

Appendix B: Coefficients for the model profile

The coefficients G_0, G_2, G_4, H_2, H_4 defined in §5 are given explicitly in this Appendix for the model skin-friction profile of §4.1. The notation is as in the main body of the paper with the additional definition

$$c = \alpha_N^{-1/3}.$$

$$\begin{aligned}
G_0 = & c\mathcal{G}_0 + (c\widehat{c}\mathcal{G}_0)/2 + c\widehat{c}\mathcal{G}_1s_N + (5B^2c\mathcal{G}_0)/72 \\
& + (3c\widehat{c}^2\mathcal{G}_0)/8 - (5B^2c\mathcal{G}_1s_N)/72 + (3c\widehat{c}^2\mathcal{G}_1s_N)/2 \\
& + (B^2c\mathcal{G}_2s_N^2)/18 + c\widehat{c}^2\mathcal{G}_2s_N^2 + (5B^2c\widehat{c}\mathcal{G}_0)/144 \\
& + (5c\widehat{c}^3\mathcal{G}_0)/16 - (5B^2c\widehat{c}\mathcal{G}_1s_N)/144 + (15c\widehat{c}^3\mathcal{G}_1s_N)/8 \\
& + (5c\widehat{c}^3\mathcal{G}_2s_N^2)/2 + (B^2c\widehat{c}\mathcal{G}_3s_N^3)/6 + c\widehat{c}^3\mathcal{G}_3s_N^3 \\
& + (5B^4c\mathcal{G}_0)/10368 + (5B^2c\widehat{c}^2\mathcal{G}_0)/192 + (35c\widehat{c}^4\mathcal{G}_0)/128 \\
& - (5B^4c\mathcal{G}_1s_N)/10368 - (5B^2c\widehat{c}^2\mathcal{G}_1s_N)/192 + (35c\widehat{c}^4\mathcal{G}_1s_N)/16 \\
& - (5B^4c\mathcal{G}_2s_N^2)/10368 - (5B^2c\widehat{c}^2\mathcal{G}_2s_N^2)/144 + (35c\widehat{c}^4\mathcal{G}_2s_N^2)/8 \\
& + (5B^4c\mathcal{G}_3s_N^3)/864 + (3B^2c\widehat{c}^2\mathcal{G}_3s_N^3)/8 + (7c\widehat{c}^4\mathcal{G}_3s_N^3)/2 \\
& + (B^4c\mathcal{G}_4s_N^4)/216 + (B^2c\widehat{c}^2\mathcal{G}_4s_N^4)/3 + c\widehat{c}^4\mathcal{G}_4s_N^4 \\
& - (5c\mathcal{G}_0\widehat{x})/6 + (c\mathcal{G}_1s_N\widehat{x})/3 - (5c\widehat{c}\mathcal{G}_0\widehat{x})/12 \\
& - (c\widehat{c}\mathcal{G}_1s_N\widehat{x})/3 + (2c\widehat{c}\mathcal{G}_2s_N^2\widehat{x})/3 + (5B^2c\mathcal{G}_0\widehat{x})/432 \\
& - (5c\widehat{c}^2\mathcal{G}_0\widehat{x})/16 - (5B^2c\mathcal{G}_1s_N\widehat{x})/432 - (5c\widehat{c}^2\mathcal{G}_1s_N\widehat{x})/8 \\
& + (5c\widehat{c}^2\mathcal{G}_2s_N^2\widehat{x})/6 + (B^2c\mathcal{G}_3s_N^3\widehat{x})/18 + c\widehat{c}^2\mathcal{G}_3s_N^3\widehat{x} \\
