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TREATMENT OF THE NEAR GROUND EFFECT IN LAGRANGIAN STOCHASTIC METHODS APPLIED TO A 2-D POINT SOURCE DISPERSION AFTER AN ISOLATED OBSTACLE IN A NEUTRAL FLOW.

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SHORT ABSTRACT

Abstract title: Treatment of the near ground effect in Lagrangian stochastic methods applied to a 2-D point source dispersion after an isolated obstacle in a neutral flow.

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Abstract text *(maximum 350 words.)*

Lagrangian stochastic methods tend to be increasingly used in atmospheric flows since they treat without spurious numerical diffusion transport as well as local source terms of any kind, which is of interest for reactive and poly-dispersed flows. In practice, hybrid moments/probability density function (PDF) methods, in which particles are transported using free-of-statistical-noise moments of a carrier flow (pre-)computed with a moments approach, is particularly attractive. However, in such formulation the influence of the wall-function boundary conditions has not always been thoroughly checked. These boundary conditions were developed by Dreeben and Pope (1997) and Minier and Pozorsky (1999) but analyzed only for stand-alone PDF approaches. Furthermore, using high Reynolds methods, in the vicinity of the wall both the mean velocity gradient and the dissipation rate diverge. This yields to a great inhomogeneity within the first cell near the wall which can yield to numerical discrepancies. The interpolation of the free-of-statistical-noise moments at the position of the particles is then a key point to put forward.

These issues are addressed here using a Rotta/simplified Langevin model. The effect of both the boundary conditions and the interpolation will be validated on a case of point source dispersion of pollutant after an obstacle in a neutral flow as proposed by Gamel (2015). First, the moments for the whole flow in all the domain are computed using the moment model. Second, to limit the computation cost, only the flow issued from the point source is simulated in the PDF methods using a Monte-Carlo approach. A great number of particles are injected at the point source location and is transported through the resolution of stochastic differential equations. The statistics obtained on this set of particles will then be conditioned by their original location. Thus, the corresponding velocity differ from the mean values measured for the whole flow. However,

the concentration being injected only in this point, its evolution can be properly treated by such an approach; the mean and variance of the concentration, but also the turbulent flux can be extracted for this kind of simulation. These moments are compared with Gamel experimental results.