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Time-dependent hook flexibilities in run-reverse-flick motility.[1] MEHDI JABBARZADEH, HENRY C. FU, University of Utah — The deformation of the hook and flagellum affects bacterial motility in run-reverse-flick motility of single-flagellated bacteria. Previously, we have modeled the initiation of a flick, in which the flagellum makes a large off-axis motion, by an efficient linear spring model with a rigid cell body and flagellum while neglecting hydrodynamic interactions between the cell body and flagellum. However, a complete flick event involves bending of both the hook and flagellum as well as a time-varying hook stiffness. Here, we study the dynamic bending of the hook and flagellar filament during run-reverse and flick motility of single flagellated bacteria. We develop an accurate and more efficient numerical approach to model the dynamics of free-swimming bacteria that includes flexibility of both the hook and flagellum. Using numerical models, we are able to constrain the time dependent flexibility of the hook during run-reverse-flick motility. We compare results from rigid body simulations to the flexible flagellar filaments. Finally, we simulate complete flick events, investigating the buckling angle and reorientations of the swimming cells due to time dependent hook stiffness.

[1]Time-dependent hook flexibilities in run-reverse-flick motility

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