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Corrigendum to "Local similarity solution for steady laminar planar jet flow of viscoelastic FENE-P fluids" [Journal of Non-Newtonian Fluid Mechanics 279 (2020) 104265]

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This is to point out two small errors in two equations of the aforementioned paper and the corresponding changes in three figures. Additionally, we point out similar errors in six equations in the appendices, but these have no impact on the results or conclusions.

The correct equation for the derivative of the Peterlin function (K) in relation to the similarity variable η, is

$$K' = -\frac{6C_5G''\left(C_1K + C_3\right) + 2\left(C_2G'' + 2C_5\eta\left(C_1K + C_3\right)\right)G'''}{C_6} \tag{46}$$

with coefficients C_1, C_2, C_3, C_5 and C_6 as given in the original paper. Then, the correct final form of the momentum equation, the differential equation on the similarity function $G(\eta)$ is

$$G''' = -\frac{\left(G'^2 + GG''\right) + \beta_p f(L)3G''^2\left(\frac{2C_5\left(C_1K+C_3\right)+C_4C_6}{\left(K-C_4C_5\right)^2C_6}\right)}{\left(\left(1-\beta_p\right) + \beta_p f(L)\left(\frac{2G''\left(C_2G''+2C_5\eta\left(C_1K+C_3\right)\right)+C_6\left(K-C_4G'\right)}{\left(K-C_4C_5\right)^2C_6}\right)\right)} \tag{47}$$

with all quantities as defined in the original paper.

As discussed in the original manuscript, the planar jet flow of the FENE-P fluid is not globally similar, but locally similar. The above modifications do not change qualitatively the results, only the numerical values of the solution and in direct proportion to their elasticity. The correct solution maintains its local similarity nature, but differs by less from the low elasticity behavior than in the original paper, i.e., larger Weissenberg numbers, higher values of β_p or lower values of L^2 than in the original paper are needed to observe differences in relation to the low elasticity asymptotes. Except for the corrected Figs. 7, 8 and 12 below, all other Figures remain unchanged or exhibit slight differences that can only be seen through zooming. Fig. 7 presents the streamwise variation of the jet-half width and exhibit now a near universal behavior, except for very high levels of elasticity. This finding is confirmed in the transverse profiles of streamwise and normal dimensionless velocities at various locations and rheological properties for $Re = 100$, as plotted in Fig. 8. The corresponding transverse profiles of the conformation tensor components are plotted in Fig. 12.

Finally, the equations for K' and G''' of each of the three simpler approximate solutions in Appendices A and B are corrected, as follows:

$$K' = \frac{\left(C_7\left(3G'' + 2\eta G'''\right)\right)(1-K)}{\left(C_7C_8 - 1\right)} \tag{A-6}$$

$$G''' = \frac{-\left(G'^2 + GG''\right) + \beta_p\frac{3C_7G''^2(1-K)}{\left(C_7C_8-1\right)}}{\left(\left(1-\beta_pK\right) - \beta_p\frac{2\eta C_7G''(1-K)}{\left(C_7C_8-1\right)}\right)} \tag{A-7}$$