& + (5B^2c\widehat{c}\mathcal{G}_0\widehat{x})/864 - (25c\widehat{c}^3\mathcal{G}_0\widehat{x})/96 - (5B^2c\widehat{c}\mathcal{G}_1s_N\widehat{x})/864 \\
& - (5c\widehat{c}^3\mathcal{G}_1s_N\widehat{x})/6 - (5B^2c\widehat{c}\mathcal{G}_2s_N^2\widehat{x})/216 + (5c\widehat{c}^3\mathcal{G}_2s_N^2\widehat{x})/6 \\
& + (7B^2c\widehat{c}\mathcal{G}_3s_N^3\widehat{x})/36 + (8c\widehat{c}^3\mathcal{G}_3s_N^3\widehat{x})/3 + (2B^2c\widehat{c}\mathcal{G}_4s_N^4\widehat{x})/9 \\
& + (4c\widehat{c}^3\mathcal{G}_4s_N^4\widehat{x})/3 + (55c\mathcal{G}_0\widehat{x}^2)/72 - (7c\mathcal{G}_1s_N\widehat{x}^2)/18 \\
& + (c\mathcal{G}_2s_N^2\widehat{x}^2)/9 + (55c\widehat{c}\mathcal{G}_0\widehat{x}^2)/144 + (13c\widehat{c}\mathcal{G}_1s_N\widehat{x}^2)/72 \\
& - (c\widehat{c}\mathcal{G}_2s_N^2\widehat{x}^2)/2 + (c\widehat{c}\mathcal{G}_3s_N^3\widehat{x}^2)/3 - (25B^2c\mathcal{G}_0\widehat{x}^2)/5184 \\
& + (55c\widehat{c}^2\mathcal{G}_0\widehat{x}^2)/192 + (25B^2c\mathcal{G}_1s_N\widehat{x}^2)/5184 + (5c\widehat{c}^2\mathcal{G}_1s_N\widehat{x}^2)/12 \\
& - (5B^2c\mathcal{G}_2s_N^2\widehat{x}^2)/1296 - (25c\widehat{c}^2\mathcal{G}_2s_N^2\widehat{x}^2)/36 + (B^2c\mathcal{G}_3s_N^3\widehat{x}^2)/216 \\
& + (B^2c\mathcal{G}_4s_N^4\widehat{x}^2)/27 + (2c\widehat{c}^2\mathcal{G}_4s_N^4\widehat{x}^2)/3 - (935c\mathcal{G}_0\widehat{x}^3)/1296 \\
& + (265c\mathcal{G}_1s_N\widehat{x}^3)/648 - (c\mathcal{G}_2s_N^2\widehat{x}^3)/6 + (c\mathcal{G}_3s_N^3\widehat{x}^3)/27 \\
& - (935c\widehat{c}\mathcal{G}_0\widehat{x}^3)/2592 - (35c\widehat{c}\mathcal{G}_1s_N\widehat{x}^3)/324 + (65c\widehat{c}\mathcal{G}_2s_N^2\widehat{x}^3)/162 \\
& - (10c\widehat{c}\mathcal{G}_3s_N^3\widehat{x}^3)/27 + (4c\widehat{c}\mathcal{G}_4s_N^4\widehat{x}^3)/27 + (21505c\mathcal{G}_0\widehat{x}^4)/31104 \\
& - (1625c\mathcal{G}_1s_N\widehat{x}^4)/3888 + (389c\mathcal{G}_2s_N^2\widehat{x}^4)/1944 - (11c\mathcal{G}_3s_N^3\widehat{x}^4)/162 \\
& + (c\mathcal{G}_4s_N^4\widehat{x}^4)/81;
\end{aligned}$$

