

Abstract Submitted
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Large Structures of Drag-Reducing Pipe Flow by Surfactant Additives. YUKI KISHITA, Tokyo Institute of Technology, YOSHITSUGU NAKA, Meiji University, YUKI MINAMOTO, MASAYASU SHIMURA, MAMORU TANAHASHI, Tokyo Institute of Technology — Characteristics of drag-reducing turbulent pipe flows with surfactant additives have been investigated using stereoscopic particle image velocimetry. Measurements have been performed for a case with surfactant solution of 150 ppm at different Reynolds numbers: $Re_d = 31254, 58268, 85556$, around the maximum drag-reduction. Two distinct peaks are observed in streamwise velocity fluctuations around $y/R = 0.07, 0.25$ and weak peaks are observed in radial velocity fluctuations at the same locations, where the Reynolds shear stress is negative. The deviations toward $u'_z > 0, u'_r > 0$ are observed at $y/R = 0.215$, and these components are proved to contribute to the negative Reynolds stress. Drag reducing turbulent structures are investigated by means of snapshot POD analysis. The most energetic POD modes show flat periodic structures along the wall, and such structures indicate the relation with these fluctuation peaks and negative Reynolds shear stress.

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