Geophysical Research Abstracts, Vol. 7, 00186, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00186

The estimation of the variation of the concentration using forward and reverse-time diffusion

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In case of a calamity at sea it is very important to predict the concentration of the pollutant in a certain area. One of the approach to solve this problem is to adopt Lagrangian particle model. By simulating the positions for many particles the ensemble a mean concentration can be found (see [1]). Here the tracks of all particles are independent, and this model allows to calculate only mean concentration.

To obtain the variation of the concentration one can adopt the two particle model. In this model two particles are released at the same time, but their movements are correlated. By simulating a large number of such pairs, not only the mean concentration, but also the variation of the concentration might be derived. The main problem of applying a two particle model in realistic applications is its high-dimensionality. It is well known, that the classical Monte-Carlo simulation for d-dimensional systems, where $d > 2$ becomes very inefficient and requires huge size of samples for providing a reasonable accuracy. In statistical literature this problem is referred as a "curse of dimensionality".

In our paper the forward-reverse estimator, recently introduced by G.N. Milstein, J.G.M. Schoenmakers and V. Spokoiny (see [2]), was applied for a two particle model. The forward-reverse estimator is based on realizations of original forward system and also on realizations of reverse time system derived from original one. This method allows to reduce the CPU time dramatically. We apply the two particle model to simulate the mean and variation of the concentration in coastal zone of the Netherlands.

REFERENCES

Heemink A.W. Stochastic modeling of dispersion in shallow water. *Stochastic Hydrol. and Hydraul.*, Vol. **4**, 161–174, 1990.

Milstein G.N., Schoenmakers J.G.M., Spokoiny V. Transition density estimation for stochastic differential equations via forward-reverse representations. *Bernoulli*, **10**,no 2, pp.281-312, 2004.