

Supporting Information

Efficiency Analysis of the Discrete Element Method Model in Gas-Fluidized Beds

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Table S1. Calculation of penetration depths for glass collision partners with different particle diameters and relative velocity of 10 m/s

Stiffness coefficients	Penetration depths			
	$d_p = 0.5$	$d_p = 1.5$	$d_p = 2.5$	$d_p = 3.5$
$k^n = 10^2$	14	73	160	260
$k^n = 10^4$	1.4	7.3	16	26
$k^n = 10^6$	0.14	0.73	1.6	2.6
$k^n = 10^8$	0.014	0.07	0.16	0.26

Table S2. Calculation of minimum normal stiffness coefficients at different particle diameters, relative velocities, and maximum penetration

Stiffness coefficients	Particle diameters			
	0.5	1.5	2.5	3.5
$k^n (u_{\max}^n = 10 \text{ [m/s]})$	5.1×10^6	5.1×10^6	5.1×10^6	5.1×10^6
$k^n (u_{\max}^n = 5 \text{ [m/s]})$	6.3×10^5	6.3×10^5	6.3×10^5	6.3×10^5
$k^n (u_{\max}^n = 2 \text{ [m/s]})$	4.1×10^4	4.1×10^4	4.1×10^4	4.1×10^4

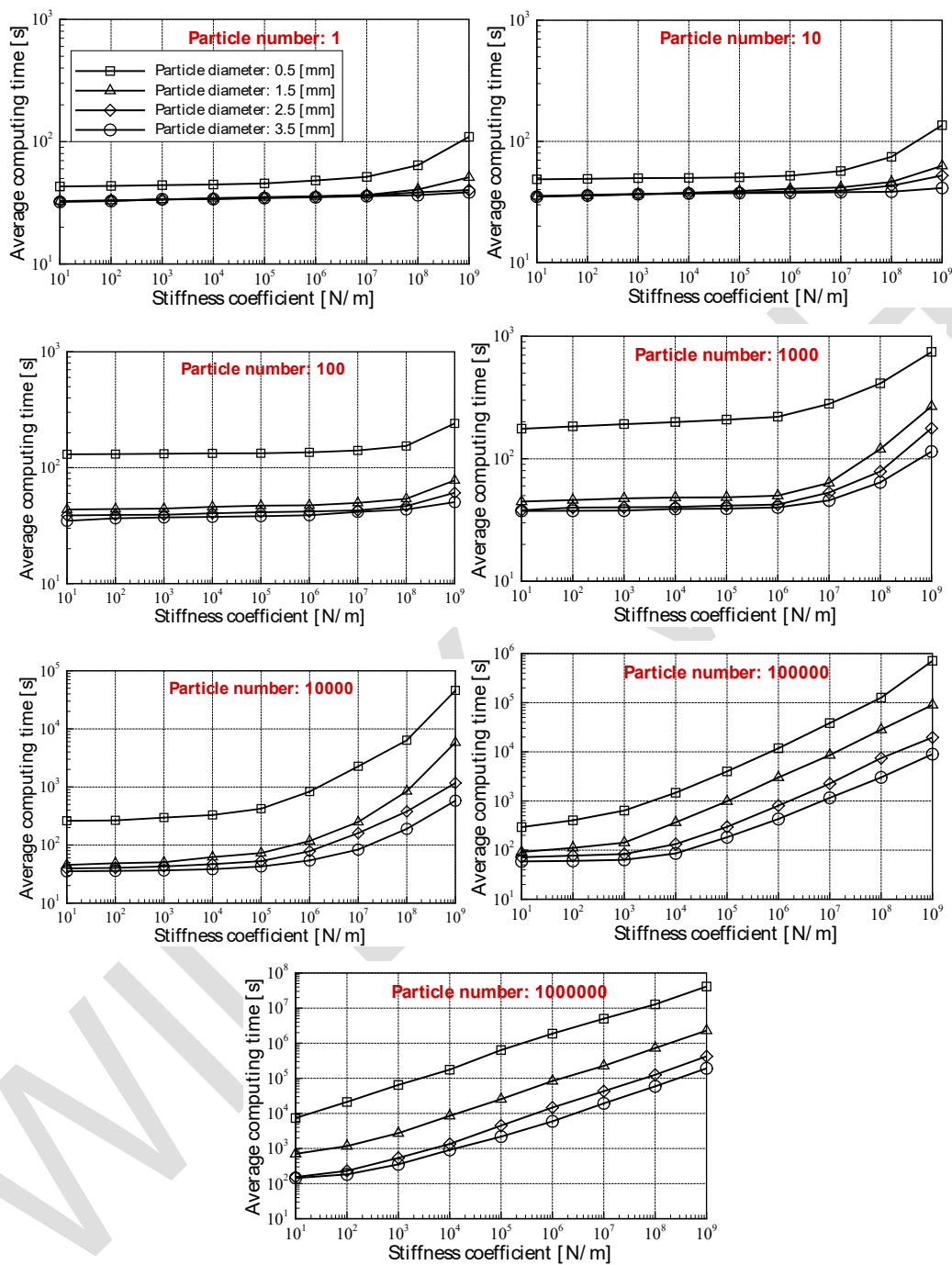


Figure S1. Influence of stiffness coefficient variation on the average computing time per time step at different particle diameters and various particle numbers

