Models of aerial radioactive discharges — in a half-way to reality

Ing. Petr Pecha, CSc[1], Ing. Radek Hofman[1], Ing. Petr Kuča[2], Mgr. Kateřina Zemánková[3]

[1] Adaptivní systémy, Ústav teorie informace a automatizace, v.v.i., AV ČR,
Pod Vodárenskou věží 4, Praha 8, 182 00, ČR
[2] Informační systémy, SÚRO, Bartoškova 28, Praha 4, 140 00, ČR
[3] Meteorologie a ochrana životního prostředí, Matematicko-fyzikální fakulta, KU,
V Holešovičkách 2, Praha 8, 180 00, ČR

pecha@utia.cas.cz

Extensive progress in research and significant improvement of input data quality and its accessibility together with rapid advancement of computing resources reflect increasing demands of practice on model development. Reliable and up to date information represents basic inevitable conditions for effective management of intervention operations targeted on consequence mitigation during emergency situations. This appeared to be a basic lesson for further progress of emergency preparedness procedures, which has arisen from former accidents where lack of reliable information has shown to be the main reason of poor effectiveness of countermeasures. Crisis management should come out from reliable picture of space and time of accident evolution, which should take into account all available information including physical knowledge of problem, expert judgment of input data, online measurements from terrain and others.

Various models of pollution transport in atmosphere are able to incorporate fundamental features of the problem under different approaches. It relates to dimensionality, calculation domain and grid resolution, parametrization of respective physical phenomena, initial and boundary conditions, computational feasibility. Modifications of the classical *Gaussian* dispersion models have to accept more precise inputs. Transition to *Lagrangian* and *Eulerian* dispersion models represents common tendency in modelling and appears to be inevitable for analysis in microscale region in built-up areas. Lagrangian particle dispersion models together with proper assimilation techniques should be capable to analyse strongly inhomogeneous and non-Gaussian processes, thus providing a proper tool for emergency management support during local accidents leading to radioactivity dispersal into the living environment (crashes during transportation, terroristic abuse of radiological dispersal devices etc.).

In our contribution we illustrate an adoption of segmented Gaussian plume model (SGPM) when more detailed 3-D meteorological forecast data are used. The purpose of SGPM development is its application in extensive computations as a pivot algorithm of multiple procedure of online Bayesian tracking of the plume trajectory progression. Some comparative particular tests with Lagrangian model HYSPLIT show problems still remaining opened between application of the gridded meteorological forecast and local point meteorological measurements. The presented results of Bayesian tracking of radioactive plume in the early phase of its propagation show that this recursive data assimilation procedure seems to be robust and suitable to manage a certain discrepancies and scenario incompletness occurring from the same beginning of an accident. The presented SGPM approach brings advantage of fast computation even for large number of realizations and promises to support the decision making process in a real time. According to our opinion, the assimilation of model predictions with observations from terrain is a right way to the realistic predictions.

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