

Comment on "Generalized analytical solution for advection-dispersion equation in finite spatial domain with arbitrary time-dependent inlet boundary condition" by Chen and Liu (HESD-8-4099-2011)(reviewed 2011-5-7).

1.General Comment:

This paper presents a generalized analytical solution for solute transport in a finite spatial domain with arbitrarily time-dependent inlet boundary condition by successively using Laplace transform and generalized integral transform techniques. Validity of the developed solution is checked by comparing with numerical solution using the Laplace transform finite difference technique under the condition of sinusoidally periodic input concentration. Numerical integration method is introduced to calculate the developed analytic solution, whose accuracy is checked by comparing with the solution using analytic integration under special case.

There are some mistakes in grammar and mathematical derivation. The sensitivity analysis in section 4.2 seems to be not thorough enough. However, the solution in this paper provides a more realistic solution to model the natural contaminant releasing and transport process and has scientific significance. I suggest publication of this paper after the following revisions.

2. Specific comment:

(1) Abstract

a. Page 4100, line 8: It is better to say "Result shows an excellent agreement between the analytical and numerical solutions".

(2) Introduction

a. Page 4101, line 2: change "advection-dispersion equation" to "ADEs";

b. Page 4101, line 7: it is better to replace "the analytical solutions" to "the closed-form analytical solutions";

c. Page 4101, line 20: change "due to" to ", because";

d. Page 4102, lines 6-8: the sentence "naturally occurring isotopes into a system from a flow through-lake can be dependent upon natural, cyclic, water-quality variations or liquid waste disposal operates on a periodic cycle" is not clear and not easy to understand;

e. Page 4102, line 14: delete "the" in front of "Laplace transform";

f. Page 4102, line 17: change "and the constraint" into ". Thus, the constraint", or add ";" between "boundary condition" and "and the constraint";

g. Page 4102, line 18: change "in finite special domain" into "in finite spacial domain";

(3) Governing equations

a. Page 4103, line 3: change "for the solute transport problem" into "for this solute transport problem";

b. Page 4103, line 7: add ";" between "the solute" and "k"; add "the" before "the first-order";

c. Page 4103, line 14: change "expression input function" into "solute concentration";

(4) Derivation of the generalized analytical solution

a. Page 4104, line 8: add "in" before "Eqs. (7) and (8)";

b. Page 4104: There is a mistake in Eq. (9) and the following equations. The retardation factor "R" seems to be lost from here.

c. Page 4104, line 14: add "dimensionless" before "Laplace transform"; add ";" or ":" before " $C_L(x_D, s)$ ";

d. Page 4104, line 15: change "which is" into "which are";

- e. Page 4105, line 3: delete "initial and"; add "in" before "Eqs. (10)";
- f. Page 4105, line 5: add "the" before "general integral transform";
- g. Page 4105, line 7: change "Eq. (12)" into "in Eq. (10)";
- h. Page 4105, line 10: delete "the" before " $C_V(x_D, s)$ ";
- i. Page 4106, Eq. (21): subscript "m" is lost in " ψ ";
- j. Page 4106: what does " C_G " mean in Eq. (22b)? Is $\overline{C}_V(x_D, s)$ the same as $C_V(x_D, s)$?

(5) Results and discussion

- a. Page 4108, line 2: change "exponential" into "exponentially";
- b. Page 4108, line 9: change "interesting" into "interested";
- c. Page 4108: what is "the conventional time-marching finite difference method"? What is the advantage of "LTFD technique" over "the conventional time-marching finite difference method"?
- d. Sensitivity analysis in part 4.2 seems to be not thorough enough?
- e. Page 4108: lines 27-28: Change the sentence " we use this analytical solution to carry out the parametric investigation in which the effect of D and k on periodic solute transport are illustrated and discussed" into " we use this analytical solution to investigate the effect of D and k on the periodic solute transport";
- f. Page 4109, line 4: add "the" before "concentration";
- g. Page 4109, line 5: change "large" into "larger".
- h. Page 4109, line 9: change "solution" into "solutions";
- i. Page 4109, line 14: delete "due to";
- j. Page 4109, line 15: add "," before "or the input function";
- k. Page 4109, line 20: change "is compared with" into "is checked by comparing with";
- l. Page 4109, line 21: change "exponential" into "exponentially";
- m. Page 4109, line 24: delete "the" before "Eq. (24)"; change "with excellent agreements" into "by the excellent agreements".
- n. Page 4109, line 28: add "the" before "development"; change "solution" into "solutions".

(6) Conclusions

- a. page 4110, line 5: change "dependent" into "time-dependent";
- b. Page 4110, line 19: change "solution" into "solutions";
- c. Page 4110, line 22: change "because several" into " , because some".