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# Evolution of Coherent Vortex Structures in the two-dimensional Mixing Layer*

*Li, W. C. 1), Fan, J. R. 1), Luo, K. 1) and Cen, K. F. 1)*

*1) Institute for Thermal Power Engineering and CE & EE, Zhejiang University, Hangzhou 310027, China.*

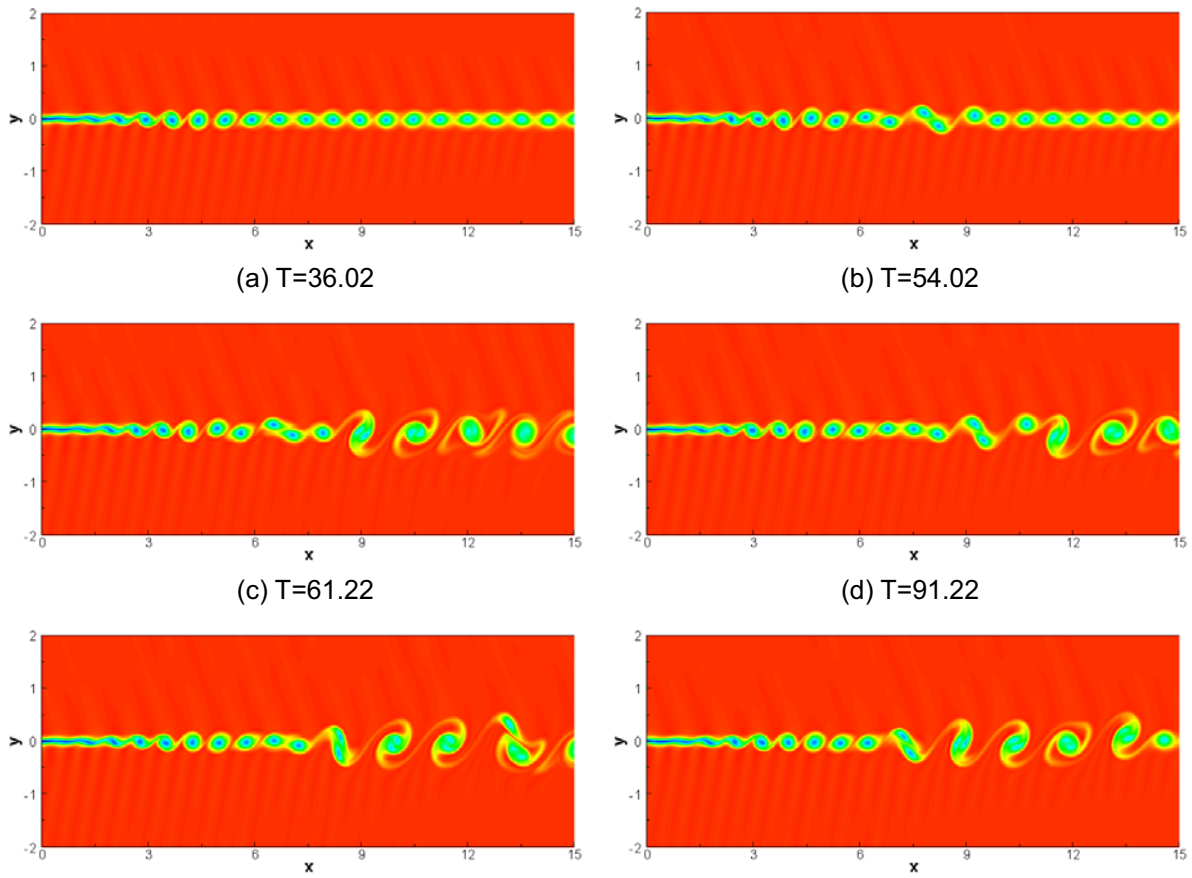


Fig. 1. The evolution of the vortex structures of mixing layer.

Using a DNS (direct numerical simulation) method, the vortex structures of a two-dimensional spatial developing mixing layer were simulated. And a two-dimensional perturbation to the mean, which was based on the unstable wavenumbers of the streamwise direction, was imposed initially. A non-uniform fourth-order compact finite difference scheme is utilized to evaluating the spatial derivatives. The Euler terms were marched in time using sufficient accuracy, low-storage, five-stage fourth-order Runge-Kutta integration scheme. But the viscous and conduction terms were marched in time using a first-order integration scheme reducing the computational time without loss of accuracy.

Fig.1 shows the evolution of the vortex structures in the flow-field. In (a), the 'cat-eye' vortex structures roll up, and from non-dimensional time T=54.02, as shown in (b), (c), (d), (e) and (f), the pairing process of vortexes begin, and captured precisely the pairing of two vortexes and the special mixing progress of three vortexes appearing in the free shear layer. Finally, the field develops in the direction of streamwise with topological sorting structure.

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