Toward Effects of Collective Animal on Dynamical Transport Barriers

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Motivation

- Ocean flows are prone to produce a wide range of coherent motions such as eddies and jets that live long time before being dissipated.
- We are going to study how collective fish swimming interact with the coherent motions in the ocean.
- This project will help to inform the environmental-related decision making such as regulations on overfishing.

Project Description

- To achieve this objective, we will conduct experiments in a quasi-two-dimensional laboratory turbulent flow equipment with a light-guided brine shrimp group to study such interaction.

Context

- The novelty of our approach is that we have the unique combination of quasi-two-dimensional laboratory flow equipment, particle tracking velocimetry system, and light guiding system for generating on-demand shrimp collective motion. Thus, we can access a wide range of parameter space.
- The limitation of the project is that the shrimp can have different locomotion details than fishes.

Primary project goal:
understanding the two-way coupling between coherent structures and fish schools in ocean flows.

Project Deliverables

- Bend of the 1-year funding period, we will produce 1 peer-reviewed paper, 1 presentation at the American Physical Society Division of Fluid Dynamics.
- •Pitt Momentum funding will enable our lab to get essential data to apply for an NSF standard grant.
- •We will spend first 6 months setting up the experiment to get the useful data. Then, the next 6 months to analyze the data.

Potential Impact

- Inform the environmental-related decision making such as regulations on overfishing.
- Enable the aquaculture site to optimize the oxygen and food supply and innovate efficient waste removal.
- Motivate the innovation in ocean modeling by including the macroscopic effects of small scale collective animal motion

References and/or Acknowledgements

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