Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Turbulent boundary layers over city-like roughness arrays[1]
ALEXANDROS MAKEDONAS, MARCO PLACIDI, MATTREO CARPENTIERI, University of Surrey — By 2050, 68% of the worlds population will live in cities. Understanding flow behaviour within and above cities is, therefore, of growing importance. To what extent do cities trap air pollution or increase the temperatures at street level, and do they affect the local weather cycles? Experimental models to study the effects of city geometry on flow behaviour in and above urban environments commonly use homogeneous-height roughness. However, cities are becoming increasingly vertically developed, and homogeneous height models are unlikely to portray an accurate picture of flow over real cities. Wind tunnel experiments were conducted at the University of Surrey over urban canopies to illustrate some essential differences of flow over uniform- and varied- height buildings. Flow characteristics of fully-developed boundary layers over four different rough surfaces that varied only in the standard deviation of element height were examined. The focus was on mean velocity profiles and higher-order quantities in the Inertial and the Roughness Sublayers. The presentation will cover the findings and draw comparisons between heterogeneous- and homogeneous- height roughnesses.

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Date submitted: 21 Oct 2020 Electronic form version 1.4