Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Quantifying Mixing around Pulsing Soft Corals[1] MATEA SANTIAGO, University of California, Merced, GABRIELLE HOBSON, Scripps Institution of Oceanography, UCSD, KEVIN A. MITCHELL, University of California, Merced, LAURA A. MILLER, Department of Mathematics, University of Arizona, SHILPA KHATRI, University of California, Merced — The pulsing behavior of soft corals in the family Xeniidae is unique in sessile marine animals. It is hypothesized through experimental procedures that the pulsing facilitates the photosynthesis and photorespiration of their symbiotic algae which in turn provide the coral with most of its energy. This hypothesis is investigated through mathematical modeling and numerical simulations. The immersed boundary method is used to solve the fluid-structure interaction of the pulsing tentacles coupled with the surrounding fluid with varying Reynolds number. The fluid flow is translated into a Poincaré Map in order to use a dynamical systems approach to quantify the chaotic advection of the fluid flow. Further, the flow is coupled with the advection and diffusion of oxygen, the waste product of photosynthesis. The Peclét number is varied along with the Reynolds number to gain insight into the role of diffusion in different Reynolds number regimes. We will present the results quantifying the mixing, production, and transport of oxygen in these different regimes of varying Peclét and Reynolds numbers.

[1]NSF PHY-1505061, NSF DMS-1853608, and NSF ACI-1429783

Matea Santiago
University of California, Merced

Date submitted: 31 Jul 2020 Electronic form version 1.4