Aquatic creatures mix ocean water

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Understanding mixing in the ocean is of fundamental importance to modeling climate change or predicting the effects of an El Niño on our weather. Modern ocean models primarily incorporate the effects of winds and tides. However, they do not generally take into account the mixing generated by swimming animals.

More than 60 years ago, oceanographers predicted that the effect of swimming animals could be profound. Accounting for this effort has proven difficult, though, so it has not entered into today's models.

Now Kakani Katija and John Dabiri at the California Institute of Technology have developed a way to estimate the extent of "biogenic" mixing. After conducting field measurements on swimming jellyfish, they built models of how animals mix the waters ocean-wide and concluded that the effect may be extensive.

"Swimming animals may contribute to ocean mixing on the same level as winds and tides," says Katija. "This necessitates the inclusion of biogenic mixing sources in ocean circulation and global climate models."

Katija will present these findings this month at the 62nd Annual Meeting of the American Physical Society's (APS) Division of Fluid Dynamics will take place from November 22-24 at the Minneapolis Convention Center.

Most of this mixing is due to the displacement created by the movement of animal bodies through the water -- rather than by the turbulence that is stirred up by fish as they swim. This displacement is found to depend primarily on the shape of the animal rather than the dynamics of the animal's swimming motion.

Moreover, says Katija, only a small part of the mixing comes from the mighty creatures that inhabit the deep. Most of it is due to meeker, but much more plentiful, animals -- the tiny krill, copepods, and other small critters that make up the vast majority of organisms swimming in the ocean.

More information: The presentation, "A Darwinian mechanism for biogenic ocean mixing" by Kakani Katija and John Dabiri of the California Institute of Technology is at 11:22 a.m. on Sunday, November 22, 2009.

Source: American Institute of Physics