According to Jeffrey (1982) for a two particle collision along the line of centres, the asymptotic solution reads:

$$f = \frac{f_{Hydrodynamic}}{f_{Stokes}} = \underbrace{\frac{2}{(1-\kappa)^2 s}}_{f_A} - \underbrace{\frac{2(1-7\kappa+\kappa^2)}{5(1-\kappa)^3} ln(s)}_{f_B} + \underbrace{K_1(\kappa)}_{f_C}$$
$$- \underbrace{\frac{2(1-18\kappa-29\kappa^2-18\kappa^3+\kappa^4)}{21(1-\kappa)^4} sln(s)}_{f_D} + \underbrace{L_1(\kappa)s}_{f_E} + O(s^2 ln(s)) \quad (0.1)$$

where $f_C = 1.3456$ and $f_E = 0.19s$ for monosized spheres approaching each other with the same constant velocity. Every included lubrication force term is mentioned as an indices, i.e. the whole solution is defined as f_{ABCDE}. The lubrication force f_{ABD} corresponds to the model suggested by Ball and Melrose (1997).

In figure 0.1, the lubrication force is shown for different combinations of the terms. The error for the “different lubrication force solutions” to the “whole set f_{ABCDE}” is plotted in figure 0.2.

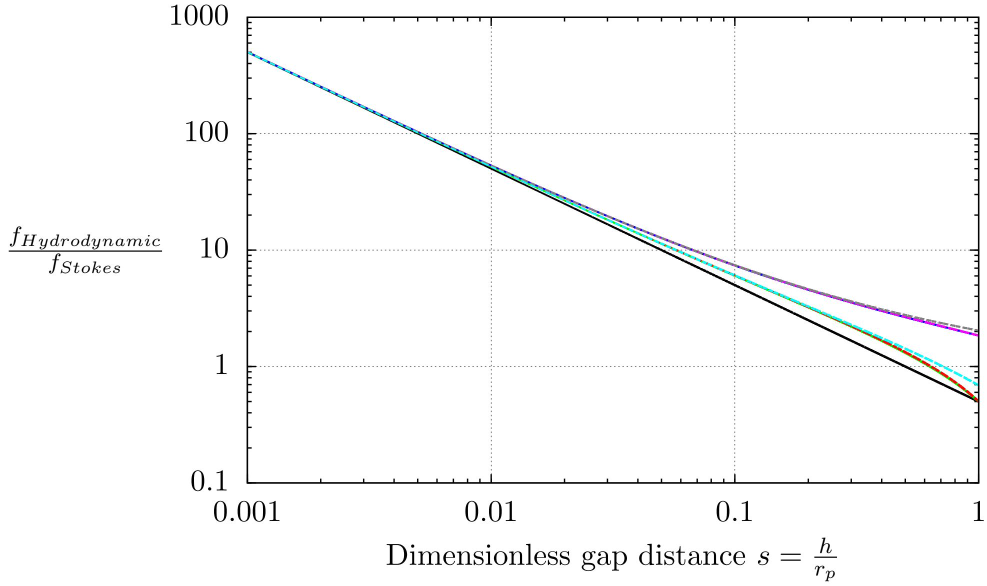

Figure 0.1: Influence of the different lubrication force terms: –: f_A, –: f_{AB}, –: f_{ABC}, –: f_{ABCD}, –: f_{ABCDE}, –: f_{ABD}, –: f_{ABDE}.

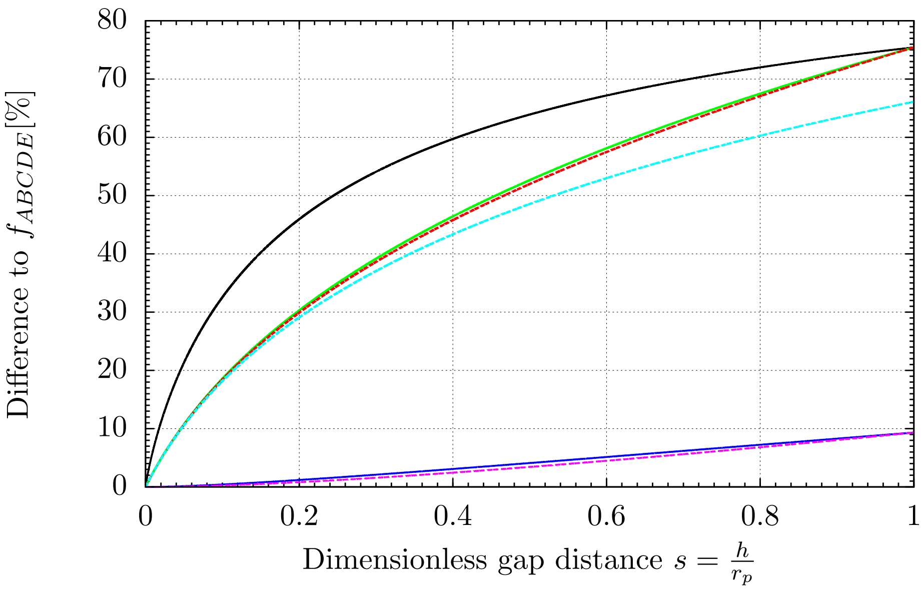

Figure 0.2: Difference to f_{ABCDE} for the lubrication forces with terms: —: f_A, —: f_{AB}, —: f_{ABC}, —: f_{ABCD}, —: f_{ABD}, —: f_{ABDE}.

Bibliography

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