

ICUC Abstract Deadline: 31/12/11

TITLE (max 12 words): Profiles of wind speed in strong wind conditions over urban areas

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KEYWORDS: Deaves-Harris model, velocity profile, log-law, power-law, Doppler lidar

CONTENT (max 250 words):

To design tall buildings in urban areas, wind engineers need to calculate the potential wind loading on the structure. This necessitates the need for an accurate representation of the wind velocity and turbulence intensity profiles in strong wind conditions. The current UK wind loading code applies an extended version of the Deaves and Harris model, which represents the wind profile throughout the entire boundary layer (Cook, 1997). However, there has been little validation of this approach, particularly for heterogeneous urban terrain (Tieleman, 2008).

This study compares the predictions of the Deaves and Harris model with those of two other models; the empirical power-law and the theoretical log-law, and profiles of the wind velocity and turbulence intensity derived from Doppler lidar measurements over Greater London. Data have been collected by a pulsed Doppler lidar (Halo Photonics) in central London since July 2010, either at Westminster City Council's building on Marylebone Road or the Strand campus of Kings College London (ACTUAL, 2011). This has been analysed to identify the periods of strong winds and near neutral conditions.

In addition, based on a database of frontal and plan area ratios of the buildings in Greater London, the magnitude of roughness length and displacement height has been estimated on a 1 km resolution (Evans, 2009). Comparisons have then been made with the simple surface classification approximation applied in the wind loading code. The results presented will show whether a more detailed assessment of the urban surface provides an improved representation of the wind profile.

Bibliography

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