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Numerical Experiments on Vortex Shedding From an Oscillating Cylinder

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Vortex street wakes behind oscillating cylinders have been studied experimentally and numerically by several authors. Williamson and Roshko attempted a classification of the various wake patterns observed as a function of two dimensionless parameters, the wavelength and amplitude of the undulatory motion of the cylinder scaled by the cylinder diameter. Several qualitatively distinct wake regimes were observed experimentally. These were classified in terms of the vortex patterns, e.g., two singlets, two pairs, pair and singlet, and so on. We have performed a number of numerical experiments for Re=140 and established several points of correspondence with the experiments. Our simulation results also shed light on the classification scheme of Williamson and Roshko and suggest how this classification may change with Reynolds number. We find remarkable sensitivity to details of the oscillation of the cylinder, in particular whether the oscillation takes place at fixed streamwise velocity or at fixed cylinder speed along its trajectory.

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