$$\begin{aligned}
G_2 = & (5Bc\mathcal{G}_0)/6 - (Bc\mathcal{G}_1s_N)/3 + (5Bc\widehat{c}\mathcal{G}_0)/12 + (Bc\widehat{c}\mathcal{G}_1s_N)/3 \\
& - (2Bc\widehat{c}\mathcal{G}_2s_N^2)/3 - (5B^3c\mathcal{G}_0)/864 + (5Bc\widehat{c}^2\mathcal{G}_0)/16 \\
& + (5B^3c\mathcal{G}_1s_N)/864 + (5Bc\widehat{c}^2\mathcal{G}_1s_N)/8 - (5Bc\widehat{c}^2\mathcal{G}_2s_N^2)/6 \\
& - (B^3c\mathcal{G}_3s_N^3)/36 - Bc\widehat{c}^2\mathcal{G}_3s_N^3 - (5B^3c\widehat{c}\mathcal{G}_0)/1728
\end{aligned}$$

$$\begin{aligned}
& +(25Bc\widehat{c}^3\mathcal{G}_0)/96 + (5B^3c\widehat{c}\mathcal{G}_{1s_N})/1728 + (5Bc\widehat{c}^3\mathcal{G}_{1s_N})/6 \\
& +(5B^3c\widehat{c}\mathcal{G}_2s_N^2)/432 - (5Bc\widehat{c}^3\mathcal{G}_2s_N^2)/6 - (7B^3c\widehat{c}\mathcal{G}_3s_N^3)/72 \\
& -(8Bc\widehat{c}^3\mathcal{G}_3s_N^3)/3 - (B^3c\widehat{c}\mathcal{G}_4s_N^4)/9 - (4Bc\widehat{c}^3\mathcal{G}_4s_N^4)/3 \\
& -(5Bc\mathcal{G}_0\widehat{x})/18 + (5Bc\mathcal{G}_{1s_N}\widehat{x})/18 - (2Bc\mathcal{G}_2s_N^2\widehat{x})/9 \\
& -(5Bc\widehat{c}\mathcal{G}_0\widehat{x})/36 + (5Bc\widehat{c}\mathcal{G}_{1s_N}\widehat{x})/36 - (2Bc\widehat{c}\mathcal{G}_3s_N^3\widehat{x})/3 \\
& -(5B^3c\mathcal{G}_0\widehat{x})/1296 - (5Bc\widehat{c}^2\mathcal{G}_0\widehat{x})/48 + (5B^3c\mathcal{G}_{1s_N}\widehat{x})/1296 \\
& +(5Bc\widehat{c}^2\mathcal{G}_{1s_N}\widehat{x})/48 + (5B^3c\mathcal{G}_2s_N^2\widehat{x})/1296 + (5Bc\widehat{c}^2\mathcal{G}_2s_N^2\widehat{x})/36 \\
& -(5B^3c\mathcal{G}_3s_N^3\widehat{x})/108 - (3Bc\widehat{c}^2\mathcal{G}_3s_N^3\widehat{x})/2 - (B^3c\mathcal{G}_4s_N^4\widehat{x})/27 \\
& -(4Bc\widehat{c}^2\mathcal{G}_4s_N^4\widehat{x})/3 + (5Bc\mathcal{G}_0\widehat{x}^2)/27 - (5Bc\mathcal{G}_{1s_N}\widehat{x}^2)/27 \\
& +(Bc\mathcal{G}_2s_N^2\widehat{x}^2)/6 - (Bc\mathcal{G}_3s_N^3\widehat{x}^2)/9 + (5Bc\widehat{c}\mathcal{G}_0\widehat{x}^2)/54 \\
& -(5Bc\widehat{c}\mathcal{G}_{1s_N}\widehat{x}^2)/54 + (5Bc\widehat{c}\mathcal{G}_2s_N^2\widehat{x}^2)/108 + (Bc\widehat{c}\mathcal{G}_3s_N^3\widehat{x}^2)/9 \\
& -(4Bc\widehat{c}\mathcal{G}_4s_N^4\widehat{x}^2)/9 - (35Bc\mathcal{G}_0\widehat{x}^3)/243 + (35Bc\mathcal{G}_{1s_N}\widehat{x}^3)/243 \\
& -(65Bc\mathcal{G}_2s_N^2\widehat{x}^3)/486 + (17Bc\mathcal{G}_3s_N^3\widehat{x}^3)/162 - (4Bc\mathcal{G}_4s_N^4\widehat{x}^3)/81;
\end{aligned}$$

$$\begin{aligned}
G_4 = & (5B^2c\mathcal{G}_0)/72 - (5B^2c\mathcal{G}_{1s_N})/72 + (B^2c\mathcal{G}_2s_N^2)/18 + (5B^2c\widehat{c}\mathcal{G}_0)/144 \\
& -(5B^2c\widehat{c}\mathcal{G}_{1s_N})/144 + (B^2c\widehat{c}\mathcal{G}_3s_N^3)/6 + (5B^4c\mathcal{G}_0)/7776 \\
& +(5B^2c\widehat{c}^2\mathcal{G}_0)/192 - (5B^4c\mathcal{G}_{1s_N})/7776 - (5B^2c\widehat{c}^2\mathcal{G}_{1s_N})/192 \\
& -(5B^4c\mathcal{G}_2s_N^2)/7776 - (5B^2c\widehat{c}^2\mathcal{G}_2s_N^2)/144 + (5B^4c\mathcal{G}_3s_N^3)/648 \\
& +(3B^2c\widehat{c}^2\mathcal{G}_3s_N^3)/8 + (B^4c\mathcal{G}_4s_N^4)/162 + (B^2c\widehat{c}^2\mathcal{G}_4s_N^4)/3 \\
& +(5B^2c\mathcal{G}_0\widehat{x})/432 - (5B^2c\mathcal{G}_{1s_N}\widehat{x})/432 + (B^2c\mathcal{G}_3s_N^3\widehat{x})/18 \\
& +(5B^2c\widehat{c}\mathcal{G}_0\widehat{x})/864 - (5B^2c\widehat{c}\mathcal{G}_{1s_N}\widehat{x})/864 - (5B^2c\widehat{c}\mathcal{G}_2s_N^2\widehat{x})/216 \\
& +(7B^2c\widehat{c}\mathcal{G}_3s_N^3\widehat{x})/36 + (2B^2c\widehat{c}\mathcal{G}_4s_N^4\widehat{x})/9 - (25B^2c\mathcal{G}_0\widehat{x}^2)/5184 \\
& +(25B^2c\mathcal{G}_{1s_N}\widehat{x}^2)/5184 - (5B^2c\mathcal{G}_2s_N^2\widehat{x}^2)/1296 + (B^2c\mathcal{G}_3s_N^3\widehat{x}^2)/216 \\
& +(B^2c\mathcal{G}_4s_N^4\widehat{x}^2)/27;
\end{aligned}$$

