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Organization of turbulence structures in polymer drag-reduced turbulent channel flow KYOUNGYOUN KIM, Hanbat National University — To investigate turbulence structures in polymer drag-reduced (DR) channel flows, the spectra and correlations of the velocity fluctuations are examined by performing direct numerical simulations of viscoelastic turbulent channel flows of a drag reduction rate of 63%. The friction Reynolds number is $Re_\tau = 395$ and the stresses created by adding polymer is modeled by the FENE-P model. It is found that in the DR flow, the length scale significantly increases, especially in the streamwise direction. Premultiplied two-dimensional spectra of streamwise velocity fluctuations show that the outer turbulence structure in the DR flow differs from those in the Newtonian flow. Two-point correlations and conditional average flow fields reveal that the buffer layer structures near the wall are more correlated with those near the opposite wall in DR flow, which implies that a large scale outer structure organizes the buffer layer structures near both upper and lower walls.

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