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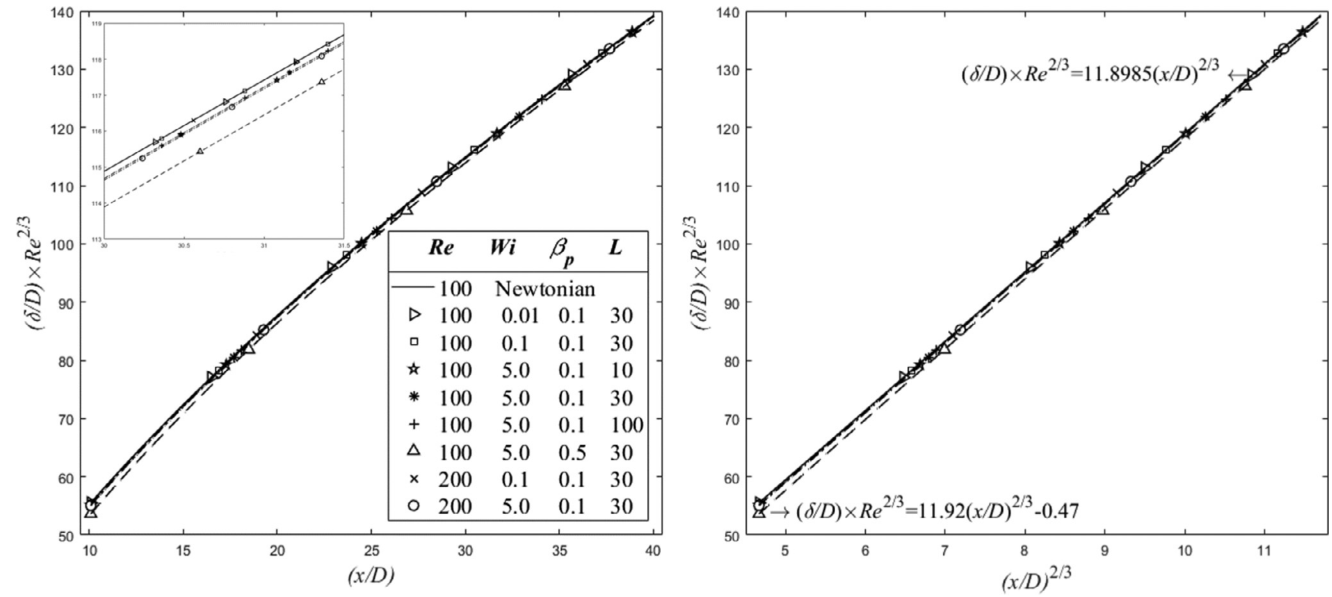
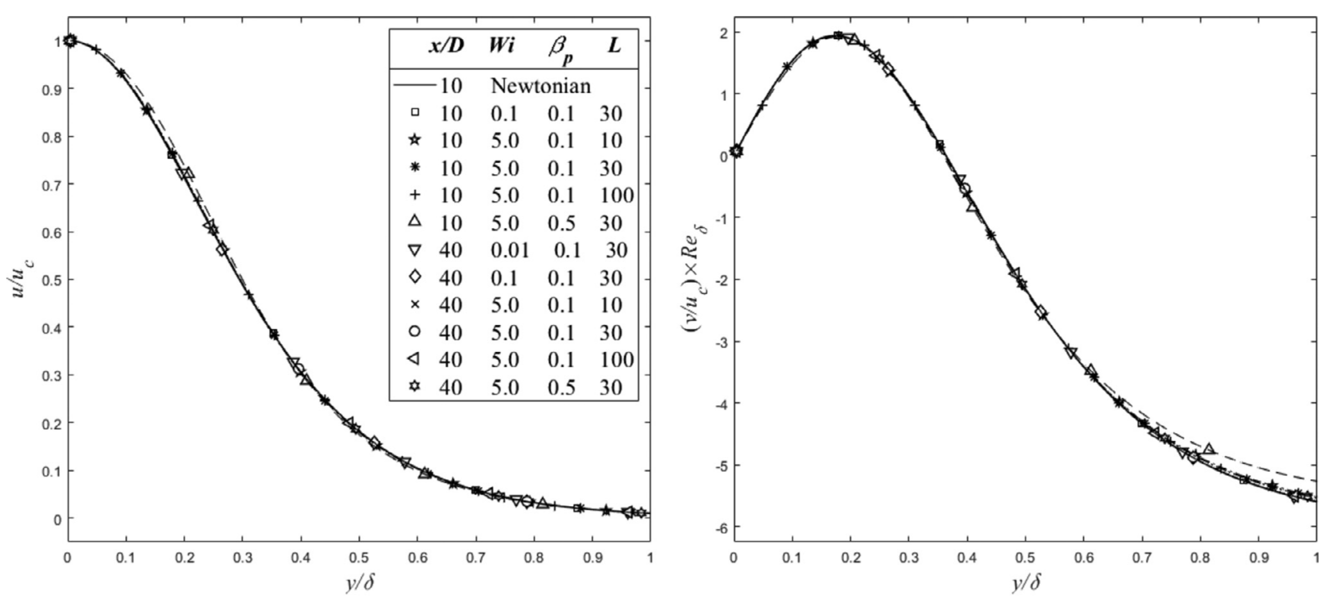


(a) (b)

Fig. 7. Evolution of the jet half-width (δ) for planar laminar jet flow: (a) variation with x/D; (b) variation with $(x/D)^{2/3}$ for the same cases in (a). In (b) the solid line simultaneously pertains to the Newtonian data and the corresponding fitted linear equation. Dashed lines are also fitted linear equations to some cases and a guide to the eye.



(a) (b)

Fig. 8. Transverse profiles of normalized velocity at $Re = 100$ as a function of x/D, Wi, β_p and L: (a) u/u_c and (b) v/u_c. Dashed lines are a guide to the eye.

