



Impacts of proposed buildings on the local wind environment

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This study investigates the impacts of new buildings on the wind environment within the center of Wilhelmsburg district, a 35.3-square kilometers area located on the homonymous island between the Northern and Southern branches of the Elbe River within the borough of Hamburg-Mitte. Currently, this area has a high rate of urban development in the form of constructing new buildings which may substantially alter the winds in the neighborhood areas and hence it is important to assess the effects of such urban development on its local wind environment.

In this study the obstacle resolving microscale model MITRAS is used to study the changes of the wind field. MITRAS is a 3-dimensional, non-hydrostatic, prognostic, numerical model for simulating the wind, temperature, humidity and transport within the obstacle layer. It resolves obstacles (buildings, trees, ..etc) including the overhanging obstacles (bridges, driveways, wind turbines, or similar) explicitly in order to account for not only the aerodynamics effects but also the thermodynamic effects including shading and heat transfer of the building walls. It is capable of simulating different domain sizes range between a few hundred meters (street canyons) and a few kilometers (suburb, part of a city) horizontally and a few hundred meters to the whole troposphere vertically (domain height).

Two configurations are addressed in the analysis: i) the existing setting before constructing the new buildings; and, ii) the new setting after constructing the new buildings. The same meteorological conditions are used in both cases, which are representative for the meteorological conditions at the site including the major wind direction and wind speed. The simulation results of both configurations are used to quantitatively identify the affected areas knowing the magnitude of changes to an existing wind environment due to the presence of the proposed buildings, using a set of comfort criteria.