Measured and Modeled Ozone Distributions over the Atlantic and Pacific Oceans from the ATom Mission

E. Hintsa[1], F.L. Moore[1,2], G.S. Dutton[1,2], B.D. Hall[2], A. McClure-Begley[1,2], J.D. Nance[1,2], J. Elkins[2], C. Thompson[1,3], J. Peischl[1,3], T. Ryerson[3], J. Liu[4], S. Strode[5,4], A. Fiore[6], L. Murray[7], and C. Flynn[8]

[1]Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO 80309; 303 497-4888, E-mail: Eric.J.Hintsa@noaa.gov
[2]NOAA Earth System Research Laboratory, Global Monitoring Division (GMD), Boulder, CO 80305
[3]NOAA Earth System Research Laboratory, Chemical Sciences Division (CSD), Boulder, CO 80305
[4]NASA Goddard Space Flight Center (GSFC), Greenbelt, MD 20771
[5]Universities Space Research Association (USRA), Colombia, MD 21046
[6]Columbia University, Lamont-Doherty Earth Observatory, Palisades, NY 10964
[7]University Of Rochester, Rochester, NY 14627
[8]University of California at Irvine, Irvine, CA 92697

Field deployments of the NASA Atmospheric Tomography (ATom) Mission in 2016–2018 have provided a large set of chemical and other data over the Atlantic, Pacific, Southern, and Arctic Oceans from near the surface to about 12 km in each season. The mission was designed to study ozone and methane chemistry, atmospheric oxidation, and other chemical cycles on large scales, and to challenge chemical transport models. I will present data and intercomparisons from ATom deployments, focusing on analysis of tropospheric ozone, related gas phase species, and model results (some from arbitrary years and some using meteorology from the ATom time periods, with results interpolated onto ATom flight tracks). The goals are to 1) map out the distributions of ozone along North-South transects across the Atlantic and Pacific Oceans and the polar regions as a function of altitude, latitude, and season, 2) compare with model results both along flight tracks and as probability distributions, and 3) improve our understanding of model-measurement agreement or differences resulting from chemistry and transport. All the models examined do a reasonable job of predicting large-scale features in ozone. The NASA Global Modeling Initiative (GMI) chemical transport model performed well in hindcasting ozone distributions in ATom-1, 2, and 3 using actual meteorology. Some discrepancies exist between model and measured data over the tropical Atlantic, where ozone observed during ATom was much higher compared to the tropical Pacific throughout the troposphere. Further work includes exploring the origin of air masses with high (and low) ozone in ATom, comparing to model runs from the same date and year as the ATom deployments, and exploring the chemical relationships between ozone and other species in models and measurements.

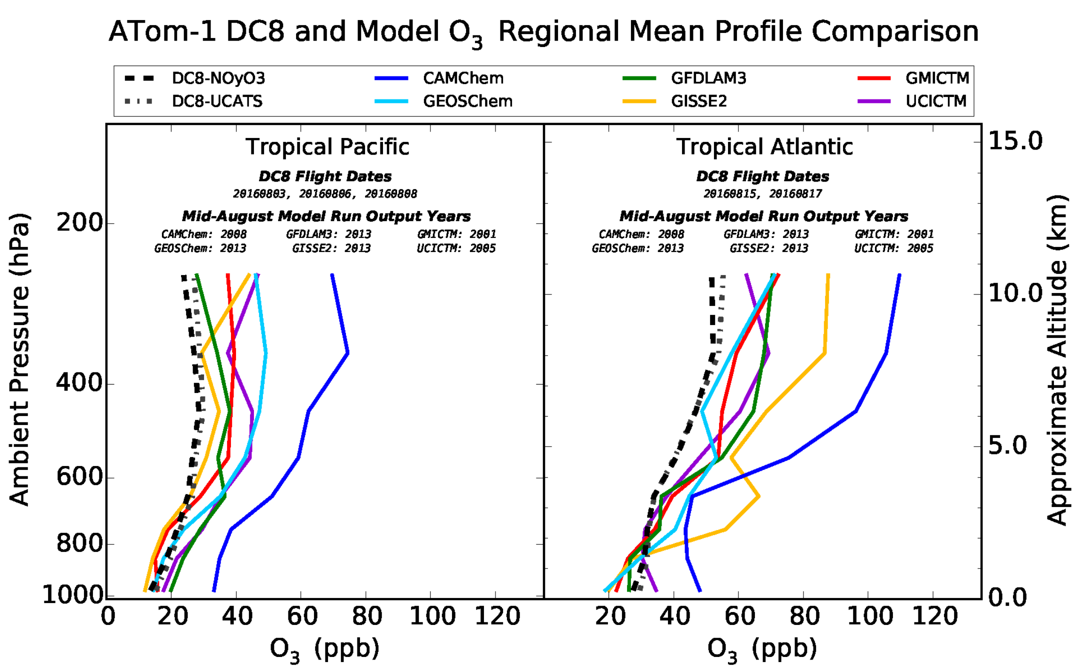

Figure 1. Average vertical profiles of ozone from the DC-8 and six global models, interpolated onto the ATom-1 flight tracks for the tropical Pacific (left) and tropical Atlantic (right). The modeled ozone results are often higher than the *in situ* data, though the model and DC-8 flight data are from different years.