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Analysis of vortical structure over sinusoidal riblet surface in turbulent channel flow by means of Dual-plane stereoscopic PIV measurement HIROYA MAMORI, Tokyo University of Science, KYOTARO YAMAGUCHI, Tokyo University of Agriculture and Technology, MONAMI SASAMORI, Japan Aerospace Exploration Agency, KAORU IWAMOTO, AKIRA MURATA, Tokyo University of Agriculture and Technology — We perform a dual-plane stereoscopic particle image velocimetry (DPS-PIV) measurement to investigate vortical structure over a sinusoidal riblet surface in the turbulent channel flow. In the sinusoidal riblet surface, its lateral spacing of the adjacent walls varies in the streamwise direction and 12% of the drag reduction rate has been confirmed in the turbulent channel flow. The DPS-PIV measurement system consists of four high-speed CCD cameras and the two laser sheets. In the flat case, the profile of the velocity statistics shows a good agreement with previous data. In the ribet case, the velocity statistics decrease in the region close to the wall as compared with that of the flat case. Since all velocity components are measured on adjacent laser sheets simultaneously, vortical structures can be obtained by a second invariant of the tensor i.e. the Q value. According to an analysis for the Q value, we found that the vortical structure is shifted up and attenuated owing to the riblet. Moreover, the riblet prevents the approaching of the vortical structure: the upward and downward flows in the region near the wall are generated by the riblet; if the vortical structure approaches the wall, it is shifted away from the wall due to the upward flow.

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