

Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Passive scalar mixing in vortex rings RAJES SAU, KRISHNAN MAHESH, University of Minnesota — Direct numerical simulations of passive scalar mixing in vortex rings are performed, with and without crossflow. The simulation results without crossflow agree well with experimental data for ‘formation number’, total circulation, trajectory and entrainment fraction. Scalar profiles, mixedness and volume of scalar carrying fluid are used to quantify mixing, whose characteristics are quite different in the formation and propagation phases of the ring. These results are explained in terms of entrainment by the ring. The simulations with crossflow show that the ring tilts and deforms. When the stroke ratio is greater than formation number, the ring tilts in the direction of the crossflow. On the other hand, when the stroke ratio is less than formation number, the ring tilts in the opposite direction, such that its induced velocity opposes the crossflow. The Magnus effect may be used to provide a simple explanation. The impact of this behavior on mixing will be discussed.

Krishnan Mahesh
University of Minnesota

Date submitted: 01 Aug 2006

Electronic form version 1.4