EDITORIAL

This special issue of the *Journal of Applied Meteorology and Climatology* presents results from the Joint Urban 2003 atmospheric dispersion study. Quality-assured meteorological and tracer datasets are vital for establishing confidence that atmospheric dispersion models used to simulate dispersal of potential toxic agents in urban atmospheres are giving trustworthy results. The National Research Council (NRC) of the National Academies, in a 2003 report titled "Tracking and predicting the atmospheric dispersion of hazardous material releases—Implications for homeland security," recommended as one of their priorities for improving modeling capabilities that "[u]rban field programs and wind-tunnel urban simulations should be conducted to allow for the testing, evaluation, and development of existing and new modeling systems (both meteorological and dispersion models)." This NRC recommendation of conducting additional urban field studies is based on appreciation of the limited number of previous urban tracer and meteorological studies with sufficient detail to improve, test, and validate various classes of urban dispersion models. These models must be capable of treating effects of urban processes (e.g., building wakes, street-canyon channeling, and vertical advection along building surfaces) on the dispersion of harmful materials released within or above urban street canyons.

To address the need for additional high-resolution urban dispersion datasets, the U.S. Departments of Defense, Energy, and Homeland Security joined together to fund the Joint Urban 2003 (JU2003) atmospheric dispersion study. This major urban study was conducted from 28 June through 31 July 2003 in Oklahoma City, Oklahoma, with the participation of over 150 scientists and engineers from over 20 U.S. and foreign institutions. Through mid-2006 over 125 papers and presentations have been given on scientific findings and model evaluations based on the field study results. At the time of publication, the official JU2003 data archive was accessible through the Internet by requesting an account (https://ju2003-dpg.dpg.army.mil/).

The JU2003 study included several integrated scientific components necessary to describe and understand the physical processes that govern dispersion within and surrounding an urban area and into and within building environments. These components included characterizing 1) the urban boundary layer; 2) flows within a street canyon, including the effects of traffic on turbulence; 3) flows within and downwind of the tall-building core; 4) the surface energy balance within an urban area; 5) dispersion of tracer into, out of, and within buildings; and 6) dispersion of tracer throughout the downtown core and out to 4 km downwind from the release.

The scientific elements of the study were accomplished using state-of-the-art meteorological and tracer instruments, including lidars, sodars, radars, sonic anemometers, airplane-based meteorological sensors, fast-response tracer analyzers, and helicopter-based remote tracer detectors. Winds and other meteorological quantities were measured continuously at nearly 100 locations in and around downtown Oklahoma City. Tracer was released on 10 days during the experiment period and included both puff and continuous releases. The tracer was sampled using over 200 integrated samplers and 25 fast-response analyzers. Vertical measurements of tracer were made by placing samplers on the tops of nearly 20 buildings and by sampling tracer at seven levels on a 90-m crane.

The 12 papers in this special issue provide a cross section of the scientific investigations pursued using JU2003 data. One-half of the papers focus on using observations to characterize winds, turbulence, and dispersion in the boundary layer above the city and into a downtown Oklahoma City street canyon (Park Avenue). The remaining papers discuss model evaluations using JU2003 data and our improved understanding of processes that govern dispersion in urban areas through use of models and observations.

The combination of a dense network of measurements with state-of-the-art instruments allowed for an unparalleled investigation of transport and diffusion in an urban environment.

We expect that the JU2003 dataset will be used for many years for model development and validation efforts and for refining our understanding of flow and dispersion in urban areas, including the exchange of contaminants between outdoor and indoor environments.

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