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Sunday–Tuesday, November 21–23, 2021; Phoenix Convention Center, Phoenix, Arizona

Session A23: Microscale Flows: Particles, Drops, Bubbles I
8:00 AM–9:57 AM, Sunday, November 21, 2021
Room: North 224 A
Chair: Daren Watson, Florida Polytechnic University

Abstract: A23.00009 : Flexible loops settling under gravity in a viscous fluid*

9:44 AM–9:57 AM

Authors:
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Abstract:
For sedimenting flexible loops, recent stability analysis and numerical simulations, based on the elastica approximation (R. Waszkiewicz *et al.*, *J. Fluid Mech.* **919** (2021) A14), predict modes of the dynamics different from the previous results obtained by applying the bead model with the pairwise-additive Rotne-Prager mobility matrices (M. Gruziel-Słomka *et al.*, *Soft Matter* **15** (2019) 7262). Therefore, we revisit the problem using a more precise theoretical method - the bead model and a fast-convergent, higher order multipole expansion of the Stokes equations, corrected for lubrication and implemented in the HYDROMULTIPOLE numerical codes of a high accuracy. As in the previous studies, initially the loop is circular and tilted at a small angle with respect to the horizontal plane, and the dynamics is determined for a wide range of values of the elasto-gravitation number *B*. We recover the essential findings of the simpler Rotne-Prager approximation. We determine the approach of more stiff loops to a unique stationary orientation, dependent on *B*. For more flexible loops we find a very similar phase diagram of sedimentation periodic orbits, with one new dynamical mode that we describe in details.

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