May 16, 2025

Abstract

1

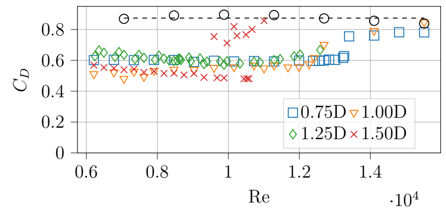
Results for a model $D = 20mm$. Flexibility can reduce drag in these cases.

In experiences with $D = 50mm$, two elastic modes can be found. Mode 1 *small* lengths. We found, for $B = 4.43 \cdot 10^{-5}\mathrm{N\,m}$ Mode 1 in ℓ/D=0.75. For $B = 23.4 \cdot 10^{-5}\mathrm{N\,m}$ $\ell/D \leq 1.00$.

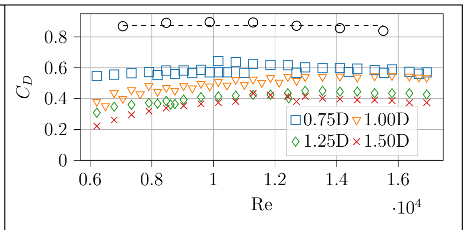
It is important in order to define a reduce velocity number $U_R = f_n D/u_\infty$ Defining a Cauchy number

$$Ca = \frac{\rho u_\infty^2 \ell^3}{8B}$$

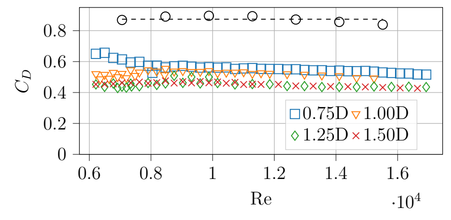
2 Deformations and vibration



(a) $B = 0.45 \cdot 10^{-5}\mathrm{N\,m}$.

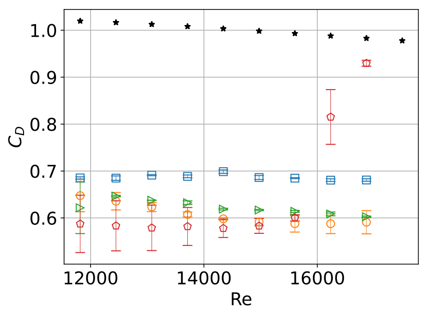


(b) $B = 5.58 \cdot 10^{-5}\mathrm{N\,m}$.

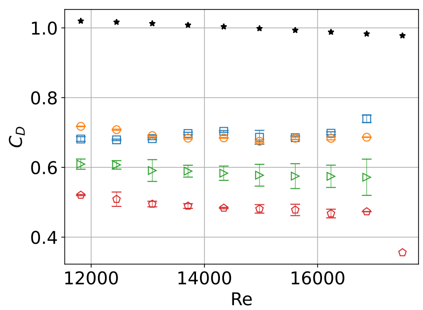


(c) $B = 45.1 \cdot 10^{-5}\mathrm{N\,m}$.

Figure 1: Drag coefficient obtained for three flexural rigidities in function of Reynolds number. The varyng parameter for each plot is the length of the flexible flaps ℓ/D attached to the D-shaped cylinder.



(a) $B = 4.43 \cdot 10^{-5}\mathrm{N\,m}$.



(b) $B = 23.4 \cdot 10^{-5}\mathrm{N\,m}$.

Figure 2: Results for a model $D = 50mm$.

