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Application of a Lagrangian model to turbulent dispersion in the surface layer: the role of coherent structures

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We present an application of a recently developed Lagrangian stochastic model to turbulent dispersion over complex terrain. The model is based on a 4-dimensional Fokker-Planck (4DFP) equation . It extends the traditional Thomson 87 approach, taking into account both spatial and temporal turbulent structures, together with the ordinary one-point statistics (Reynolds tensor, average wind). We investigate the performance of the model in two different atmospheric stability conditions. In the first case we show the results of numerical simulations performed in neutral conditions using wind, Reynolds stress and correlation profiles reported in literature over vegetated canopies. In the second case we show some preliminary results about the dispersion in a convective boundary layer. We use the profiles of mean wind and turbulence derived from the statistical analysis of SODAR data. We report the equilibrium concentration and the diffusion coefficient profile obtained in both stability conditions. To investigate the effect of turbulent geometrical structure on diffusion coefficient, the simulations have been performed with different model set up: isotropy condition, inclusion of anisotropy only in temporal correlation functions, only in spatial ones, and finally including both temporal and spatial correlation functions.