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Relationship between the wake and the flexibility of a falling plate EDWIN M. LAU, Chaoyang University of Technology, WEI-XI HUANG, JUN-DUO ZHANG, YONG-XIA JIA, Tsinghua University — The natural free fall of a flat body has received considerable attention through experimental and theoretical analyses modelling as a rigid body. However, the motion of a leaf in its fall appears to remain incomprehensible. A falling leaf conforms and its motion may be affected. Here, free falling is investigated using flexible, flat plates in particle image velocimetry. The experiment depicts a plate deformation and the corresponding flow fields. Plate flexibilities in the chordwise direction are controlled through various mixtures of PDMS and polymer materials. A water tank is prepared with glass beads for laser reflections. The plates are released in free falls within the tank. The movement of the flow is captured at about one thousand frames per second using a high speed camera. As the plates chordwise deformation is observed, it is accompanied by a downwashing flow. This flow is produced by the vortical wake generated as the plate traverses across the still fluid as it falls. A relationship between the plates flexibility and the flow is drawn, suggesting that downwash affects deformation. In turn, this deformation would lead to the change in wake proximity and the configuration that produces the downwash itself, and would ultimately change the motion of the plates.

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