Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

**Mobility mechanisms condition the instabilities in active microdrops**[1] MATVEY MOROZOV, SEBASTIEN MICHELIN, Ecole Polytechnique — Chemically active droplets submerged in the bulk of surfactant solution self-propel with straight, helical, or random trajectories. Here we employ numerical simulations to establish the link between the behavior of an active drop and its interfacial properties. To this end, we consider a drop that converts the gradients of surfactant concentration into flow via two different mobility mechanisms: diffusiophoresis and the Marangoni effect. The resulting surfactant advection is the only nonlinear effect and, thus, the only source of dynamical complexity in the model. Our numerical simulations indicate that strong advection may destabilize the regime of straight and steady self-propulsion. For axisymmetric flow, this instability results in a regime of symmetric extensile flow around a stationary droplet. If advection is strengthened further, chaotic oscillations may develop. In 3D, a drop driven by diffusiophoresis alone does not exhibit extensile flow and the random behavior emerges right after the steady self-propulsion becomes unstable. Our results reveal that the thresholds of these instabilities depend heavily on the balance between diffusiophoresis and the Marangoni effect.

[1]Funded by ERC grant no. 714027 to S.M.

Matvey Morozov
Ecole Polytechnique

Date submitted: 30 Jul 2019 Electronic form version 1.4