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The Role of Motor Reversal and Hook-Winding Timescales in Run-Reverse-Flick Motility. MEHDI JABBARZADEH, HENRY C. FU, University of Utah — Monotrichous bacteria reverse rotation direction of the motor to go forward (CCW) and reverse (CW). During reverse motility (CW) the hook, which is a short flexible joint between the motor and longer helical flagellar filament, unwinds and its flexibility decreases. Switching from reverse to forward swimming, bacteria reorient by a "flick" during which the unwound hook deforms under compressional loads. Previously, we developed an efficient and accurate numerical approach to simulate flexible filaments and described run-reverse-flick motility while prescribing motor torques and time-dependent hook stiffnesses. However, experimental torque-speed measurements of the flagellar motor suggest that immediately after the reversal, torque and rotation rates should be drastically limited. In addition, the stiffness should vary in time only through the winding state of the hook. Here, we study motor reversal and hook winding timescales during short pre-flick motility (˜10ms) to obtain more realistic winding-dependent hook stiffnesses for wound and unwound hooks, incorporating the torque-speed characteristics of the motor. We explain how fast winding of the hook leads to experimentally observed flick reorientation.

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