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Particle-laden upward jet in a crossflow: particle dispersion and tracking of particle source[1] JOOYEON PARK, HYUNGMIN PARK, Seoul National University — We experimentally investigate the particle dispersion due to the vortical interaction in the particle-laden upward jet with a crossflow focusing on a large scale phenomena in multiple planes. We vary the velocity ratio (R) between the jet and crossflow, which is classified into three regimes of no crossflow, 3.0 – 3.5 and 1.0 – 1.2. As a dispersed phase, we use Silicon particles (6 – 205 um in size) and the corresponding Stokes number is in the range of St = 0.01 – 27.42. For each case, the air flow and particle velocities are measured by PIV, and the particle distribution is obtained by planar nephelometry. For lower R, due to stronger counter-rotating vortex pairs (CVPs) in a continuous phase, drag force on particles become dominant so that the particles are swept from the jet center near the jet exit for St <<1, but for St >>1, the particles tend to travel along the jet center regardless of vortical effects. Interestingly, only for St = 1 (irrespective of R), the particles agglomerate along the jet center before the CVP collapses. Finally, based on these observations, a 3D dispersion model is developed, which is used for the estimation of particle source location and validated with the experimental data.

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