Viscous Flow past a Body Translating by Time-Periodic Motion with Zero Average

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We study existence, uniqueness, regularity and asymptotic spatial behavior of a Navier-Stokes flow past a body, $\mathcal{B}$, moving by a time-periodic translational motion of period $T$, and with zero average. For example, $\mathcal{B}$ moves in an oscillating fashion. The flow is also time-periodic with same period $T$. However, sufficiently “far” from the body, the oscillatory component decays faster than the averaged component, so that the flow shows there a distinctive steady-state character. This provides a rigorous proof of the “steady streaming” phenomenon.