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The locomotion of marine and terrestrial gastropods: can the acceleration of the ventral pedal waves contribute to the generation of net propulsive forces? JUAN C. DEL ALAMO, JAVIER RODROGUEZ-RODRIGUEZ, JANICE LAI, JUAN C. LASHERAS, University of California San Diego, LABORATORY OF BIOFLUIDS TEAM — Marine and terrestrial gastropods move by gliding over a ventral foot that is lubricated by secreted mucus (terrestrial) or simply by water (marine). The rim of the ventral foot generates suction forces that keep the animal adhered to the substrate. The central part of the foot produces a net propulsive force by generating trains of pedal waves through periodic muscle contractions. Recent experiments show that, in some gastropods, these pedal waves become faster and longer as they move forward, suggesting a mechanism for the generation of net propulsive forces by building a pressure difference across consecutive waves. We have investigated the efficiency of this mechanism through a theoretical analysis of a two-dimensional lubrication layer between a train of waves of slowly varying length and speed, and a flat, rigid, impermeable surface. The inhomogeneity of the speed and length of the pedal waves has been modeled through multiple-scale asymptotics. We have considered a Newtonian fluid to separate the effect of this inhomogeneity from the viscoelastic propulsion reported in previous works.

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