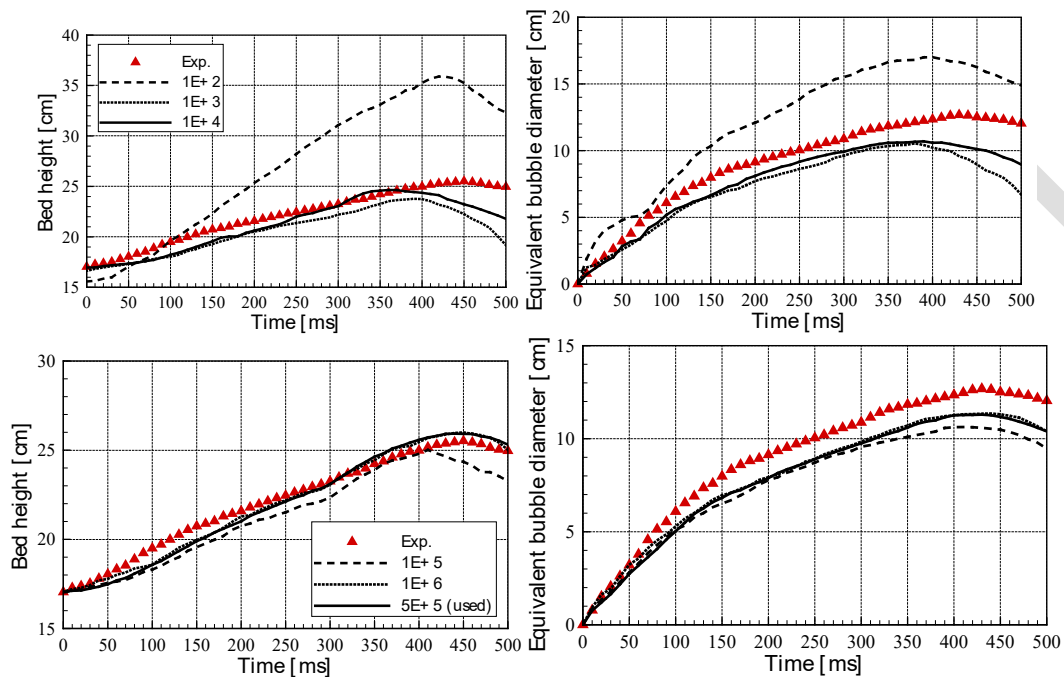


Figure S2. Influence of the stiffness coefficient variation on the simulation accuracy of the Euler-Lagrange/DEM model (number of particles is 36500 and the particle diameter is 2.5 mm for a mass flow rate of 0.006 kg/s)

