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Formation of a spot-like pollution structure of the underlying surface by a powerful elevated finite source

O. Skrynyk (1), R. Chernysh (1), and Yu. Hrytsyuk (2)

(1) Ukrainian Research Hydrometeorological Institute, Physics of Atmosphere, Kiev, Ukraine (skrynyk@univ.kiev.ua), (2) Ternopil National Pedagogical University, Ternopil, Ukraine

It is known that the large scale pollution field of the underlying surface, which takes place under intense atmospheric escapes, has very distinct spot-like structure (with more than one maxima). The radioactive contamination of the ground after Chernobyl nuclear reactor accident is a well known example of such structure.
We believe that the periodic change (diurnal cycle or changes of weather pattern) of the vertical turbulent mixing intensity in the Atmospheric Boundary Layer can be one of the reasons causing the formation of a large scale spot-like pollution structure. Using numerical simulations and analytic solutions of some model diffusion problems, we have studied the process of formation of a spot-like pollution structure of the underlying surface by a powerful high-altitude source that is active during a certain time interval. In this study, we have found that the total deposition at the ground as a function of downwind distance has more than one maxima if the source lifetime, tk, is much shorter than the diurnal period (or period of weather pattern change), T. Hence, tk/T<1 may be interpreted as an empirical criterion for the appearance of a spot-like pollution structure.