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A Modelling Approach on Fine Particle Spatial Distribution for Street Canyons in Asian Residential Community

Hong Ling (1), Shih-Chun Candice Lung (1,2), and Ulrich Uhrner (3)

(1) Research Center for Environmental Changes, Academia Sinica, Taipei 11529,Taiwan, (2) Department of Atmospheric Sciences, National Taiwan University, Taipei 10617, Taiwan, (3) Institute of Internal Combustion Engines and Thermodynamics, Graz University of Technology, 8010 Graz, Austria

Rapidly increasing urban pollution poses severe health risks.Especially fine particles pollution is considered to be closely related to respiratory and cardiovascular disease. In this work, ambient fine particles are studied in street canyons of a typical Asian residential community using a computational fluid dynamics (CFD) dispersion modelling approach. The community is characterised by an artery road with a busy traffic flow of about 4000 light vehicles (mainly cars and motorcycles) per hour at rush hours, three streets with hundreds light vehicles per hour at rush hours and several small lanes with less traffic. The objective is to study the spatial distribution of the ambient fine particle concentrations within micro-environments, in order to assess fine particle exposure of the people living in the community. The GRAL modelling system is used to simulate and assess the emission and dispersion of the traffic-related fine particles within the community. Traffic emission factors and traffic situation is assigned using both field observation and local emissions inventory data. High resolution digital elevation data (DEM) and building height data are used to resolve the topographical features. Air quality monitoring and mobile monitoring within the community is used to validate the simulation results. By using this modelling approach, the dispersion of fine particles in street canyons is simulated; the impact of wind condition and street orientation are investigated; the contributions of car and motorcycle emissions are quantified respectively; the residents' exposure level of fine particles is assessed.

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