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Non-negligible Flow Scale for the Vortex Generation in an Isotropic Homogeneous Turbulence SHO SAEKI, Division of Mechanical Engineering, Graduate School of Engineering, Aichi Institute of Technology, KATSUYUKI NAKAYAMA, Department of Mechanical Engineering, Aichi Institute of Technology — The present study investigates the flow scale that contributes to the vortex generation, in terms of the local flow topology. In order to specify the flow scale that leads to the flow transition into a vortex, we focus on the key flow that is expressed as the velocity gradient tensor component in specific coordinate system associated with predicted swirl plane, and the Fourier spectrum is applied to express the key flow as a function of wavenumber that is not the Fourier coefficient. This analysis is performed in an isotropic homogeneous decaying turbulence with low Reynolds number in Direct Numerical Simulation. Subjected nodes of the vortex generation are extracted by monitoring the swirlity that specifies the unidirectionality and intensity of the azimuthal flow. In the transition, middle and small flow scales, e.g., the flows composed of wavenumbers 20-40 and 60-120 in the total wavenumber less than 120, are indispensable for the creation of the key flow. Therefore, although much smaller flow scales have less kinetic energy and may be assumed not to affect greatly to turbulent flows in terms of flow dynamics, these may play non-negligible role for the vortex generation. This feature seems to be inherent in low Reynolds number of this turbulence.

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