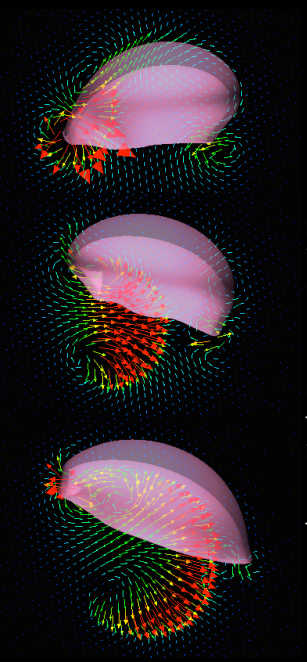
Steering and Maneuvering in Jellyfish Bells

Alexander Hoover[1], Laura Miller[1,2], and Boyce Griffith[1]

University of North Carolina at Chapel Hill

[1] Department of Mathematics, [2] Department of Biology

Using an immersed boundary simulation of an elastic jellyfish bell, we model jellyfish propulsion by applying an active tension to the lower half of bell that pushes fluid out of the bell, transferring momentum from the bell to the surrounding fluid environment. There are no prescribed kinematics in this simulation, only prescribed tension. The images display the results from our model during forward propulsion and turning at Re=500.



From right to left, vorticity magnitude is plotted for forward propulsion. A uniform tension is applied to the lower portion of the bell and then released, allowing the bell to passively expand.

From top to bottom, velocity vectors are plotted for during a turning movement. An asymmetric contraction wave is initiated at the inner pivot of the turn and travels along the rim of the bell. The elastic recoil of the bell pushes water into the cavity bell, generating angular momentum.

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