Corrections to "A multi-scale model for solute transport in a wavy-walled channel"

November 13, 2008

Following the online first publication of "A multi-scale model for solute transport in a wavy-walled channel" on the Journal of Engineering Mathematics website (DOI: 10.1007/s10665-008-9239-x) a small error has been found in the $O(\varepsilon^2)$ term of the small ε asymptotic solution to the velocity. This error carries through to terms in the asymptotic concentration solution. This changes equation (3.1) to

$$\mathbf{u} = \begin{pmatrix} y \\ 0 \end{pmatrix} + \varepsilon \begin{pmatrix} e^{-y}(y-1)\cos x \\ -ye^{-y}\sin x \end{pmatrix} + \varepsilon^2 \begin{pmatrix} e^{-2y}(y-1)\cos 2x - 1 \\ \frac{1}{2}e^{-2y}(1-2y)\sin 2x \end{pmatrix} + O(\varepsilon^3). \quad (1)$$

This change in the small ε velocity changes the asymptotic solution of the concentration for Cases 1 and 2. This results in equations (A.4) and (A.5) changing to

$$\mathrm{Pe}\, y\bar{c}_{2x} - \bar{c}_{2xx} - \bar{c}_{2yy} = -\tfrac{1}{2}\mathrm{Pe}\, e^{-2y}(1-2y)\sin 2x + \mathrm{Pe}\, e^{-y}\left[y\sin x\bar{c}_{1y} - (y-1)\cos x\bar{c}_{1x}\right], \quad (2a)$$

and

$$\frac{1}{2}\mathrm{Pe}\, ye + \tfrac{d}{4} - d_{yy} = -\tfrac{1}{2}\mathrm{Pe}\, e^{-y}\left[(y-1)b + yb_y\right], \quad (3a)$$

$$-\frac{1}{2}\mathrm{Pe}\, yd + \tfrac{e}{4} - e_{yy} = -\tfrac{1}{2}\mathrm{Pe}\, e^{-2y}(1-2y) + \tfrac{1}{2}\mathrm{Pe}\, e^{-y}\left[(y-1)a + ya_y\right], \quad (3b)$$

$$f_{yy} = \tfrac{1}{2}\mathrm{Pe}\, e^{-y}\left[(y-1)b - yb_y\right], \quad (3c)$$

respectively. Although this causes a change to the overall asymptotic concentration, the change to the solution seen in Figure 4a is barely visable so a new figure is not shown.
Similarly equations (B.4) and (B.5) are changed to

$$\mathrm{Pe}\, yc_{2x} - c_{2xx} - c_{2yy} = -\tfrac{1}{2}\mathrm{Pe}\, e^{-2y}(1-2y)\sin 2x + \mathrm{Pe}\, e^{-y}\left[y\sin x c_{1y} - (y-1)\cos x c_{1x}\right], \quad (4)$$

and

$$
\begin{aligned}
\tfrac{1}{2}\mathrm{Pe}\, ym + \tfrac{1}{4}k - k_{yy} &= -\tfrac{1}{2}\mathrm{Pe}\, e^{-y}\left[(y-1)j + yj_y\right], && \text{(5a)}\\
-\tfrac{1}{2}\mathrm{Pe}\, yk + \tfrac{1}{4}m - m_{yy} &= -\tfrac{1}{2}\mathrm{Pe}\, e^{-2y}\,(1-2y) + \tfrac{1}{2}\mathrm{Pe}\, e^{-y}\left[(y-1)h + yh_y\right], && \text{(5b)}\\
n_{yy} &= \tfrac{1}{2}\mathrm{Pe}\, e^{-y}\left[(y-1)j - yj_y\right], && \text{(5c)}\\
k_y - \bar{\mu}k &= -\tfrac{1}{2}h + \tfrac{1}{2}\bar{\mu}h_y - \tfrac{1}{2}h_{yy} - \tfrac{1}{4},\ \text{ on } y = 0, && \text{(5d)}\\
m_y - \bar{\mu}m &= -\tfrac{1}{2}j + \tfrac{1}{2}\bar{\mu}j_y - \tfrac{1}{2}j_{yy},\ \text{ on } y = 0, && \text{(5e)}\\
n_y - \bar{\mu}n &= \tfrac{1}{2}h + \tfrac{1}{2}\bar{\mu}h_y - \tfrac{1}{2}h_{yy} + \tfrac{1}{4},\ \text{ on } y = 0, && \text{(5f)}\\
k_y, m_y, n_y &\to 0,\ \text{ as } y \to \infty. && \text{(5g)}
\end{aligned}
$$

respectively.