Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **10 (2003)** 43-56

ASPECTS OF TWO-PHASE TURBULENCE SIMULATION WITH COMBINED EULERIAN-LAGRANGIAN METHOD

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Abstract. Two aspects in modeling two-phase turbulent flows by use of the stochastic Eulerian-Lagrangian method which were usually overlooked in the past studies are discussed and examined through two well-defined problems. It is evident that the inlet u'_{pi} conditions have to be considered in the calculation to obtain correct solution of the dispersed-phase turbulence characteristics, in particular for the two-phase flows under the inlet conditions of $k_f < k_p$. It is also concluded that the transient drag coefficient has to be taken into account when the condition of the Stokes number large than $O(10^1)$ is encountered in the investigated two-phase flow.

Key Words. stochastic Eulerian-Lagrangian method, two-phase turbulence

1. Introduction

The study of two-phase flows is a very vast domain of research of engineering interest. In general, there are two fundamentally different theoretical approaches utilized to predict the two-phase flows [6, 8]. One is called the two-fluid (or Eulerian-Eulerian) models in which the dispersed phase is also formulated under an Eulerian framework. Obviously, this approach is more suitably applicable to the dense cases of two-phase flows because a prerequisite condition of the Eulerian formulation, i.e., "continuum", can be met for both the continuous and dispersed phases. The other is called the Eulerian-Lagrangian models which treat the carrier fluid (continuous phase) as a continuum while the particles (dispersed phase) as discrete entities. The Eulerian-Lagrangian models are therefore suitably applicable to the dilute two-phase flows. This paper is solely addressed to the flow types in which discrete dispersed-elements (such as particles or droplests, per se) are transported by carrier flows (dilute two-phase flows) such s sprays, pneumatic transport of particles, cyclones, etc. Note these dilute two-phase flows are usually of turbulent regime.