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Alleviation of hypoxia by biologically generated mixing from aggregations of centimeter-scale swimmers[1] ISABEL HOUGHTON, University of San Francisco, JOHN DABIRI, Stanford University — Daily vertical migrations of zooplankton have been shown to affect nutrient distributions and dissolved gas concentrations in ocean and lake environments. Additionally, laboratory experiments have demonstrated the potential for mixing generated by these migrations to alter the physical structure of a water column by mixing different density water. In this work, we investigate the importance of biologically generated mixing relative to other processes in determining the biogeochemical structure of a water column inhabited by migrating zooplankton. Specifically, we consider oxygen, a highly ecologically relevant scalar, and the competition between metabolic consumption and biogenic mixing in a stably stratified water column with a hypoxic layer. We illustrate the potential for migrating animals to alleviate hypoxia, introducing complex feedbacks between the presence of animals and the biogeochemical state of their surroundings. Furthermore, we demonstrate the feasibility of oxygen as a potential indicator of biogenic mixing for future in situ investigation given its low diffusivity and higher signal-to-noise.

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