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Erratum

Erratum to "A general algorithm for exact simulation of multicomponent aggregation processes" [J. Comput. Phys. 177 (2002) 418–449]

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

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

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

$$\hat{c}(u,v;0) = c_1\lambda_1 e^{-\lambda_1 u}\lambda_2\delta(\lambda_2 v) + c_2\lambda_2 e^{-\lambda_2 v}\lambda_1\delta(\lambda_1 u). \quad (2)$$

Although the cumulative distribution $G(u,v;t) = \int_0^u \int_0^v \hat{c}(u,v;t)dv\,du$ 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

$$\hat{c}(u,v;T) = \frac{4c_0\lambda_1\lambda_2}{(2+T)^2}\Bigg\{x_1\delta(\lambda_2 v)e^{-\lambda_1 \upsilon_1 u} + x_2\delta(\lambda_1 u)e^{-\lambda_2 \upsilon_2 v} + 2x_1x_2\Theta I_0\left(2\Theta\sqrt{x_1x_2\lambda_2\lambda_1 uv}\right) + x_1x_2\Theta e^{-\lambda_1\upsilon_1 u - \lambda_2\upsilon_2 v}\left[\left(\sqrt{\frac{x_2\lambda_2 v}{x_1\lambda_1 u}} + \sqrt{\frac{x_1\lambda_1 u}{x_2\lambda_2 v}}\right) \times I_1\left(2\Theta\sqrt{(x_1\lambda_1 u)(x_2\lambda_2 v)}\right)\right]\Bigg\}, \quad (3)$$

where

$$\Theta = \frac{T}{2+T},$$
$$\upsilon_i = 1 - \Theta x_i, \quad i = 1,2,$$
$$x_i = \frac{c_i}{c_0}, \quad i = 1,2,$$

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$$c_0 = c_1 + c_2,$$
$$T = c_0 \beta t$$

and $I_n(x)$ is the modified Bessel function [3]. In the published paper, the factors of Θ 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

$$c(m, n; t) = \binom{m+n}{n} \left(\frac{c_1}{c_0}\right)^m \left(\frac{c_2}{c_0}\right)^n c(m+n, t), \quad c_0 = c_1 + c_2. \tag{4}$$

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

References

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[3] M. Abramovitz, I.A. Stegun, Handbook of Mathematical Functions, Dover, New York, NY, 1965.