Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Long-range interactions dominate surface accumulation of Chlamydomonas reinhardtii[1] ABEL-JOHN BUCHNER, KOEN MULLER, DANIEL TAM, Delft University of Technology — Swimming microorganisms accumulate near solid surfaces in their environment. This has implications for the process of surface colonisation. For extensile swimmers, long-range hydrodynamic interactions have been shown to play a role in governing this near-surface accumulation. Such interactions role in the accumulation of contractile swimmers is less clear. We investigate the roles of surface scattering and long-range interactions in the near-surface accumulation of a model contractile swimmer. A population of C. reinhardtii swimming within a large volume, bounded by two flat surfaces, was recorded simultaneously by four cameras, and a large sample of 3D cell trajectories triangulated. We derived statistics of the cells isotropically diffusive swimming kinematics as well as their surface scattering dynamics, and observe a long-range cell-surface interaction. These statistics were sampled to build an empirically-driven Markov Chain Monte-Carlo simulation. In this way, we directly link the populations near-surface accumulation to the cells swimming, scattering and surface interaction dynamics. We find that the experimentally observed population distribution can only be accounted for by including, in the model, the long-range cell-surface interaction characterised experimentally.

[1]This work is funded through ERC project no 716712

Daniel Tam
Delft University of Technology

Date submitted: 03 Aug 2020 Electronic form version 1.4