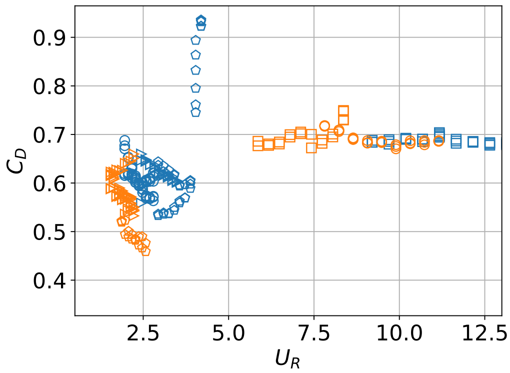


Figure 3: Grouping through reduced velocity $U_R = f_n D/u_\infty$. Orange $B = 23.4 \cdot 10^{-5}\mathrm{N\,m} >$ Blue $B = 4.43 \cdot 10^{-5}\mathrm{N\,m}$

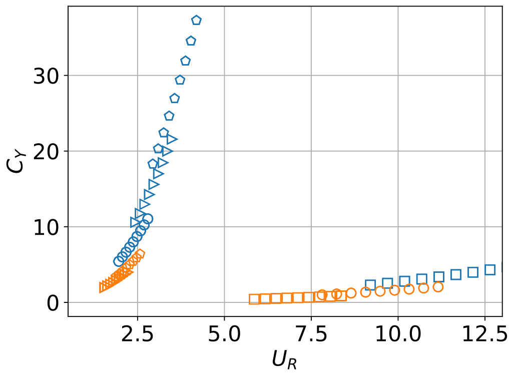


Figure 4: Two elastic modes

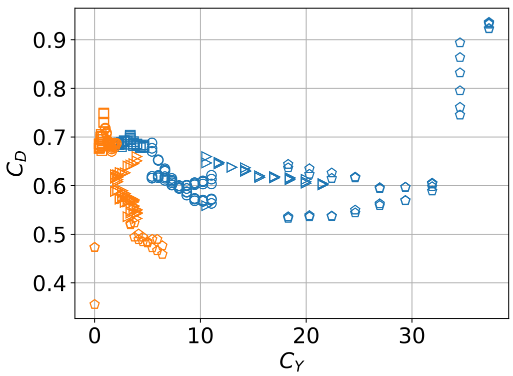
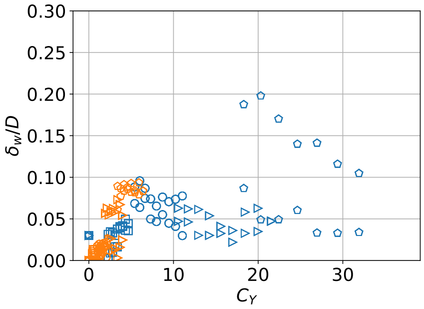
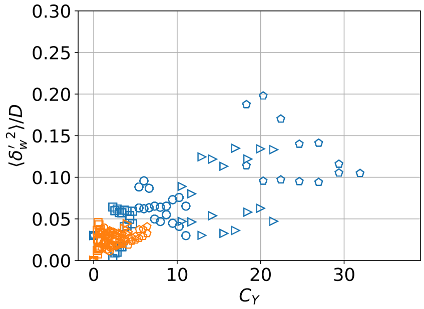


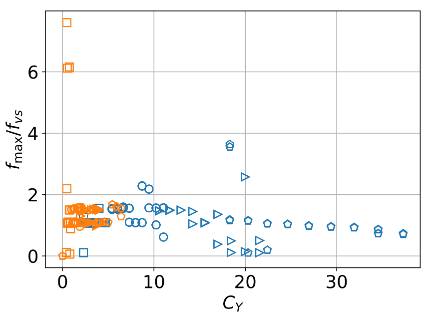
Figure 5: Cauchy $Ca = \dfrac{\rho u_\infty^2 \ell^3}{8B}$ is not enough to reduce the problem.



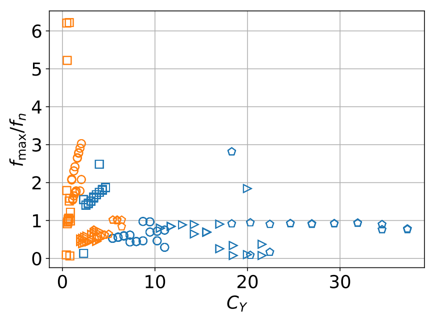
(a) Foils displacements



(b) Amplitude of displacements fluctuations



(a)



(b)