ASSESSING THE INFLUENCE OF SMALL SCALE PHENOMENA TO LOCAL/MESO-SCALE SIMULATION RESULTS BY TWO-WAY MODEL COUPLING I. FAST CHEMISTRY MODULE IMPLEMENTATION & VERTICAL FLUXES CALCULATION II. MESOSCALE SIMULATIONS

S. Zoras, A. Merah, L. Aidaoui, S. Papalexiou, A.G. Triantafyllou, V. Evagelopoulos, S. Garas, C. Diamantopoulos
Laboratory of Atmospheric pollution and Environmental Physics, Technological Education Institute of West Macedonia, Kila, 50100 Kozani, Greece

Model coupling by using the larger scale model results as input for defining boundary conditions for smaller scale model simulations is the traditional way to simulate atmospheric transport and photochemical phenomena. Fluxes calculations (of momentum, pollutants etc) have shown however that upward transport of these physical parameters may be quite important affecting simulation results at larger scales than those at which they were computed.

The goal of this study, which will be divided into two twin subprojects, is the development of a "top-down/bottom-up" model cascade strategy in order to quantify the influence of small scale effects such as fast chemistry at street canyons to local/meso scale model results.

The objective of part I is the performance of small-scale computations for an urban geometry in a medium sized city in Northwestern Greece by using a CFD code (ANSYS-CFX) to provide hourly averaged wind and pollutant concentration fields. A fast chemistry module simulating chemical reactions taking place within street canyons right after traffic pollutants are emitted will be implemented to the model in order to assess the composition of NO_X and ozone that should be provided as an emission input to mesoscale model simulations. Circulations created by the city itself and affect pollutant dispersion will be accounted for and hotspot concentrations that depend on street canyon scale effects will be computed.

Boundary condition input for these simulations will be provided by mesoscale simulations with the use of the Air Pollution Model (TAPM http://www.csiro.au/tapm) that will be performed at part II of this project.

The objective of part II is to assess the influence of small scale physicochemical effects on the performance of local/meso scale model simulations by the aid of the mesoscale model TAPM using as input pollutant and momentum fluxes provided by the CFD simulations of part I. TAPM is a nestable, prognostic meteorological and air pollution model. Its condensed chemistry scheme also allows nitrogen dioxide, ozone, and particulates to be modelled for long periods. In this study TAPM will be calibrated under specific urban physicogeographic conditions for ozone predictions by taking data and in particular integrated vertical momentum and pollutant fluxes from CFX model results of part I.

Experimental data will be provided from a surface sampling station and a Differential Optical Adsorption Spectrometer (DOAS) that emits / recepts along the street canyon . The coupled model will be tested for ozone predictions in a medium sized city in Northwestern Greece.

EXTENDED ABSTRACT NOT SUPPLIED