B Reactive nitrogen budget during the NASA SONEX mission

Talbot, R.W., J.E. Dibb, E.M. Scheuer, Y. Kondo, M. Koike, H.B. Singh, L. Salas, Y. Fukui, J.O. Ballenthin, R.F. Meads, T.M. Miller, D.E. Hunton, A.A. Viggiano, D.R. Blake, N.J. Blake, E. Atlas, F. Flocke, D.J. Jacob, and L. Jaeglé

Geophys. Res. Lett., 26, 3057-3060, 1999.

Abstract

The SASS Ozone and Nitrogen Oxides Experiment (SONEX) over the North Atlantic during October/November 1998 offered an excellent opportunity to examine the budget of total reactive nitrogen (NO_y) in the upper troposphere (8-12 km altitude). The median measured NO_y mixing ratio was 425 parts per trillion volume (pptv). Two different methods were used to measure HNO_3: (1) the mist chamber technique and (2) chemical ionization mass spectrometry. Two merged data sets using these HNO_3 measurements were used to calculate NO_y by summing the reactive niteogen species (a combination of measured plus modeled results) and comparing the resultant values to measured NO_y (gold catalytic reduction method). Both comparisons showed good agreement in the two quantities (slope > 0.9 and r^2 0.9). Thus, the total reactive nitrogen budget in the upper troposphere over the North Atlantic can be explained in a general manner as a simple mixture of NO_x (NO + NO_2), HNO_3, and PAN. Median values of NO_x/NO_y were 0.25, HNO_3/NO_y = 0.35 and PAN/NO_y = 0.17. Particulate NO_3^- and alkylnitrates combined composed <10% of NO_y. At this point in time the magnitude of uncertainties in both measured and modeled quantities limit our ability to critically evaluate the reactive nitrogen budget in the remote troposphere.