A Numerical Model for Boundary-Layer Flow over Changes of Surface

W. Weng (1), P.A. Taylor (1) and J.R. Salmon (2)

(1) York University, Toronto, Canada M3J 1P3, (2) Zephyr North Ltd., Burlington, Canada, L7S 1T5 (wweng@yorku.ca/Fax:4167365817)

A numerical model is presented to study atmospheric boundary-layer flow over changes in surface conditions. These changes can include surface roughness, thermal and moisture properties. The flow near the surface is assumed to be in local equilibrium after changes of the surface conditions. A wall layer is used within which Monin-Obukhov similarity theory is applied. The results are discussed and compared with other models and published field data with emphasis on single and multiple step changes in surface roughness.

A simplified calculation procedure uses assumed forms of profile within one or multiple internal boundary layers and estimates of internal boundary-layer height. This is particularly useful for wind energy resource and wind loading assessment applications in combination with calculations of topographic effects.