$$\begin{aligned}
H_2 = & \beta B\mathcal{F}_0 + \beta B\widehat{c}\mathcal{F}_{1s_N} + (\beta B^3\mathcal{F}_0)/16 + (11\beta B^3\mathcal{F}_{1s_N})/144 \\
& + \beta B\widehat{c}^2\mathcal{F}_{1s_N} + (\beta B^3\mathcal{F}_2s_N^2)/36 + \beta B\widehat{c}^2\mathcal{F}_2s_N^2 + (5\beta B^3\widehat{c}\mathcal{F}_{1s_N})/36 \\
& + \beta B\widehat{c}^3\mathcal{F}_{1s_N} + (5\beta B^3\widehat{c}\mathcal{F}_2s_N^2)/24 + 2\beta B\widehat{c}^3\mathcal{F}_2s_N^2 \\
& + (\beta B^3\widehat{c}\mathcal{F}_3s_N^3)/12 + \beta B\widehat{c}^3\mathcal{F}_3s_N^3 + (\beta B\mathcal{F}_0\widehat{x})/2 + (\beta B\mathcal{F}_{1s_N}\widehat{x})/3 \\
& +(5\beta B\widehat{c}\mathcal{F}_{1s_N}\widehat{x})/6 + (2\beta B\widehat{c}\mathcal{F}_2s_N^2\widehat{x})/3 + (3\beta B^3\mathcal{F}_0\widehat{x})/32 \\
& +(139\beta B^3\mathcal{F}_{1s_N}\widehat{x})/864 + (5\beta B\widehat{c}^2\mathcal{F}_{1s_N}\widehat{x})/6 + (\beta B^3\mathcal{F}_2s_N^2\widehat{x})/9 \\
& +(11\beta B\widehat{c}^2\mathcal{F}_2s_N^2\widehat{x})/6 + (\beta B^3\mathcal{F}_3s_N^3\widehat{x})/36 + \beta B\widehat{c}^2\mathcal{F}_3s_N^3\widehat{x} \\
& - (\beta B\mathcal{F}_0\widehat{x}^2)/8 + (\beta B\mathcal{F}_{1s_N}\widehat{x}^2)/18 + (\beta B\mathcal{F}_2s_N^2\widehat{x}^2)/9 \\
& - (5\beta B\widehat{c}\mathcal{F}_{1s_N}\widehat{x}^2)/72 + (\beta B\widehat{c}\mathcal{F}_2s_N^2\widehat{x}^2)/3 + (\beta B\widehat{c}\mathcal{F}_3s_N^3\widehat{x}^2)/3 \\
& + (\beta B\mathcal{F}_0\widehat{x}^3)/16 - (23\beta B\mathcal{F}_{1s_N}\widehat{x}^3)/648 - (\beta B\mathcal{F}_2s_N^2\widehat{x}^3)/54 \\
& + (\beta B\mathcal{F}_3s_N^3\widehat{x}^3)/27;
\end{aligned}$$

$$H_4 = -(\beta B^2\mathcal{F}_0)/4 - (\beta B^2\mathcal{F}_{1s_N})/6 - (5\beta B^2\widehat{c}\mathcal{F}_{1s_N})/12 - (\beta B^2\widehat{c}\mathcal{F}_2s_N^2)/3$$

$$\begin{aligned}
& -(\beta B^4 \mathcal{F}_0)/32 - (139\beta B^4 \mathcal{F}_1 s_N)/2592 - (5\beta B^2 \widehat{e}^2 \mathcal{F}_1 s_N)/12 \\
& -(\beta B^4 \mathcal{F}_2 s_N^2)/27 - (11\beta B^2 \widehat{e}^2 \mathcal{F}_2 s_N^2)/12 - (\beta B^4 \mathcal{F}_3 s_N^3)/108 \\
& -(\beta B^2 \widehat{e}^2 \mathcal{F}_3 s_N^3)/2 - (\beta B^2 \mathcal{F}_0 \widehat{x})/4 - (11\beta B^2 \mathcal{F}_1 s_N \widehat{x})/36 \\
& -(\beta B^2 \mathcal{F}_2 s_N^2 \widehat{x})/9 - (5\beta B^2 \widehat{e} \mathcal{F}_1 s_N \widehat{x})/9 - (5\beta B^2 \widehat{e} \mathcal{F}_2 s_N^2 \widehat{x})/6 \\
& -(\beta B^2 \widehat{e} \mathcal{F}_3 s_N^3 \widehat{x})/3 - (5\beta B^2 \mathcal{F}_1 s_N \widehat{x}^2)/54 - (5\beta B^2 \mathcal{F}_2 s_N^2 \widehat{x}^2)/36 \\
& -(\beta B^2 \mathcal{F}_3 s_N^3 \widehat{x}^2)/18.
\end{aligned}$$