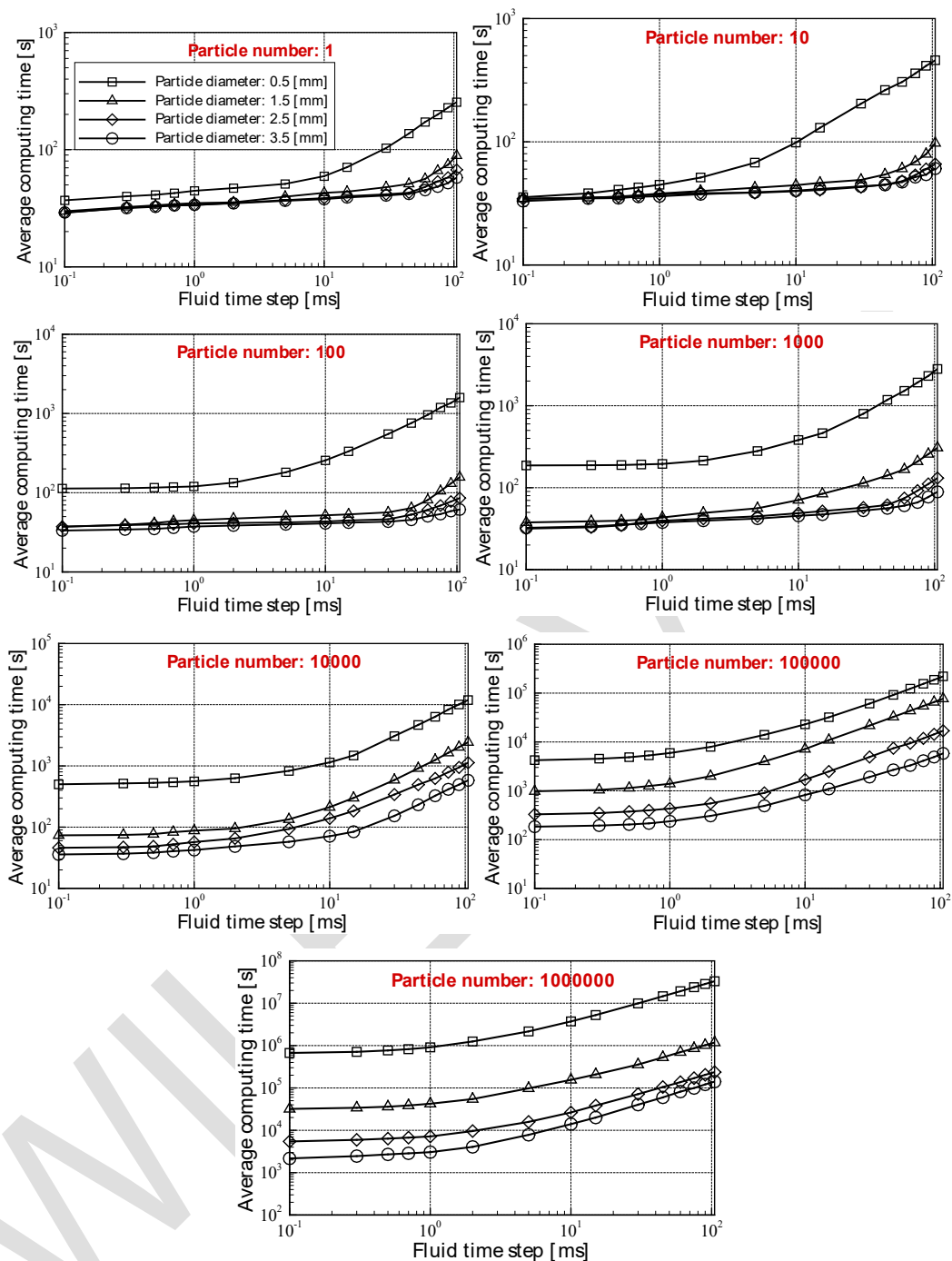


Figure S3. Influence of fluid time step variation on the average computing time per time step at different particle diameters and various particle numbers

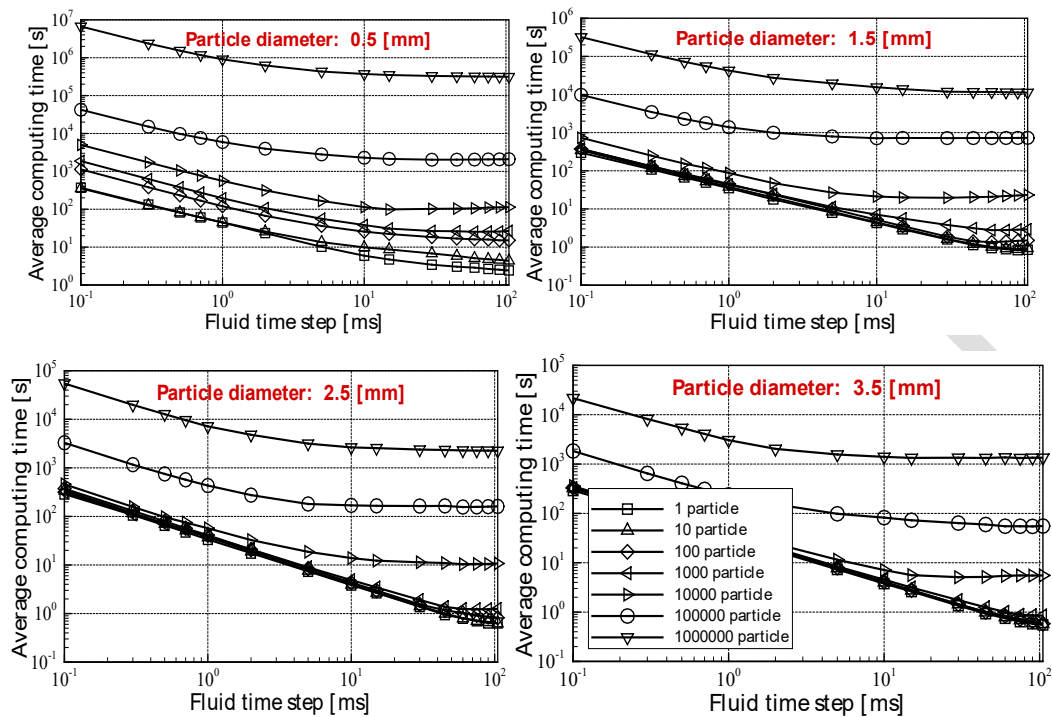


Figure S4. Influence of fluid time step variation on the average computing time per one millisecond at different solid loadings and various particle diameters

