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Corrigendum

Corrigendum to “Transition in a numerical model of contact line dynamics and forced dewetting” [J. Comput. Phys. 374 (2018) 1061–1093]

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ABSTRACT

We correct an error by a factor of “e” in several equations of Afkhami et al. (2018) [1].

In our original paper [1], in Appendix B, there is an error in equation (B.7). The error is due to the fact that the expression in (B.7) follows only approximately from (B.6) and is the result of an asymptotic expansion. The leading order term in the expansion in powers of $1/|\ln x|$ was kept but not the second order term which should also be kept. It should also be noted that equation (B.7) is reproduced in Appendix A as (A.3). As a result equations (A.3) and (B.7) should both read

$$\eta'(\zeta) \sim \{9\mathrm{Ca}\ln[\pi/(2^{2/3}\beta^2 \mathrm{e}\zeta)]\}^{1/3} + \mathcal{O}\left[|\ln(\beta^2\zeta)|^{-5/3}\right],$$

with an additional factor of “e”. The rest of Appendix B is unchanged. In appendix A, due to the change in equation (A.3), a factor of “e” carries over to several expressions. Equation (A.4) should read

$$\beta^2 \sim \frac{\pi}{2^{2/3}\mathrm{e}r_m}\exp\left[-\frac{\theta_e^3}{9\mathrm{Ca}}\right],$$

and then equation (A.8) should be

$$\frac{3^{1/3}2^{-1/3}}{\pi\,\mathrm{Ai}^2(s_{\max})}\frac{\mathrm{Ca}_{cr}^{1/3}}{\mathrm{e}r_m}\exp\left(-\frac{\theta_e^3}{9\mathrm{Ca}_{cr}}\right) = \kappa_\infty.$$

Finally in equation (A.9) the factor of “e” cancels out and the equation reads

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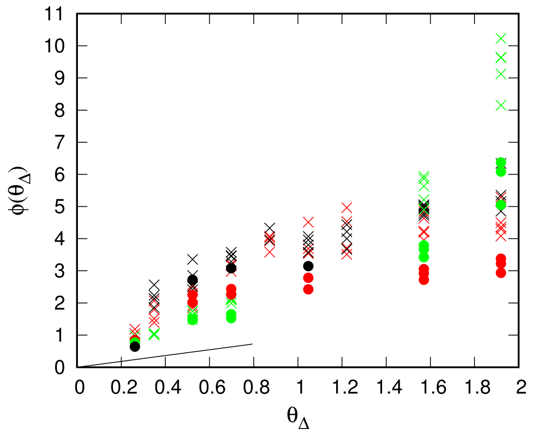

Fig. 1. The modified Figure 25. The gauge function ϕ plotted using expression (2) above, for Setups A (×), B (×), and C (×), compared to the computed values from the best fit of ϕ for Setups A (•), B (•), and C (•). The solid line is the prediction from lubrication theory. When $\lambda = \Delta$ lubrication theory gives $\phi = e\theta_\Delta/3$. For a given angle θ_Δ, the various values of ϕ correspond to the various values of the grid size Δ for each Setup. (For interpretation of the colors in the figure(s), the reader is referred to the web version of this article.)

$$\frac{\theta_e}{18^{1/3}\pi \,\mathrm{Ai}^2(s_{\max})} \frac{\mathrm{Ca}_{cr}^{1/3}}{\lambda} \exp\left(-\frac{\theta_e^3}{9\mathrm{Ca}_{cr}}\right) = \kappa_\infty. \tag{1}$$

This expression is now in full agreement with equation (9) of [2] contrary to what was written in the paragraph below equation (A.9).

In the original paper, equations (32) and (33) gain a factor of "e" as follows

$$C(0) = \frac{3^{1/3}2^{-1/3}}{\pi \,e\mathrm{Ai}^2(s_{\max})\kappa_\infty l_c},$$
$$\frac{3^{1/3}2^{-1/3}\mathrm{Ca}_{cr}^{1/3}}{\pi \,e\mathrm{Ai}^2(s_{\max}) r_m \kappa_\infty} \exp\left[-\frac{G(\theta_e)}{\mathrm{Ca}_{cr}}\right] = 1.$$

Again the discussion that follows should be modified to reflect that, as far as the factor of "e" is concerned, we now have agreement with both [2] and [3]. Finally, the estimate of the gauge function ϕ given in equation (37) in the original paper should be modified to gain a factor of "e"

$$\tilde{\phi}(\theta_\Delta, q) = \frac{\pi \,e\mathrm{Ai}^2(s_{\max})}{3^{1/3}2^{-5/6}} \frac{\Delta}{\mathrm{Ca}_{cr}^{1/3} l_c} \exp\left[\frac{G(\theta_\Delta, q)}{\mathrm{Ca}_{cr}}\right]. \tag{2}$$

