On the origin of tropospheric ozone and NO_x over the tropical South Pacific

Schultz, M.G., D.J. Jacob, Y. Wang, J.A. Logan, E. Atlas, D.R. Blake, N.J. Blake, J.D. Bradshaw, E.V. Browell, M.A. Fenn, F. Flocke, G.L. Gregory, B.G. Heikes, G.W. Sachse, S.T. Sandholm, R.E. Shetter, H.B. Singh, and R.W. Talbot,

J. Geophys. Res., **104**, 5829-5844, 1999.

Abstract

The budgets of ozone and nitrogen oxides (NO_x=NO+NO_2) in the tropical South Pacific troposphere are analyzed by photochemical point modeling of aircraft observations at 0-12 km altitude from the PEM-Tropics campaign flown in September-October 1996. The photochemical point model reproduces the observed NO_2/NO concentration ratio to within 30%, and has similar success in simulating observed concentrations of peroxides (H_2O_2, CH_3OOH), lending confidence in its use to investigate ozone chemistry. It is found that chemical production of ozone balances only half of chemical loss in the tropospheric column over the tropical South Pacific. The net loss is 1.8×10^{11} molecules $cm^{-2}s^{-1}$. The missing source of ozone is due to westerly transport of continental pollution into the region. Independent analysis of the regional ozone budget with a global 3-dimensional model corroborates the results from the point model and reveales the importance of biomass burning emissions in South America and Africa for the ozone budget over the tropical South Pacific. In this model, biomass burning increases average ozone concentrations by 7-8 ppbv throughout the troposphere. The NO_x responsible for ozone production within the South Pacific troposphere below 4 km can be largely explained by decomposition of peroxyacetylnitrate (PAN) transported into the region with biomass burning pollution at higher altitudes.

The full text of this paper is available as a pdf file