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## Hydrodynamic Force on a Cylinder Oscillating at Low Frequency

By -

BiblioGov. Paperback. Book Condition: New. This item is printed on demand. Paperback. 50 pages. Dimensions: 9.7in. x 7.4in. x 0.1in. The hydrodynamic force on a cylinder oscillating transversely to its axis is a nonlinear function of the displacement amplitude  $x_0$ . We report measurements and numerical calculations of the force at frequencies low enough that  $\delta R$ , where  $\delta$  is the viscous penetration length and  $R$  is the cylinder radius. For small amplitudes, the numerically calculated Fourier transform of the force per unit length,  $F(\text{sub small})$ , agrees with Stokes analytical calculation. For larger amplitudes, the force per unit length found by both calculation and measurement is  $F(\text{sub small})C(x_0\delta, R\delta)$ . The complex function  $C$  depends only weakly on  $R\delta$ , indicating that  $x_0\delta$  is more appropriate as a scaling variable than the Keulegan-Carpenter number  $KC = x_0\omega R$ . The measurements used a torsion oscillator driven at frequencies from 1 to 12 Hz while immersed in dense xenon. The oscillator comprised cylinders with an effective radius of  $R = 13.4 \mu\text{m}$  and oscillation amplitudes as large as  $x_0\delta = 4$  (corresponding to  $KC$  as large as 71). The calculations used similar conditions except that the amplitudes were as large as  $x_0\delta = 28$ . This...



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