Schmidt, David P.; **Rutland, C. J.**

A new droplet collision algorithm. (English) Zbl 0988.76079

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From the summary: The droplet collision algorithm of O'Rourke [*P. J. O'Rourke*, Collective drop effects on vaporizing liquid sprays, Department of Mechanical and Aerospace Engineering, Princeton University (1981)] is currently the standard approach to calculating collisions in Lagrangian spray simulations. This algorithm has a cost proportional to the square of number of computational particles, or "parcels." To more efficiently calculate droplet collisions, a technique applied to gas dynamics simulations is extended for use in sprays. For this technique to work efficiently, it must be able to handle the general case where the number of droplets in each parcel varies. The present work shows how the no-time-counter (NTC) method can be extended to the general case of varying numbers of droplets per parcel. The basis of this improvement is analytically derived. The new algorithm is compared to closed-form solutions and to the algorithm of O'Rourke, and it is shown that the NTC method is several orders of magnitude faster and slightly more accurate than O'Rourke's method.

The second part of the paper concerns implementation of the collision algorithm into a multidimensional code that also models the gas phase behavior and spray breakup.

MSC:

76M35 Stochastic analysis applied to problems in fluid mechanics
76T10 Liquid-gas two-phase flows, bubbly flows

Keywords:

no-time-counter method; method of O'Rourke; droplet collision algorithm; sprays; varying numbers of droplets per parcel; multidimensional code; spray breakup

Software:

Kiva-2

Full Text: DOI

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