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Direct 3d numerical simulation of shear turbulent mixing

O.G. Sin'kova, V.P. Statsenko, Yu.V. Yanilkin & V.A. Zhmailo

Russian Federal Nuclear Center - VNIIEF,
Sarov, Russia
yan@md08.vniief.ru

The paper considers one of the simplest shear flows that is a 1D time-dependent plane mixture layer. A variety of more complex flows – a time-independent plane mixture layer, initial sections of plane and circle jets, mixing process in a cylindrical vortex in its initial phase, etc. – are similar to it under certain conditions.

Earlier, we carried out numerical studies of the problem by direct numerical simulation using 2D and 3D codes.

In the given paper, the problem of shear turbulent mixing on a plane interface between two incompressible fluids of the fixed density is also studied by direct numerical simulation using 3D hydrodynamic code TREK, however, computations were carried out using a more fine computational grid (up to $16*10^6$ cells).

Numerical arrays of hydrodynamic quantities from 3D computations are used to find the moments for these quantities. Velocity pulsations in the turbulent mixing zone have been analyzed spectrally, its approximation to Kolmogorov spectrum has been studied

Some 3D computation results are compared to the results of measurements, as well as the data of the semi-empirical theory of turbulence considering the Reynolds tensor anisotropy. Good agreement between computational and experimental data is observed.