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Multi-scale analysis of turbulence data from AIRTEC-CM urban field campaigns in Madrid

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Several urban field campaigns have been carried out in the city of Madrid (Spain) during the years 2020 and 2021 in the frame of the AIRTEC-CM^(*) research project (Urban Air Quality and Climate Change Integral Assessment). The analysis of the relation between the turbulence measured close to the surface and pollution concentration (e.g., particle matter of different sizes, NO_x, etc.) is a key aspect to achieve the different objectives of the project. In this context, we present some preliminary analyses of the turbulence data measured from sonic anemometers located at different emplacements. We focus on the turbulence differences among two instruments nearby located but at different heights above the street level: 1) at the top of a 22 m-height building, and 2) at the top of a shorter building of 2.5 m of height. Typical turbulent parameters (turbulent kinetic energy (TKE), friction velocity (u^*) and sensible heat flux (SH)) are analysed for both sonic anemometers and their differences are statistically compared. An investigation of the main temporal scales involved in the atmospheric diffusion is also performed using the Multi-Resolution Flux Decomposition technique (MRFD), applied over a relatively long period that includes different atmospheric conditions in February 2020. The information obtained from this analysis will be related to the pollution concentration measured in the city, trying to determine the importance of the near-surface turbulence (and the corresponding scales of the main eddies found) in the pollutant's levels.

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