Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Bacterial magneto-convection[1] ALBANE THERY, DAMTP, Cambridge University, LUCAS LE NAGARD, JEAN-CHRISTOPHE ONO-DIT-BIOT, CECILE FRADIN, KARI DALNOKI-VERESS, McMaster University, ERIC LAUGA, DAMTP, Cambridge University — Magnetotactic bacteria are prokaryotic microswimmers that synthetize magnetosomes, which are chains of nano-magnets in their cytoplasm. Under external magnetic fields these cells are subject to magnetic torques and thus passively align along magnetic lines, providing a simple control mechanism. We use microfluidics experiments to show that collective motion arises from an initial uniform distribution of magnetotactic bacteria under confinement when an external magnetic field is applied. Dense suspensions of magnetotactic bacteria of strain AMB1 are driven toward a glass capillary wall by a magnetic field perpendicular to the channel walls. Their initial random spacing on the surface becomes unstable due to attractive hydrodynamic interactions between swimmers. These interactions result in bacterial magneto-convection: bacterial plumes perpendicular to the wall emerge spontaneously and develop into self-sustained convection cells. The plumes grow and merge and their dynamics is studied experimentally by measuring their wavelength and the flow they generate. Using a numerical model based on hydrodynamic singularities, we are able to capture quantitatively the instability observed in the cell suspension and reproduce the flow field as well as the long-time clustering dynamics.

[1]Funded by ERC (No. 682754 to EL) and the Natural Science and Engineering Research Council of Canada

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Date submitted: 29 Jul 2019 Electronic form version 1.4