



A semi analytical model for short range dispersion from ground sources

Ehud Gavze, Rivka Reichman, and Eyal Fattal

Hebrew University, Jerusalem, Israel (ehudga@mail.huji.ac.il)

A semi-analytical model for dispersion of passive scalars from ground sources up to distances of a few hundred meters is presented. Analytical, or semi-analytical models are useful as they are simple to use and require only a short computation time, compared, for example, to Lagrangian Stochastic Models. As such they are valuable in cases where repeated computations of the concentration field is required, as for example in risk assessments and in the inverse problem of source determination. Among the analytical models the most widely used are the Gaussian models which assume both a uniform wind field and homogeneous turbulence. These assumptions are not valid when ground source is involved since both the wind and the turbulence depend on height. The model proposed here is free of these two assumptions. The formulation of the vertical dispersion is based on approximating the vertical profiles of the wind and the vertical diffusion coefficient as power laws. One advantage of this approach is that it allows for non Gaussian vertical profiles of the concentration which better fit the experimental data. For the lateral dispersion the model still assumes a Gaussian form. A system of equations was developed to compute the cloud width, taking into account the non-homogeneity of the wind and the turbulence in the vertical direction. The model was tested against two field experiments. Comparison with a Gaussian model showed that it performed much better in predicting both the integrated cross wind ground concentration and the cloud width.