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Stochastic fields method for sub-grid scale emission heterogeneity in mesoscale atmospheric dispersion models

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An innovative way for tackling the issue of sub-grid scale emission variability in mesoscale and large scale dispersion models is proposed based on the stochastic fields method for turbulent reacting flows. This method is a solution technique for the probability density function (PDF) transport equation and can be seen as an extension of currently used mesoscale dispersion models. It has been implemented in an existing mesoscale model and the results compared with Large-Eddy Simulation (LES) data devised to test specifically the effect of sub-grid scale emission heterogeneity on boundary layer concentration fluctuations. The stochastic fields method solves transport equations of the concentration PDF for dispersing scalars and therefore it possesses the ability to handle chemistry of any complexity without closure assumptions on the chemical reactions. This study shows for the first time the feasibility of applying this method to a mesoscale chemical transport model.