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Vortex structures in turbulent channel flow behind an orifice SOICHIRO MAKINO, KAORU IWAMOTO, HIROSHI KAWAMURA, Dept. Mech. Eng., Tokyo University of Science. — Direct numerical simulation of a channel flow with an orifice has been performed for $Re_{\tau 0} = 10 - 600$, where $u_{\tau 0}$ is the friction velocity calculated from the mean pressure gradient, δ the channel half width and ν the kinematic viscosity. In the wake region, the mean flow becomes asymmetric by the Coanda effect. The degree of asymmetry increases with increasing the Reynolds number for the laminar flow at $Re_{\tau 0} < 50$. The degree decreases abruptly at $Re_{\tau 0} = 50$, where the transition from the laminar to the turbulent flow take places. Large-scale spanwise vortices generated at the orifice edges. They become deformed and break up into disordered small-scale structures in shear layer. The small-scale vortices are convected towards the channel center. The large-scale vortices have an important effect upon the reattachment locations and streamwise vortices near the wall in the wake region.

Soichiro Makino
Dept. Mech. Eng., Tokyo University of Science.

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