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Experimental and numerical analysis of the steady streaming around a cylinder pair E. GALÁN-VICENTE, W. COENEN, Dept. Ingeniería Térmica y de Fluidos, Universidad Carlos III de Madrid, 28911 Leganés, Spain — The steady streaming motion that develops around a cylinder pair in small-amplitude oscillatory flow, is studied experimentally and numerically. The axes of the cylinders are perpendicular to the plane of motion, and the angle that the flow makes with the line connecting the cylinder centers, as well as the distance between them, is varied. We focus on the regime where the ratio ϵ of the amplitude of oscillation to a cylinder radius a is small. A theoretical analysis shows that the action of the Reynolds stresses in thin Stokes shear-wave layers close to the cylinder surfaces induces a steady streaming motion that persists at the edge of these layers with velocities of $\mathcal{O}(\epsilon\mathcal{U})$, where U is the velocity amplitude of the basic oscillatory flow. This streaming velocity at its turn drives an outer flow, governed by the steady Navier-Stokes equations with streaming Reynolds number $R_s = \epsilon U a/\nu$. We consider cases with $R_s \gg 1$. The steady equations are solved numerically, imposing the streaming velocity obtained from the asymptotic analysis as a slip boundary condition at the cylinder surfaces. The resuling flow patterns show good agreement with experimental flow visualizations in the form of phase-averages over various oscillation cycles.

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