Basic aspects of Lagrangian Stochastic Dispersion Models

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Lagrangian stochastic dispersion models (LSDM) are being increasingly used to simulate air pollution dispersion at different spatial and temporal scales and in various stability conditions. In this presentation, a brief review of the present state of the art of LSDM for the description of airborne dispersion in the Planetary Boundary Layer will be presented. In these models the motion of air masses or particles passively following the flow is studied. To simulate the presence of turbulent eddies, particle velocities are subject to a random forcing. Consequently, these models are of stochastic type. Each particle is moved, at each time step, by transport, due to the mean wind, and diffusion, related to the turbulent wind velocity fluctuations.
These models are based on the generalised Langevin equation. Their theoretical basis (Langevin equation, Fokker-Plank equation, PDFs, turbulence parameterisation, well mixed condition) and relevant implementation aspects (link with meteorological models, boundary conditions, concentration calculation) will be reviewed. The various application fields will be outlined.