Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Fluid Velocity Superposition method for fluid-structure interaction in viscous flows using the Immersed Boundary Method[1] ALEX SZATMARY, CHARLES EGGLETON, UMBC — The Immersed Boundary Method conventionally uses Chorin's spectral projection method as a viscous flow solver due to its computational speed and high degree of convergence. These advantages hold most fully for Fourier basis functions (which suppose periodic boundary conditions). It is advantageous to extend the capabilities of the spectral projection method to viscous flow with non-periodic boundary conditions. Here, a technique is proposed in which fluid velocity is represented as the superposition of a non-periodic mean velocity profile and a periodic disturbance due to the presence of an immersed body. The spectral projection method is then applied only to the disturbance velocity. The proposed method is tested by simulating the deformation of a capsule in unbounded linear flow fields with both extensional and shear components, as well as in shear flows near a wall. Accuracy of these results is confirmed by comparison with theory in the limit of small deformations and numerical results for finite deformation from the literature.

[1]This material is based upon work supported under a National Science Foundation Graduate Research Fellowship.

Charles Eggleton
UMBC

Date submitted: 31 Jul 2008 Electronic form version 1.4