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Turbulence dissipation rate derivation for meandering occurrences in a stable planetary boundary layer

G. A. Degrazia[1], A. Goulart[2], J. Costa Carvalho[3], C. R. P. Szinvelski[1], L. Buligon[1], and A. Ucker Timm[1]
[1]Departamento de Física, Universidade Federal de Santa Maria, Santa Maria, RS, Brazil
[2]Centro de Tecnologia de Alegrete, UNIPAMPA/UFSM, Alegrete, RS, Brazil
[3]Faculdade de Meteorologia, Universidade Federal de Pelotas, Pelotas, RS, Brazil

Abstract. A new formulation for the turbulence dissipation rate ε occurring in meandering conditions has been presented. The derivation consists of a MacLaurin series expansion of a lateral dispersion parameter that represents cases in which turbulence and oscillatory movements associated to the meandering events coexist. The new formulation presents the identical physical premises contained in the classical and largely used one, but the new formulation derived from meandering situations is expressed in terms of the loop parameter *m* that controls the absolute value of the negative lobe in the meandering autocorrelation function. Therefore, the *m* magnitude regulates the turbulence dissipation rate. This dissipation rate decreases for cases in which turbulence and low frequency horizontal wind oscillations coexist and increases for a fully developed turbulence. Furthermore, a statistical comparison to observed concentration data shows that the alternative relation for the turbulent dissipation rate occurring in situations of meandering enhanced dispersion is suitable for applications in Lagrangian Stochastic dispersion models.

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