Fluid and particle transport of a hairy structure

HONGKI LEE, MOHSEN LAHOOTI, DAEGYOUM KIM, SEYEONG JUNG, KAIST — Hairy appendages of animals are used to capture particles, sense surrounding flow, and generate propulsive force. Due to the small size of the hairy structures, their hydrodynamics have been studied mostly in very low Reynolds number. In this work, in a broad range of Reynolds number, $O(1) - O(100)$, flow structure and inertial particle dynamics around an array of two-dimensional cylinders are investigated numerically by using an immersed boundary method. Given flow fields, Maxey-Riley equation is adopted to examine particle dynamics. Here, we discuss the effects of Reynolds number, density ratio of inertial particles and fluid, and distance between cylinders on particle behaviors around a moving structure. In addition, drift volume of inertial particles is correlated with the model parameters.