An Urban Morphological Database Created Using Remote Sensing for Modeling of Atmospheric Dispersion and Micro-Meteorology

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The transport of momentum, heat and pollutants over urban areas take place within an atmospheric boundary layer (ABL). The mixing properties of the ABL depend strongly on the ground-air interactions, and thus on the surface morphology. Computational Fluid Dynamics (CFD) models of various degrees of description of involved physical processes are used in studies of the ABL processes over urban areas.

In large-scale models the surface morphology is typically modeled by means of simple scalar measures of surface roughness. This is a highly simplified approach and cannot provide new insight into the details of the ground-air interactions processes taking place in the lowest part of urban ABL, the roughness layer. To understand these processes and to assess and further develop better simplified models for them, so called obstacle resolving numerical simulations are needed. This means that a morphology model of the urban area is required [1].

In this study a morphological database is created for the city of Paris, France, based mostly on remote sensed data. The database has two resolution levels and areas. A high resolution area is located in southern Paris in the vicinity of Place d'Itale and its area is 6x3 km^2. The coarse resolution area is the whole Paris inside beltway and its surroundings, an area of 13x10 km^2.

The database is created using Optical images, digital maps and SAR interferometry. The sources of optical images and digital maps are public internet map services e.g. Google Maps and Microsoft Virtual Earth. SAR images are obtained from ESA's Envisat ASAR instrument. Another public source for the morphological database was NASA's SRTM database.

The database consists of several layers. These layers hold information from streets and roads, parks and cemeteries, water bodies, buildings, trees, terrains digital elevation model as well as building height. The layer extraction and creation methods include supervised classification and interferometric coherence manipulation [2].

References

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