Flow around a circular cylinder at Re_d = 137 000

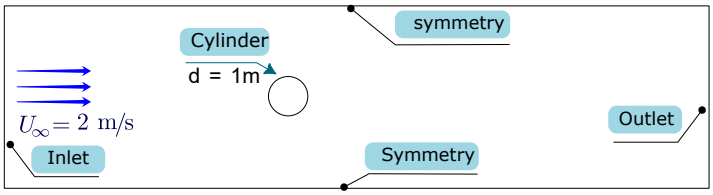

Fig. 1: Computational domain.

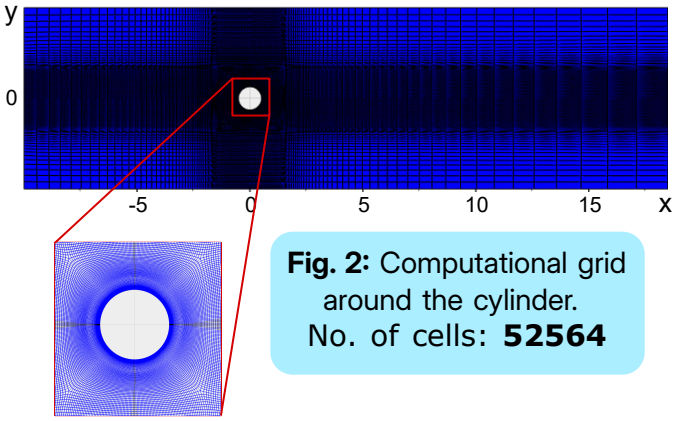

Fig. 2: Computational grid around the cylinder. No. of cells: **52564**

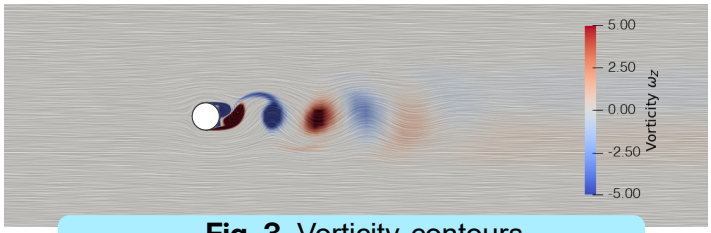

Fig. 3. Vorticity contours.

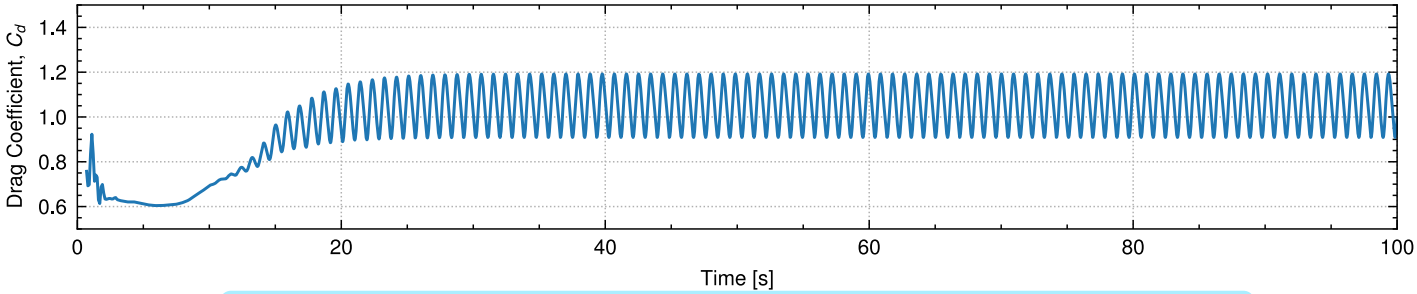

Fig. 4: Variation of drag coefficient of the cylinder over time.

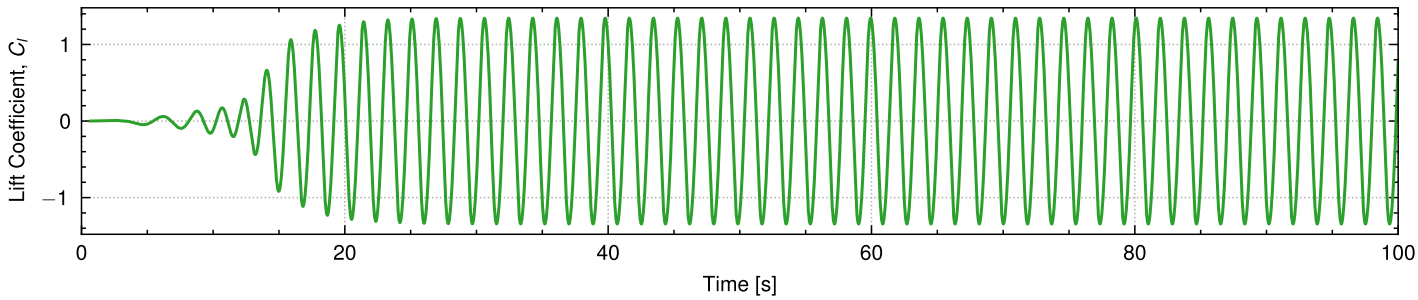

Fig. 5: Variation of lift coefficient of the cylinder over time.

Discussion

The flow characteristics around a circular cylinder at a Reynolds number, Re_d, of 137,000 were investigated using OpenFOAM v2212 with k-ω SST turbulence model. The resultant aerodynamic behavior can be interpreted by examining the temporal evolution of the drag and lift coefficients, as shown in **Figs. 4** and **5**, respectively. Complementing this quantitative assessment, the **Fig. 3** visually depicts the vortex shedding downstream of the cylinder, the phenomenon that drives the observed variations in the coefficients. Specifically, after transitioning through an initial phase, the drag coefficient, C_d, shown in **Fig. 4**, settles into a consistent oscillatory pattern, with its average value hovering around 1.0. Such behavior is characteristic of vortex shedding, a well-documented occurrence in flows past bluff bodies within this Reynolds number range. Concurrently, the lift coefficient, C_l in **Fig. 5**, exhibits a symmetrical oscillation between its positive and negative peaks. This periodicity, coupled with its near-zero mean value, suggests alternating vortex shedding from the opposing sides of the cylinder.

Video on Youtube: https://www.youtube.com/watch?v=uawEUb3q-Ps