

## **19b Modeling Aerosol Transport in the Vicinity of Vegetative Canopies in the Urban Environment**

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Near-real time modeling of aerosol dispersion in urban environments is essential to the informed direction of an emergency response to hazardous releases of chemical, biological, or radioactive species. In addition to buildings, the urban environment incorporates vegetation in a variety of arrangements. Understanding the interaction between vegetation and airflow is therefore necessary for the development of efficient urban parameterizations for use in near-real time dispersion models. The numerical simulation used in this study is based on the Reynolds Averaged Navier-Stokes (RANS) equations, with closure achieved using a standard two-equation Launder & Spalding k-epsilon model. To model the flow within the canopy, a momentum sink term based on Forchheimer's Law is added to account for the drag imposed by the foliage elements. The Sanz canopy turbulence model has been implemented, providing TKE and TDR sink and source terms to account for the conversion of the kinetic energy of the mean flow into fine scale turbulence in the interior of the canopy. The equations determining the source term parameters are based on the foliage morphology as characterized by forestry data such as the Leaf Area Index and the effective foliage diameter. The model has been used to investigate the airflow around isolated individual canopies, ordered, staggered, and random stands of limited extent, and continuous canopies of semi-infinite extent. The results from the investigation have shown that wake morphology in the lee of isolated individual canopies show significant differences to wakes found directly downstream of solid cylinders of comparable size. In addition, for ordered, staggered, and random stands of limited extent the velocity profiles of the stands are in close agreement. TKE profiles, however, for the three limited extent stands show significant differences, which will have implications for aerosol dispersion within the stands. Finally for semi-infinite continuous stands, a zone of elevated TKE has been observed above the canopy, due to the high shear in that region. This zone contributes significantly to the turbulent transfer of aerosols across the upper surface of extensive continuous canopies.