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AIRBORNE FORMALDEHYDE MEASUREMENT ON A NOAA WP-3 DURING THE 1999 SOS SUMMER FIELD EXPERIMENT

Yin-Nan Lee
Atmospheric Sciences Division, Environmental Sciences Dept., Brookhaven National Laboratory, Upton, NY 11973-5000

Tom Ryerson, Paul Goldan, William Kuster, John Holloway, and David Parrish
NOAA Aeronomy Laboratory, 325 Broadway R/AL7, Boulder, CO 80305

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Atmospheric formaldehyde (HCHO) concentration was determined on board a NOAA WP-3 aircraft using a technique involving scrubbing gaseous HCHO into an aqueous solution, derivatizing the dissolved HCHO using 2,4-dinitrophenylhydrazine, and analyzing the HCHO-hydrazone using an on-board high performance liquid chromatograph equipped with a UV-Visible detector. This technique was on-line and continuous, yielding data of 2 min time resolution and a limit of detection of 0.080 parts-per-billion by volume (ppbv). The boundary layer HCHO concentrations determined on eight flights between 7/3 and 7/14, spanning a latitude between 33 and 40 degrees, ranged between 0.3 and 8 ppbv, with the lowest observed on 7/11 over Indiana and Illinois (median 1.2 ppbv) and the highest on 7/6 over Atlanta, GA (median 5.1 ppbv). Dividing the study region into north, middle, and south latitudes, we found HCHO concentration increased with decreasing latitude, median values being 1.6, 2.6, and 5.6 ppbv, respectively. A similar trend is also exhibited by isoprene, the corresponding values being 0.16, 0.47, and 0.80 ppbv, corroborating a previous observation that isoprene is an important precursor for HCHO. As a radical source, HCHO contributed to ~20% of the total radical production. A strong correlation between HCHO and ozone was observed in the Atlanta region and the Ozarks (Missouri) where isoprene emissions are strong, implicating the role isoprene plays in ozone formation. The flight of 7/4 which extended into evening hours (7:30 pm-10:30 pm, local time) showed that HCHO was essentially unchanged from late afternoon values, suggesting insignificant nighttime sinks for FA.

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