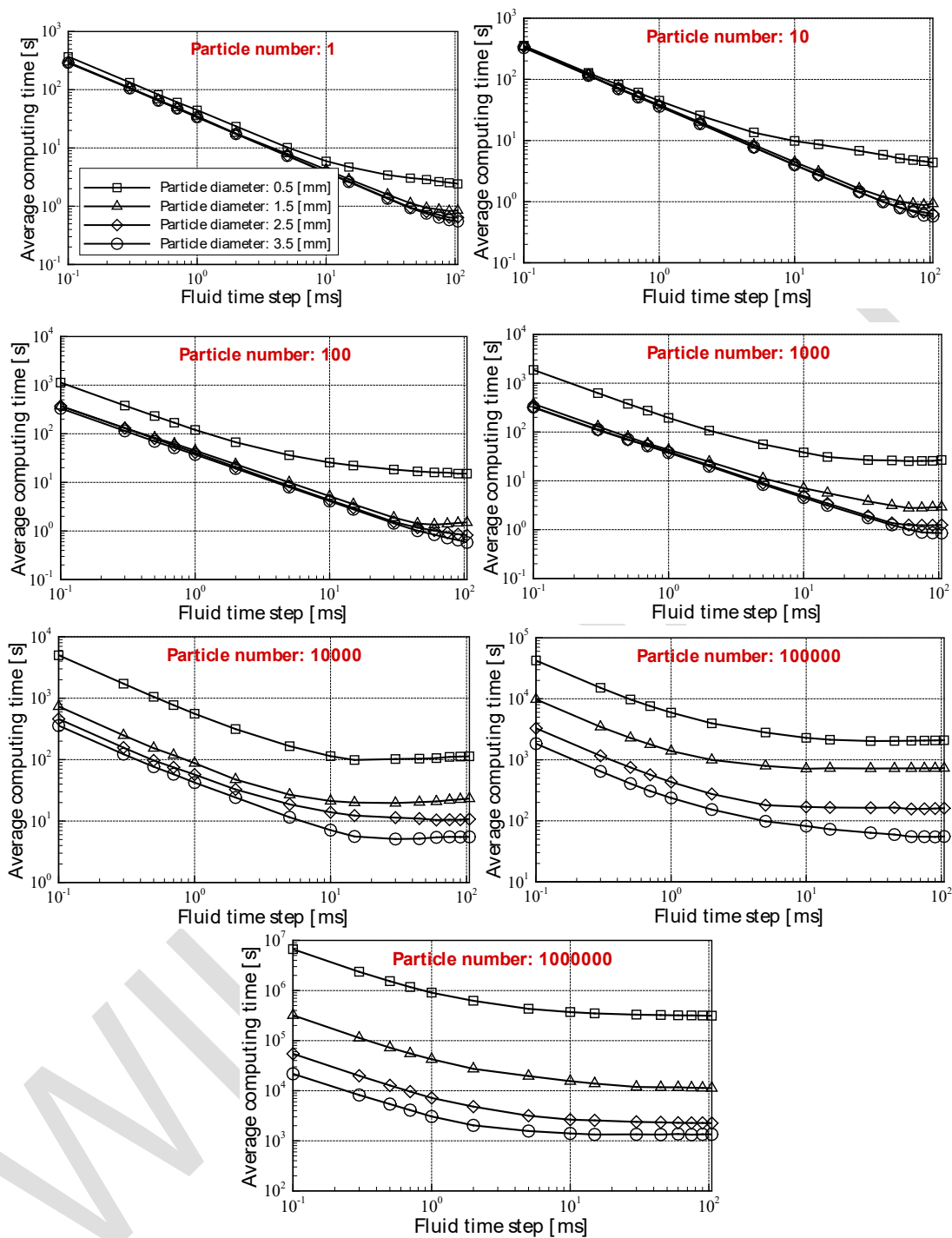


Figure S5. Influence of fluid time step variation on the average computing time per one millisecond at different solid loadings and various particle diameters