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The Effect of Streamwise Vortex Structures on the Particle Distribution in the Roll-Up*

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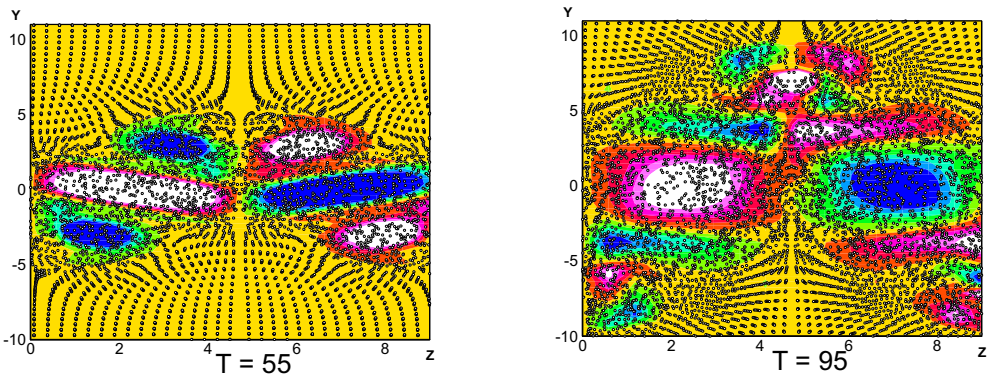

Fig. 1. Particle distribution along the spanwise for *St* = 0.01 at two instants.

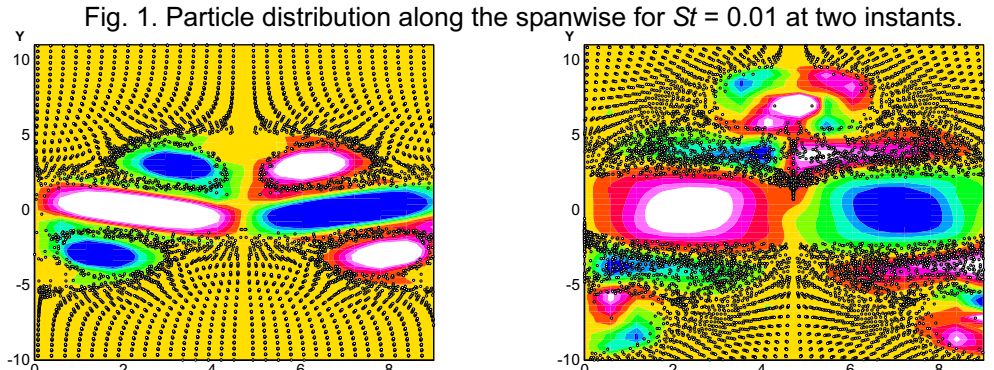

Fig. 2. Particle distribution along the spanwise for *St* = 1 at two instants.

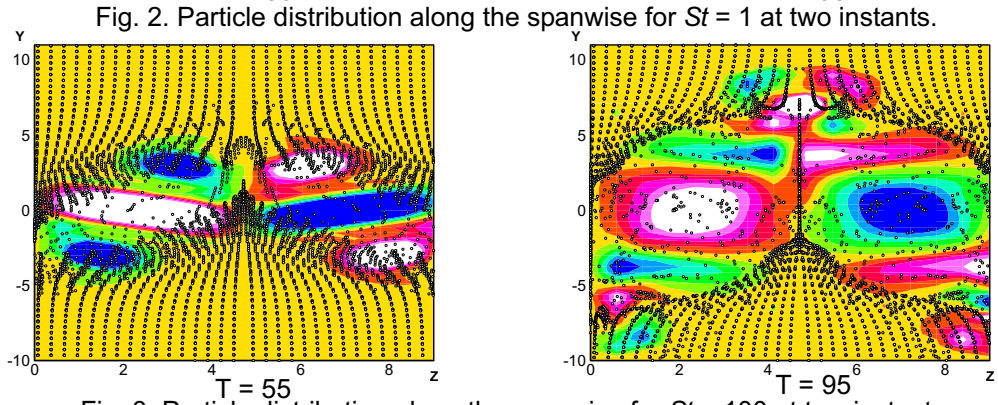

Fig. 3. Particle distribution along the spanwise for *St* = 100 at two instants.

A direct numerical simulation is employed to demonstrate how the streamwise large-scale structures affect the particle distribution in a three-dimensional free shear flow. The black dots in the figures represent the particles distribution, and the color contours represent the pairs of counter-rotating streamwise vortices. It is obvious that the particles with *St* = 1 accumulate most on the circumference of the large-scale structures while other particles distribute more evenly along spanwise direction. The spanwise variation of the concentration is dependent on the streamwise vortex structures. With the development of the streamwise structures and three-dimensionality, the spanwise variation of particle distribution gets stronger, and finally leads to the 'mushroom' shaped pattern of the spanwise particle distribution, this is especially true for the intermediate Stokes number of 1.

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