Abstract Submitted
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Experiments and models of low Reynolds number flows generated by a precessing rod over a plane[1] JAMES MARTINDALE, ROBERTO CAMASSA, RICHARD M. MCLAUGHLIN, LEANDRA VICCI, University of North Carolina, LONGHUA ZHAO, University of Minnesota, UNC NSF RTG FLUIDS TEAM COLLABORATION — Slender body asymptotics and experiments are developed to emulate dynamics biological interest such as primary cilia in developing embryos. Experiments are performed using high viscosity silicon oil with magnetically actuated precessing rod in a table-top setup. Stereoscopic Lagrangian tracking show quantified long-time agreement with an appropriately imaged slender body theory to enforce the no-slip boundary condition of the floor. In contrast, breaking symmetry by a bent rod creates additional flow components which destroy quantitative short time agreement with the theory while maintaining its qualitative features including the creation of large scale Lagrangian tori. Higher order asymptotic corrections are implemented and compared in an attempt to restore quantitative predictability. Direct comparison with 3D stereoscopic PIV measurements will be presented.

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