Erratum


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Lushnikov’s population balance equation describing the aggregation of particles composed of at most two-components is [1]

\[
\frac{d\tilde{c}(u, v; t)}{dt} = \frac{1}{2} \int_0^u \int_0^v K(u', v'|u - u', v - v') \tilde{c}(u', v'; t) \tilde{c}(u - u', v - v'; t) dv'du' - \tilde{c}(u, v; t) \int_0^\infty \int_0^\infty K(u, v|u', v') \tilde{c}(u', v'; t) dv'du' - \tilde{c}(u, v; t) \int_0^\infty \int_0^\infty K(u, v|u', v') \tilde{c}(u', v'; t) dv'du'.
\]

(1)

In the published paper [2], a solution for the special case where \(K(u, v|u', v') = \beta = \text{const.}\) was presented, subject to the initial distribution corresponding to a mixture of two populations of homogeneous particles, each exponentially distributed in size

\[
\tilde{c}(u, v; 0) = c_1 \lambda_1 e^{-\lambda_1 u} \lambda_2 \delta(\lambda_2 v) + c_2 \lambda_2 e^{-\lambda_2 v} \lambda_1 \delta(\lambda_1 u).
\]

(2)

Although the cumulative distribution \(G(u, v; t) = \int_0^u \int_0^v \tilde{c}(u, v; t) dv du\) presented as Eq. (54) is correct as written, the solution for the concentration density function presented as Eq. (A.6) has a typographical error. The correct expression is

\[
\tilde{c}(u, v; T) = \frac{4c_0 \lambda_1 \lambda_2}{(2 + T)^2} \left\{ x_1 \delta(\lambda_2 v) e^{-\lambda_1 x_1 u} + x_2 \delta(\lambda_1 u) e^{-\lambda_2 x_2 v} + 2x_1 x_2 \Theta I_0 \left( 2\Theta \sqrt{x_1 x_2 \lambda_1 \lambda_2 u v} \right) \right. \\
+ x_1 x_2 \Theta e^{-\lambda_1 x_1 u - \lambda_2 x_2 v} \left[ \left( \frac{x_2 \lambda_2 v}{x_1 \lambda_1 u} + \frac{x_1 \lambda_1 u}{x_2 \lambda_2 v} \right) \times I_1 \left( 2\Theta \sqrt{(x_1 \lambda_1 u)(x_2 \lambda_2 v)} \right) \right) \right\},
\]

(3)

where

DOI of original article: 10.1006/jcph.2002.7017.

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\[ \Theta = \frac{T}{2 + T}, \]
\[ v_i = 1 - \Theta x_i, \quad i = 1, 2, \]
\[ x_i = \frac{c_i}{c_0}, \quad i = 1, 2, \]
\[ c_0 = c_1 + c_2, \]
\[ T = c_0 \beta t \]

and \( I_\nu(x) \) is the modified Bessel function \([3]\). In the published paper, the factors of \( \Theta \) multiplying the modified Bessel functions were absent. Note that Eq. (3) reverts to Eq. (2) as \( T \to 0 \), as one would expect.

Finally, there is a typo on p. 432, Eq. (45) should read
\[ c(m, n, t) = \binom{m + n}{n} \left( \frac{c_1}{c_0} \right)^m \left( \frac{c_2}{c_0} \right)^n c(m + n, t), \quad c_0 = c_1 + c_2. \]

All results presented in the published paper employ the (correct) expressions presented here.

References