Notice also that our equations (17) and (20) in the original paper are unchanged, so we still have $\phi = e\theta_e/3$ at small angles $\theta_e = \theta_\Delta$, and our comment that "equation (33) of [2] misses the above factor of e because of an incorrect derivation from equation (32) of [2]" still stands, but because it should also be $e\xi$ instead of ξ in equation (31) of [4] the two errors cancel and equation (41) of [4] corresponding to equation (1) above stands. As a result, the data points in Figs. 25 and 26 corresponding to this expression should be shifted upwards by a factor of "e", resulting in the two new figures displayed here (Figs. 1 and 2). The gauge function ϕ plotted using the new expression (2) is now in better agreement with values from the best fit of ϕ with the direct measurement of interface slopes. However the agreement with equation (20) in the original paper is worse, reflecting the fact that the prediction of equation (20) in the original paper, which is derived from the lubrication theory, is not well verified even at small angles. We thank Jens Eggers for his helpful correspondence about the derivation of equation (1).

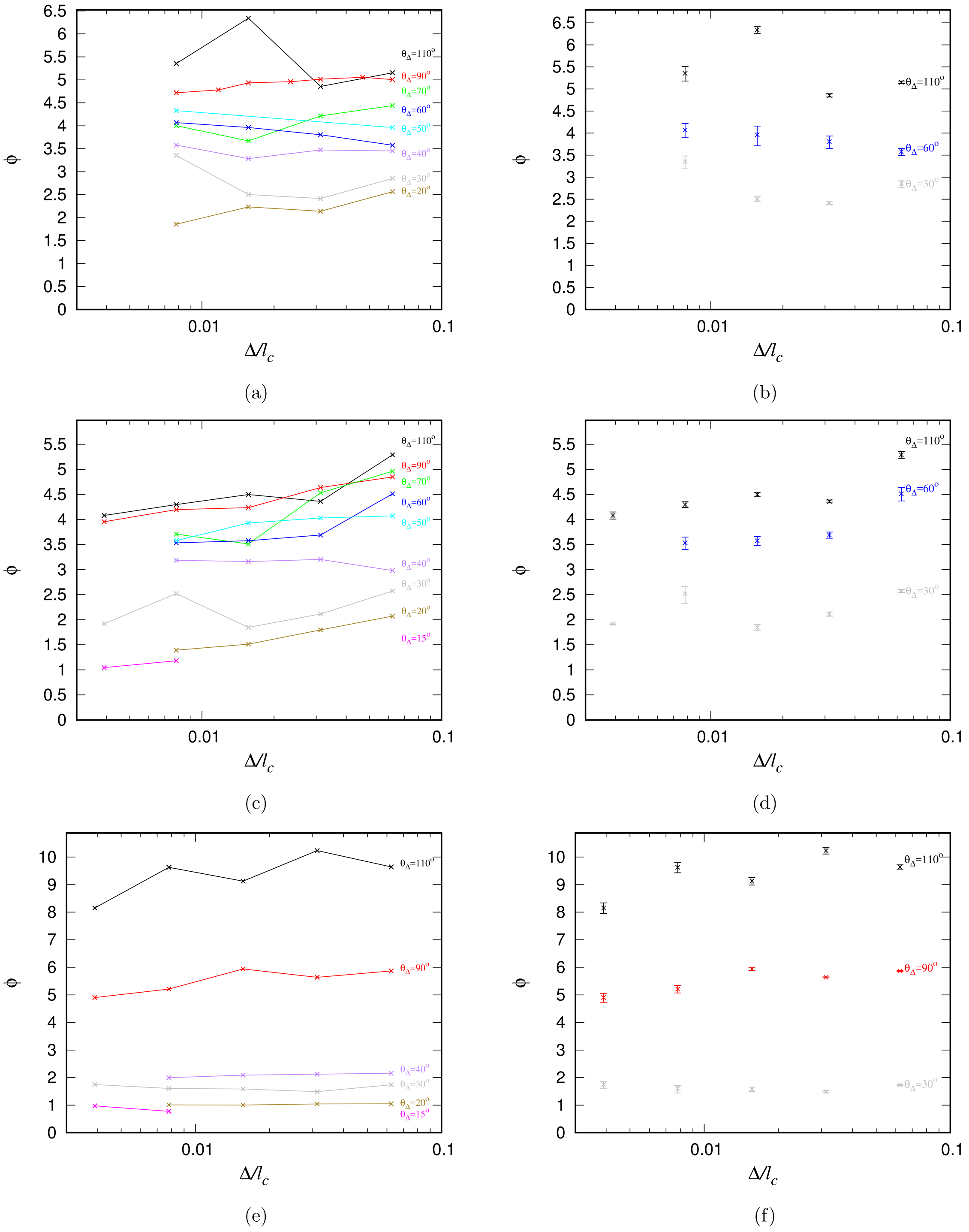

Fig. 2. The modified Figure 26. $\phi(\theta_\Delta)$ as obtained from equation (2) is plotted as a function of Δ/l_c for (a) Setup A, (c) Setup B, and (e) Setup C, and exemplifying the errors in the computation of ϕ for (b) Setup A, (d) Setup B, and (f) Setup C.

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