Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Optimal computational methods for swimming and pumping with helical filaments at low Reynolds number JAMES MARTINDALE, MEHDI JABBARZADEH, HENRY FU, Univ of Nevada - Reno — The flows induced by biological and artificial helical filaments are important to many possible applications including microscale swimming and pumping. Microscale helices can span a wide range of geometries, from thin bacterial flagella to thick helical bacterial cell bodies. While the proper choice of numerical method is critical for obtaining accurate results, there is little guidance about which method is optimal for a specified filament geometry. Using two physical scenarios - a swimmer with a head, and a pump - I establish guidelines for the choice of numerical method based on helical geometry. For a range of helical geometries that encompass most natural and artificial helices, I create benchmark results using a surface distribution of regularized Stokeslets, then evaluate the accuracy of resistive force theory, slender body theory, and a centerline distribution of regularized Stokeslets. Taking the computational cost of each method into account, I present the optimal choice of numerical method for each filament geometry as a guideline for future investigations involving filament-induced flows.

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Date submitted: 21 Jul 2015 Electronic form version 1.4