Geophysical Research Abstracts, Vol. 8, 06137, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06137

Inverse modelling for radionuclides from small to regional scale

M. Krysta (1), M. Bocquet (1), D. Quélo (1), B. Sportisse (1) and O. Isnard (2)

(1) CEREA, Research and Teaching Centre in Atmospheric Environment, Joint laboratory École Nationale des Ponts et Chaussées / EDF R&D, 6-8 avenue Blaise Pascal, 77455 Champs sur Marne, France,
(2) IRSN, Institute of Radiation Protection and Nuclear Safety, Environment and Emergency Operations Division, Emergencies and Emergency Response Organisation Department, 92262 Fontenay-aux-Roses cedex, France
(krysta@cerea.enpc.fr / phone: +33 (0)1 64 15 21 49)

Attempts to reconstruct a source of several potential accidental releases of radionuclides are reported. The source reconstructions are based on model-oriented techniques and the employed methods vary according to the scale of the problem.

At small scale (up to 10 km), we have developed a data assimilation system with a view to an efficient emergency response tool. The tool aims at inverting parameters which control an accidental release such as the emission rate, the deposition velocity, wind and turbulence parameters. Since activity concentrations are non-linear functions of these parameters, a variational approach to inverse modelling is used. The gradients required by the algorithm are computed in the adjoint mode which is constructed with an automatic differentiator. The system is tested on data from a wind tunnel experiment carried out on a scale model of the Bugey nuclear power plant, France.

At the European scale, a method for the retrieval of radionuclides' sources has been developed. The method relies on a Bayesian approach which is based on information theory. It is thought to be optimal as it can easily benefit from any prior information on the source (especially its positivity and boundedness). The method generates prior dependent cost functions that generalise the least square cost function widely used in variational data assimilation. Results are given on both noisy synthetic numerical experiments and real data sets (ETEX, Algeciras incident).