

Fig. 1.2. Planar images of concentration in a turbulent jet: (a) $Re = 5,000$ and (b) $Re = 20,000$. From Dahm and Dimotakis (1990).

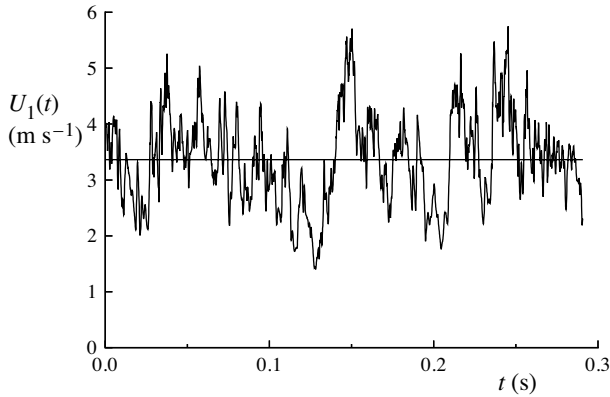


Fig. 1.3. The time history of the axial component of velocity $U_1(t)$ on the centerline of a turbulent jet. From the experiment of Tong and Warhaft (1995).

An important characteristic of turbulence is its ability to transport and mix fluid much more effectively than a comparable laminar flow. This is well demonstrated by an experiment first reported by Osborne Reynolds (1883). Dye is steadily injected on the centerline of a long pipe in which water is flowing. As Reynolds (1894) later established, this flow is characterized by a single non-dimensional parameter, now known as the Reynolds number Re . In general, it is defined by $Re = \mathcal{U}\mathcal{L}/\nu$, where \mathcal{U} and \mathcal{L} are characteristic