Falling clouds of particles in vortical flows

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Captions of movie files

Movie1.mp4: (left) typical experimental evolution of a cloud settling in the vortical flow for case $A1b$ and (right) corresponding point-particle simulation using a Stokeslet approximation. The flow field measured by PIV is indicated by red arrows. The experimental conditions are listed in table 3, and chronophotographies are shown in figure 4 (a) and (b), respectively.

Movie2.mp4: (left) typical experimental evolution of a cloud settling in the vortical flow for case $B1b$ and (right) corresponding point-particle simulation using a Stokeslet approximation. The flow field measured by PIV is indicated by red arrows. The experimental conditions are listed in table 3, and chronophotographies are shown in figure 5 (a) and (b), respectively.

Movie3.mp4: (left) typical experimental evolution of a cloud settling in the vortical flow for case $C2b$ and (right) corresponding point-particle simulation using an Oseenlet approximation. The flow field measured by PIV is indicated by red arrows. The experimental conditions are listed in table 3, and chronophotographies are shown in figure 6 (a) and (b), respectively.

Movie4.mp4: Stokeslet simulation (case $B1a$ with $N_0 = 2500$ particles).The original flow field measured by PIV is indicated by black arrows while the perturbed flow field is represented by blue streamlines. Snapshots are shown in figure 9 (a).

Movie5.mp4: Oseenlet simulation (case $C2b$ with $N_0 = 500$ particles). The original flow field measured by PIV is indicated by black arrows while the perturbed flow field is represented by blue streamlines. Snapshots are shown in figure 9 (b).

Movie6.mp4: Oseenlet simulation in the cloud reference frame (case $C2b$). The flow

field is computed at successive times in the vertical plane. High (low) velocity is indicated in white (dark). Snapshots are shown in figure 11.

Movie7.mp4: Oseenlet simulations for case $C2a$. From left to right: (i) with and (ii) without hydrodynamic interactions for $Q = 0.5$ and $N_0 = 500$, (iii) with and (iv) without hydrodynamic interactions for $Q = 2$ and $N_0 = 500$, (v) with and (vi) without hydrodynamic interactions for $Q = 2$ and $N_0 = 2000$. Snapshots are shown in figure 12.