$$K' = -\frac{3C_9G''(K+1) + \left(2\eta C_9(K+1) + 2C_{10}G''(K-1)\right)G'''}{C_{12}} \tag{A-10}$$

$$G''' = -\frac{\left(G'^2 + GG''\right) + \beta_p \frac{3C_9G''^2(K+1)}{C_{12}}}{\left(\left(1-\beta_pK\right) + 2\beta_pG''\frac{\eta C_9(K+1)+C_{10}G''(K-1)}{C_{12}}\right)} \tag{A-11}$$

$$K' = -\frac{2C_{13}G''G'''K^3}{3C_{13}K^2G''^2 + C_{14}} \tag{B-10}$$

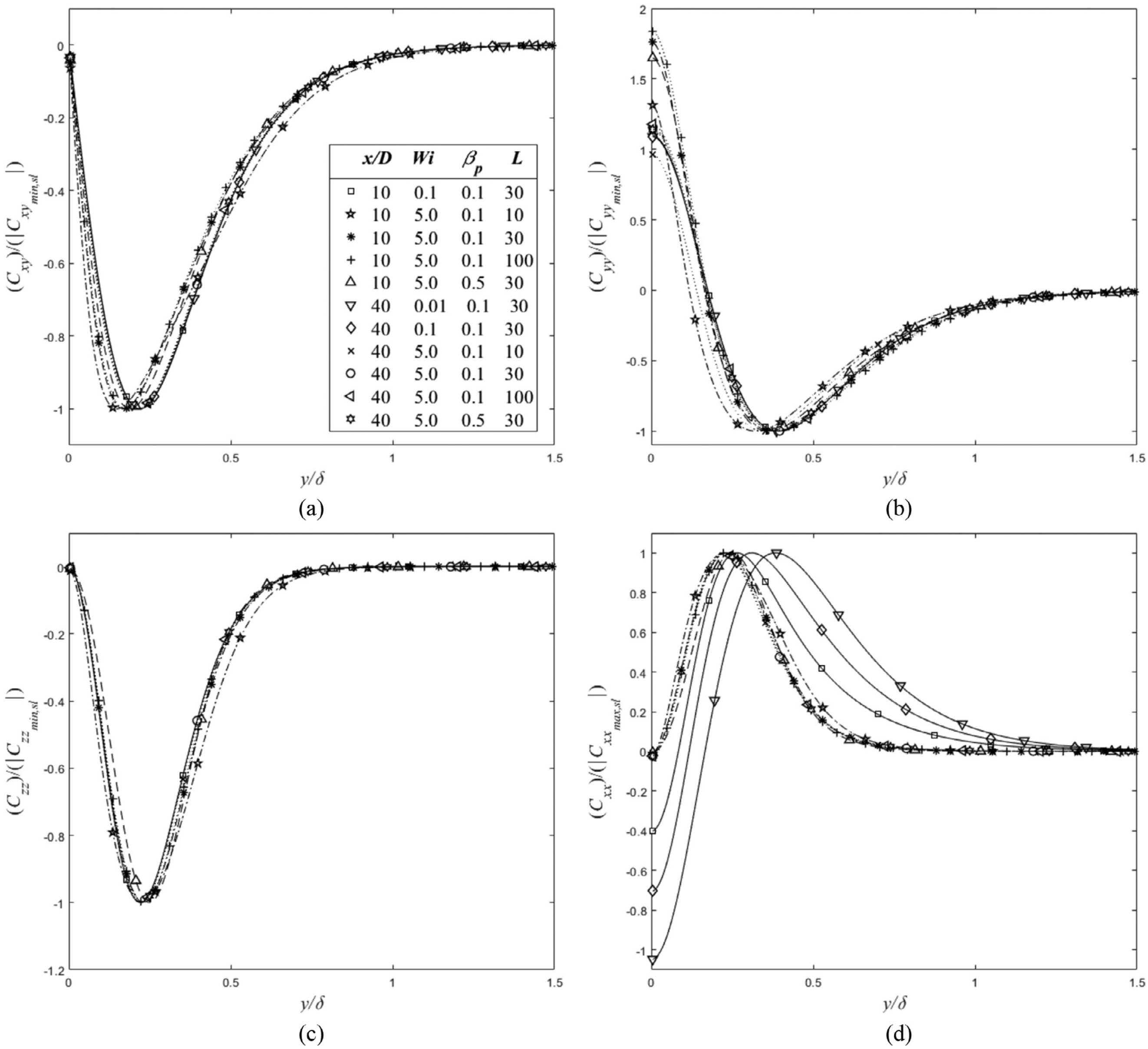


Fig. 12. Transverse profiles of the normalized conformation tensor components at $Re = 100$: (a) $C_{xy}/|C_{xy}|_{max}$, (b) $(C_{yy}-1)/(|C_{yy}-1|_{max,sl})$, (c) $(C_{zz}-1)/(|C_{zz}-1|_{max,sl})$ and (d) $(C_{xx}-1)/(|C_{xx}-1|_{max,sl})$. Subscript "max,sl" refers to local maximum value at the jet shear layer.

$$G''' = \frac{-\left(G'^2 + GG''\right)}{1-\beta_p+\beta_p f(L)K-\beta_p f(L)\frac{2C_{13}G''^2K^3}{C_{14}+3C_{13}K^2G''^2}} \tag{B-11}$$