

Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Stereo DPIV investigation of a free surface mixing layer

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— An experimental study has been conducted to examine a turbulent plane mixing layer intersecting a free surface at low Fr . The local Re was $\sim 10,000$. Stereoscopic Digital Particle Image Velocimetry was used to obtain instantaneous three-component velocity fields within planar slices of the spatially developing mixing layer. Guided by previous studies revealing near-surface counter-rotating vortices in the mean flow, specific depths were chosen at a single downstream station for investigation. 3,000 consecutive image pairs were recorded at each location, allowing spectral analysis. Power spectra of all three components are shown; the isotropy seen to be present at depth is seen to disappear near the surface as surface-normal fluctuations are reduced. A slow transverse oscillation is deduced in the vicinity of the mean streamwise vortices. Not present at all at significant depth, the motions at this frequency are also observed to markedly decrease as the surface is approached. Comparisons are made with other observed meanderings in free surface flows, and the origin of the present oscillation will be discussed. This work is supported by the U.S. Office of Naval Research (#N00014-98-1-0017).

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Date submitted: 12 Aug 2005

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