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Parameterising wind profiles in the urban roughness sublayer of an anisotropic street canyon

Natalie Theeuwes (1), Reinder Ronda (2), Ian Harman (3), Andreas Christen (4), and Sue Grimmond (1)

(1) University of Reading, Reading, United Kingdom (n.e.theeuwes@reading.ac.uk), (2) Royal Netherlands Meteorological Institute (KNMI), de Bilt, the Netherlands, (3) Commonwealth Scientific and Industrial Research Organisation (CSIRO), Canberra, Australia, (4) University of Freiburg, Freiburg, Germany

The modelling of the urban atmosphere still brings along many challenges, because most surface- and boundary-layer parameterisations are not designed for urban areas and require homogeneous surface conditions. However, urban areas consist of obstacles (e.g. buildings and trees) that disturb the flow and in turn the turbulent fluxes. The layer at which the flow and turbulent fluxes are disturbed is known as the roughness sublayer. In the roughness sublayer Monin-Obukhov similarity theory is invalid and is not designed to capture profiles of wind and scalars such as temperature and humidity.

This study explores several ways of parameterising wind profiles within the roughness sublayer. Measurement data in and above the urban canopy is used from an observational campaign in Basel, Switzerland (BUBBLE). Several scaling approaches for vegetation canopies are tested and adjusted in order to accurately model profiles of wind and temperature in the roughness sublayer. The orientation of the wind with respect to the street canyon is of major importance in the model performance. Depending on the method used, anisotropic building morphological information will improve the profiles of momentum.