are found to be positively correlated to those in larger time-intervals in a power-law fashion. For temperature, the exponent of this dependence is larger in the mid-latitudes than in the tropics at long time scales, while for ozone, the exponent is larger in tropics than in the mid-latitudes. In general, greater persistence could be a result of either stronger positive feedbacks or larger inertia. Therefore, the increased slope of the power distribution of temperature in mid-latitudes at long time scales compared to the slope in the tropics could be connected to the poleward increase in climate sensitivity predicted by the global climate models. The detrended fluctuation analysis of model and observed time series provides a helpful tool for visualizing errors in the treatment of long-range correlations, whose correct modeling would greatly enhance confidence in long-term climate and atmospheric chemistry modeling.

Final Revised Paper (PDF, 321 KB) Discussion Paper (ACPD)

Citation: Varotsos, C. and Kirk-Davidoff, D.: Long-memory processes in ozone and temperature variations at the region 60° S–60° N, Atmos. Chem. Phys., 6, 4093-4100, 2006. Bibtex EndNote Reference Manager