

Abstract Submitted
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Measurement of Fine Scale Structure in Turbulence by Time-Resolved Dual-Plane Stereoscopic PIV TETSU HIRAYAMA, MAMORU TANAHASHI, TOSHIO MIYAUCHI, Tokyo Institute of Technology, 2-12-1 Ookayama, Meguro-ku, Tokyo, 152-8550, Japan, GYUNG-MIN CHOI, Pusan National University, 30 Jangjeon-dong, Geumjeoung-ku, Busan 609-735, Republic of Korea — To investigate fine scale structure of turbulent flows, time-resolved dual-plane stereoscopic particle image velocimetry (TRDPSPIV) has been developed using high-repetition-rate Nd:YAG lasers for industrial processing and high-speed CMOS cameras. This system provides all three velocity components and nine velocity gradients with high spatial and temporal resolution. The developed system was applied to velocity measurements of a turbulent jet. It is shown that probability density functions of the measured nine velocity gradients agree well with those obtained from direct numerical simulation (DNS). From these velocity gradients, various physical quantities such as vorticity vectors and second invariant of velocity gradient tensor are obtained exactly. These quantities allow an eddy identification, which has been used in the analysis of DNS, to investigate fine scale structure of turbulence. The characteristics of the experimentally-detected fine scale eddy coincide with those obtained from DNS.

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