

Abstract Submitted
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Measure of coherence on the collective phase of concentrated swimming bacteria¹ LUIS CISNEROS, University of Arizona, RICARDO CORTEZ, Tulane University, CHRISTOPHER DOMBROWSKI, University of Arizona, RAYMOND GOLDSTEIN, University of Cambridge, JOHN KESSLER, University of Arizona — Nearly close-packed populations of the swimming bacterium *B. subtilis* form a collective phase, the “Zooming BioNematic” (ZBN). This state exhibits turbulence-like dynamics. It also develops large-scale orientational coherence, analogous to the molecular alignment of nematic liquid crystals. The alignment of the bacterial bodies is polar. The resulting dynamics exhibit remarkable spatial and temporal correlations of velocity and vorticity, measured by standard applications of particle imaging velocimetry. We introduce a new method of analysis which consists of defining a scalar field to measure the level of coherent directional motion in the velocity field. This novel method shows the global continuity of angular and polar correlations – information that is otherwise hidden in the standard correlation function analysis. By means of this new tool, we define an order parameter to characterize the collective phase. Some new statistical analyses on the distribution of coherent regions and velocities have been developed.

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