Reconstructing historical contamination events: use of computational tools to assist environmental engineers and health scientists

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Abstract

The Agency for Toxic Substances and Disease Registry (ATSDR) assesses numerous historical and legacy hazardous waste sites as part of its congressionally mandated public health responsibilities. Because historical, site-specific, contaminant and exposure data may be very limited or non-existent, computational tools (models) are needed to answer environmental and health-related questions associated with exposure scenarios and the conduct of public health assessments. This paper summarizes two case studies that demonstrate the effective application and use of computational tools for reconstructing historical contamination and exposure events. The case studies demonstrate the application of an analytical multimedia computational tool—the analytical contaminant analysis transport system (ACTS) and a water-distribution system model (EPANET) that has been coupled with a progressive optimality genetic algorithm (POGA). The resulting application and use of these computational tools have allowed environmental engineers and health scientists at the ATSDR to assess numerous exposure scenarios so that public health managers could address issues related to health risks associated with contaminated public water supplies.
Keywords: historical reconstruction, analytical models, probabilistic analysis, ACTS, water-distribution system model, EPANET, genetic algorithm, POG

1 Introduction

Exposures to toxic environmental contaminants are significant risk factors in human health and disease.

2 Main level Heading

In this paper, two types of models will be presented and briefly discussed.

2.1 Second level heading

The Agency for Toxic Substances and Disease Registry (ATSDR), an agency of the U.S. Department of Health and Human Services is required to address the potential association of disease with environmental contamination.

2.1.1 Third level heading

EPANET is a public-domain water-distribution system-modeling package that performs extended-period simulation of hydraulic and water-quality behavior within pressurized pipe networks, [16, 17

2.1.1.1 Fourth level heading

Two case studies are presented to illustrate the use and application of the computational models described above.

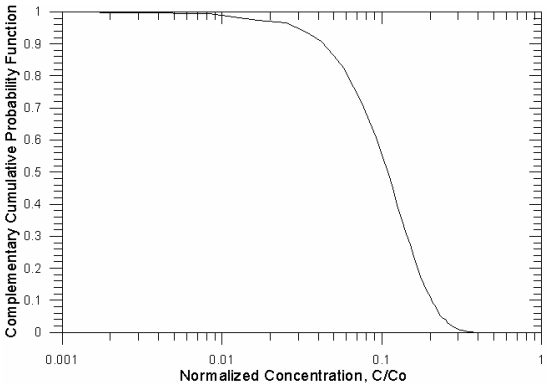

Figure 1. Complementary probability distribution function from ACTS analysis for fate and transport

$$\frac{\partial h}{\partial t} = K \frac{\partial^2 h}{\partial x^2} \tag{1}$$

Table 1: This is an example of table

Test 1	Test 2	Test 3	Test 4	Test 5
2	3.4	6.5	0.77	4.5
3	4.5	7.6	8.2	1000
4	5.5	89	44	5

4 Conclusions

Exposures to toxic environmental contaminants pose significant risk factors in human health and disease.

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[The references given below are examples of the following: (1) book; (2) paper in a journal; (3) report (4) manual (5) web reference (6)chapter in a book; (7) edited book; (8) paper in a conference proceeding; (9) personal communication;

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