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# Analysis of spatial average properties of the turbulent flow over an urban configuration (MUST field experiment) using RANS simulations

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The interest on urban mesoscale modeling has been increased since mid 1990s due to different factors: the continuous increase of urban population and the improvement of computational power. The mesoscale simulation of urban boundary layer is difficult because the urban terrain is very complex. In a city, there are elements such as buildings, cars or gardens with different dynamical and thermal/radiative properties. In addition, the domain of a high resolution mesoscale model over urban environment should contain the whole city and its surrounding areas. However, it is impossible, for computational reasons, to have a domain large enough to contain these zones and to have a resolution high enough to solve explicitly all the buildings of the city. Therefore, urban parameterizations are necessary. This work is focused on dynamical properties. In this way, Computational Fluid Dynamics (CFD) models that solve every building play an important role in the modeling process. They provide flow variables with high enough spatial resolution to compute accurate values of the spatial average properties over zones comparable with the grid cell volume of the mesoscale models. In this study, the configuration of MUST field experiment is simulated by a CFD model. The MUST (Mock Urban Setting Test) is an experiment carried out in the great basin desert (USA) to investigate dispersion over an array composed by 12 by 10 containers. This configuration was chosen to represent an urban environment (Biltoft, 2001). The CFD model is based on Reynolds Averaged Navier-Stokes equations (RANS) using a k-epsilon turbulence model. Several cases are simulated using different geometry and boundary conditions. Spatial average variables such as wind

velocity, turbulent kinetic energy or stresses are study over different portion of the array. The objectives are:

- To analyse the influence of some irregularities of the array on the average properties.

- To observe the differences depending on the portion of the array used for the spatial average.

- To study the evolution of the average properties with the change of geometrical parameters of the street canyon.

- To analyse the influence of wind direction on the average properties.