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VALIDATION OF LAGRANGIAN MODELS FOR PARTICLE-TURBULENCE INTERACTION

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LAGRANGE'I MEETODI KASUTAMINE OSAKESTE JA VOOLUSE TURBULENTSI VAHELISTE KOOSTOIMEPROTSESSIDE KIRJELDAMISEL. Martin SOMMERFELD

ОБОСНОВАНИЕ ПРИМЕНИМОСТИ ПОДХОДА ЛАГРАНЖА К ОПИСАНИЮ ПРОЦЕССА ВЗАИМОДЕЙСТВИЯ ЧАСТИЦ С ТУРБУЛЕНТНОСТЬЮ. Мартин ЗОММЕРФЕЛЬД

Key words: dispersed phase, anisotropic turbulence, particle tracking.

One of the basic problems for the numerical calculation of particle-laden flows is the modelling of the turbulence induced particle motion. In connection with the Lagrangian approach the discrete eddy concept (DEC) initially proposed by Gosman and Ioannides [1] is the most common one in use. Other models are based on the Langevin equation [2, 3]. However, both models reveal some difficulties in anisotropic turbulence.

Therefore, a detailed survey was performed for validating particle dispersion models. The first criterion which a particle dispersion model has to fulfil is the correct simulation of fluid element dispersion. Hence the dispersion of fluid particles was studied in a plane shear layer and a pipe flow. In the pipe flow calculation it was found that the particle tracking in

cylindrical coordinates leads to a wrong prediction of the density due to the singularity at $r = 0$ in the particle equations. Therefore, the particle tracking was performed in cartesian coordinates for all the considered cases.

Further validations of the particle dispersion models were performed according to the experiments of Snyder and Lumley, Wells and Stock and Calabrese and Middleman [4, 5, 6]. For the latter case, where the density of the particles is close to that of the fluid, the effects of added mass and Basset history term on particle dispersion were studied in detail.

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