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Influence of upstream turbulence on self-sustained oscillations in an open cavity[1] SANG BONG LEE, HYUNG JIN SUNG — Main feature of an open cavity is a self-sustained oscillation which is caused by the interaction between the instability of shear layer and impingement. The presence of the self-sustained oscillation is well-known for incoming laminar boundary layer, not for turbulent boundary layer. In the present study, DNSs and LESs of turbulent flow over an open cavity are performed to investigate the influences of upstream turbulence and cavity length on the self-sustained oscillation ($3{,}000 \leq Re \leq 12{,}000$, $1 \leq L/D \leq 6$). When the ratio of the cavity depth to the upstream momentum thickness is small ($D/\theta=10$), the separated shear layer has the energetic frequencies due to 3D vortical structures near the leading edge. The small vortices related to upstream high-speed streaky structures produce high pressure fluctuations on the trailing edge. The separated shear layer and 3D vortices undergo a complex transition as the cavity length increases. Meanwhile, if the depth ratio to the momentum thickness is large ($D/\theta=40$), turbulence statistics and frequency spectra show a development of 3D vortical structures which are related to the self-sustained oscillation.

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