Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

General mechanisms of thin layers in high Reynolds number turbulent flows JULIAN HUNT, University College London, TAKASHI ISHIHARA, JST CREST, Nagoya University, KOJI MORISHITA, Kobe University — Mechanisms and computation are presented for the three types of thin, high vorticity, randomly moving shear layers at high Reynolds number. They decorrelate eddy motions on each side and, in the first two types, have an internal micro-scale, dissipative structure. Their form also depends on the mean strain/shear outside the layer, and the proximity of any resistive boundaries. The first type (T/NT) lie between regions of sheared turbulence and external non-turbulent motions. Depending on whether the inflection points of the conditional mean shear profile, $\langle U(y - y_i)\rangle$, relative to the interface coordinate y_i, are on the outside or inside edges of the layer, the forms of the interface are "nibbling" motions on the scale of the layer thickness or large "engulfing" motions, which affect the overall flow structure. In the second type (T/In), which occurs in the interior of turbulent flows, because the interface instabilities are suppressed, the stretching increases more than in T/NT, causing the micro-scale vorticity, velocity and dissipation to greatly exceed Kolmogorov's theory. The third type (T/W) within the buffer wall layer, by blocking outer eddies, determines the displaced form of the mean logarithmic profile, and fluctuations of wall shear stress.

Takashi Ishihara
Nagoya University

Date submitted: 01 Aug 2015 Electronic form version 1.4