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Vortex reconnection in the K-type transitional channel flow[1]
YAOMIN ZHAO, YUE YANG, SHIYI CHEN, Peking Univ — Vortex reconnection, as the topological change of vortex lines or surfaces, is a critical process in transitional flows, but is challenging to accurately characterize in shear flows. We apply the vortex-surface field (VSF), whose isosurface is the vortex surface consisting of vortex lines, to study vortex reconnection in the K-type temporal transition in channel flow. Based on the VSF, both qualitative visualization and quantitative analysis are used to investigate the reconnection between the hairpin-like vortical structures evolving from the opposite channel halves. The incipient vortex reconnection is characterized by the vanishing minimum distance between a pair of vortex surfaces and the reduction of vorticity flux through the region enclosed by the VSF isolines on the spanwise symmetric plane. In addition, we find that the surge of the wall friction coefficient begins at the identified reconnection time, which is discussed with the induced velocity during reconnection and the Biot-Sarvart law.

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Yaomin Zhao
Peking Univ

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