DISPERSION PARAMETERS DERIVED FROM TURBULENT EULERIAN SPECTRA: EVALUATION IN DIFFERENT ATMOSPHERIC CONDITIONS.

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Most air quality dispersion models used for regulatory applications are based on Gaussian and K-diffusion formulations. The reliability of such models strongly depends on how dispersion parameters and eddy diffusivities are computed on the basis of the update understanding of the Planetary Boundary Layer (PBL) meteorology. Accounting for the current knowledge of the atmospheric boundary layer, dispersion coefficients sigmas and eddy diffusivity coefficients have been derived by using a model for the frequency spectrum of eddy energy. The approach based on Taylor classical diffusion theory and further developments by Pasquill, adequately represents the turbulent mechanisms in the various regimes of the Atmospheric Boundary Layer (ABL) (Degrazia et al. 2000, Rizza et al. 2001, Mangia et al. 2002), giving continuous values at all elevations and all stability conditions from unstable to stable. The main advantage of such approach is that it relates plume dispersion directly and explicitly to the effective turbulent eddy sizes acting on the layer. The derived turbulent parameters are well-behaved and presented in form of similarity profiles, using the velocity (u_*, w_*) and characteristic length scales (z_i, h, L, Λ); furthermore, they reproduce important results previously obtained by other approaches. The sigmas parameters and K coefficients included in a Gaussian and K- diffusion model respectively, are tested and compared with dispersion schemes reported in literature, using data from field experiments in different emission and meteorological conditions. Results show that the new parameters are well suited for application in air pollution modelling in a wide range of atmospheric stabilities.

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