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Inertial flow past moderately yawed cylinders MOHAMMED KHARROUBA, JEAN-LOU PIERSON, IFP Energies nouvelles, JACQUES MAGNAUDET, IMFT, Universits de Toulouse — The flow past a finite-end yawed cylindrical particle is studied numerically. Three dimensionless parameters govern the problem when the flow is steady and uniform: the aspect ratio $\frac{L}{D}$ where L is the length of the cylinder and D its diameter, the yaw angle θ which is the angle between the cylinder axis and the inlet velocity, and the Reynolds number based on D. Particular attention is paid to the effect of these parameters on the particle wake and hydrodynamic loads. The aspect ratio is prescribed in the range $[2; 10]$, the yaw angle in the range $[0; 30]$, and the Reynolds number in the range $[0; 400]$. Various types of vortex patterns are observed, including steady shedding of two counter-rotating vortices, periodic shedding of counter-rotating vortices and unsteady shedding of hairpin-shaped vortices. Results show that the dynamical regime and time evolution of the loads change drastically with the yaw angle θ. The wake is found to be unsteady in the range $Re \in [360; 400]$ at small yaw angles ($\theta \leq 30$) with $\frac{L}{D} = 2$. We propose a drag law valid for low and high Reynolds numbers in the case of a cylinder aligned with the flow.

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