



Observations of wind speed profiles over Greater London, UK, using a Doppler lidar

D. Drew, J. Barlow, and S. Lane

Department of Meteorology, University of Reading, Reading, United Kingdom (d.r.drew@reading.ac.uk)

To design tall buildings in urban areas, wind engineers need to calculate the maximum potential wind loading on the structure. This requires an accurate representation of the wind speed profile in high wind conditions. Traditionally, this data has been difficult to obtain in urban areas as it is generally not feasible to erect masts at the height of many tall buildings. Consequently, there is a reliance on the predictions of wind engineering tools, such as the Deaves and Harris non-equilibrium model outlined in the ESDU data item 82026. Recent developments in remote sensing instruments such as fast scan pattern Doppler lidars provide the opportunity to estimate the wind speed at a large range of heights in urban areas. As part of the ACTUAL project (Advanced Climate Technology Urban Atmospheric Laboratory) a pulsed Doppler lidar has been installed at a highly built up site in central London, to measure the wind speed profile using a Doppler Beam Swinging method (DBS) at approximately 2 minute intervals.

Observations over an eight month period (May 2011-Jan 2012) have been compared with a reference sonic anemometer located at 190 m above ground level, at a site 1.6 km from the lidar. A strong correlation was found between the hourly mean wind speeds of the two instruments, although the lidar has a tendency to overestimate the wind speed by approximately 0 to 0.5 ms⁻¹ at values of less than 20 ms⁻¹. This presentation will also show that when used in conjunction with surface parameters derived from an urban morphology database, the non-equilibrium model outlined in the ESDU 82026 provides a good representation of the hourly mean wind speed profile in strong wind conditions. For heights below 500 m, the predicted wind speed remains within the 95% confidence interval of the measured data.