Abstract

Wind data representativeness in the atmospheric surface layer is crucial for their proper use in atmospheric modeling and other applications. In this paper the effective roughness length z_{eff} concept is used in order to take into account surface inhomogeneity in the suburban area of the city of Zagreb (Croatia). The z_{eff} value is reflected on the vertical wind speed profile as well as other meteorologically relevant profiles. At the same time, it represents an average effect of all obstacles over distance of several kilometers in the upwind direction. In other words, it means that the wind speed measured at one place represents actually "the weighted average" wind speed over a wider area in the upwind direction. Such "average" wind speed is usable for application at grid rasters in atmospheric models with resolution of several kilometers, especially over suburban and urban areas.

Three methods are presented to estimate the effective roughness length z_{eff} of inhomogeneous suburban area of the city of Zagreb. The first method is based on root mean squared error (RMSE) between estimated and corresponding measured values of wind speed at 2 m above ground. In the second method the relationship between the standard deviation of wind speed at 10 m height and z_{eff} is used while the third approach takes into account the relationship between the median of wind gust factor at 10 m height and z_{eff}. One of more important results here is the classification of z_{eff} according to wind direction; z_{eff} values obtained are higher for western than for eastern quadrants of wind direction, what is in accordance with inhomogeneous (regarding surface roughness) studied area.