Abstract submission form

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Abstract information

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Method of Source Identification following an Accidental Release at an Unknown Location Using a Lagrangian Atmospheric Dispersion Model

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Abstract
We present the development of a computationally efficient source inversion algorithm and its implementation in the Lagrangian atmospheric dispersion model DIPCOT. The algorithm consists of two steps: in the first step of source location estimation a correlation-based cost function is minimised that contains model-calculated and observed concentrations; in the second step the release start time, duration and emission rate are assessed. The model-calculated concentrations are calculated through source-receptor functions obtained by backward-in-time dispersion simulations with the monitoring locations as sources. The novelty of the algorithm consists in the use of the values of the time-integrated concentrations at the monitoring stations instead of all of the individual measurements in the full concentration-time series, resulting in a significant reduction in the number of integrations of the backward transport equations. The developed algorithm was verified for the conditions of the ETEX-I (European Tracer Experiment—1st release). Using time-integrated measurements from all available stations, the distance between the estimated and true source location was 108 km. The estimated start time of the release was only about 1 h different from the true value, within the possible accuracy of estimate of this parameter. The estimated release duration was 21 h (the true value was 12 h). The estimated release rate was 4.28 g/s (the true value was 7.95 g/s). The estimated released mass almost perfectly fitted the true released mass (323.6 vs. 343.4 kg). It thus could be concluded that the developed algorithm is suitable for further integration in real-time decision support systems.