Abstract Submitted
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Dynamics of a freely-falling maple seed[1] INJAE LEE, HAECHEON CHOI, Seoul National University — We conduct numerical simulations of a freely-falling maple seed using an immersed boundary method in a non-inertial reference frame (Kim and Choi, JCP, 2006). A three-dimensional seed model is obtained by scanning a maple seed. The seed reaches a steady autorotation after a transient period, and a stable leading-edge vortex is attached on the surface of the rotating seed, which increases the drag force during autorotation. In addition, two different approaches are considered to obtain scaling laws describing the relation among the seed weight and geometry, and descending and rotating velocities. The first uses the conservations of mass, linear and angular momentum, and energy. In this approach, a model constant to be determined, called axial induction factor, is obtained from the result of present simulation. The second approach employs a classical steady wing theory in which the vortical strength is scaled with the circulation around a wing and the lift force is modeled by the time derivative of vortical impulse (Lee *et al.*, JFM, 2015). Available data on various seeds well fall on these scaling laws.

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