Biogenic mixing by individual and multiple (or colonial) swimming organisms

Biogenic mixing has received recent attention in studies of diurnally migrating animals. As part of our previous research, we identified an effective mechanism for biogenic mixing called drift. A body moving in fluid can be used to describe drift. As the body moves, fluid is displaced in the direction of body motion, and as the body shape is altered, the volume of drifting fluid changes. This mechanism serves to stir the fluid, and can contribute to mixing in the ocean. To understand how swimming mode, animal size, and morphology affect animal-induced fluid transport or drift, we will conduct qualitative and quantitative measurements of flow surrounding swimming animals in the laboratory and in the field. From these measurements, we will identify particular animal swimming modes or morphologies that enhance the drift volume and transport of fluid in the ocean. In addition, we hope to inform discussion on whether animals swimming in concert can affect the mixed state of a large body of water by conducting a study of fluid drift and mixing by multiple animals (i.e., krill, copepods, salp chains, and colonial siphonophores).