Abstract
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Scaled TKE measurements in an urban roughness sublayer

Scaled turbulence kinetic energy, TKE/u_*^2 where $\mathrm{TKE} = \left(\overline{u'u'} + \overline{v'v'} + \overline{w'w'}\right)/2$ and u_* is the surface stress, is normally taken to be a constant by most models. This is found to be true in general for measurements within the urban roughness sublayer using Joint Urban 2003 data. In situations where buoyancy is a dominant factor, scaled TKE values can be larger, but in the urban roughness sublayer, buoyancy is often less dominant due to the enhanced shear produced by the proximity of diverse obstacles. Values for TKE/u_*^2 will be presented as a function of upwind fetch.

Very near the vertical surfaces of buildings, the surface normal direction is horizontal, adding a $\overline{u'v'}$ component to the surface stress. Slightly farther from the building, both the vertical surface and horizontal ground surface could have comparable contribution to the surface stress. Standard definitions of surface stress may no longer capture all of the surface stress, while the standard definition of TKE is still valid since measured TKE is not dependent on the choice of surface normal. This results in higher measured values of scaled TKE immediately downstream of obstacles. Simply adding a $\overline{u'v'}$ term to the surface stress is not sufficient since non-zero values of $\overline{u'v'}$ can also be due to other phenomena. Flow through porous obstacles such as trees is even more complicated. The behavior of $\overline{u'v'}$ will be presented as a function of upwind fetch.