Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Quantitative Mixing Measurements Using MRI of the D2O, H2O System MICHAEL BENSON, PAUL MOBLEY, CHRIS ELKINS, JOHN EATON, Stanford University — We have developed a quantitative technique for measuring the mean concentration distribution in turbulent, two-fluid mixing. The technique uses Magnetic Resonance Imaging (MRI) to study the mixing of de-ionized water, with its strong MRI signal, and heavy water, deuterium oxide with no signal. The MRI generates a 3D concentration distribution in liquids with good spatial resolution in about 10 seconds of scan time. Several repeated trials are used to obtain adequately converged statistics in turbulent flow. A qualification experiment in which water and heavy water mix in a 3D turbulent mixing layer has been completed. The full 3D concentration field is measured with MRI in a 256 X 24 X 9 array of voxels, giving a spatial resolution of 1.6 mm^3. Methanol is added at 33% by volume to get a neutral density between the water and heavy water. Reynolds number based on the velocity difference and the downstream channel width is 3320. Planar Laser-Induced Fluorescence (PLIF) concentration measurements of water containing Rhodamine WT dye in place of the heavy water are used for validation and to obtain an uncertainty evaluation for the MR-based method.

Michael Benson
Stanford University

Date submitted: 29 Jul 2008 Electronic form version 1.4