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Development of a new canopy model to improve urban meteorology modeling

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Urban population and energy consumption are increasing everywhere in the world. These processes have direct impacts on human health and global climate since our energy consumption leads to the emission of both harmful air pollutants and GHG. Several models have been developed to help in defining urban mitigation strategies to reduce energy consumption and air pollution. They cover several spatial scales from microscale (few series of buildings) to mesoscale (urban to regional scales), with usually a gap between these scales. The research focuses on the development of a mesoscale meteorological model designed to simulate cities-atmosphere interactions. The objective is to study urban meteorology and to estimate its effect on building energy consumption (which represent 47% of the total energy consumed in a city) and air pollution. The present paper will especially present the development of a new Canopy Interface Model proposed to interface with a mesoscale meteorological model, like the Finite Volume Model (Clappier et al. 1996) with any kind of land surface fluxes calculation. The surface fluxes could be produced with a surface parameterization, like the Building Effect Parameterization (BEP, Martilli et al., 2002, Krpo et al., 2010), or with a microscale CFD model, that could be linked to the mesoscale model by using a two-way nesting. The canopy model computes highly resolved vertical profiles for momentum, air humidity and temperature, using a finite volume method where the effect of obstacles are taken into account through surface and volume porosities. These profiles are then used to produce surface fluxes parameters needed by the mesoscale model.