

Abstract Submitted  
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**Spiral motion of free falling disks** HONGJIE ZHONG, CUNBIAO LEE, LTCS and College of Engineering, Peking University — We report on experimental work on circular thin disks falling freely in quiescent water. A stereoscopic vision method was applied to measure the evolution of the six degrees of freedom. By analyzing the digital images of the disk obtained by two fixed CCD cameras, the position and orientation of the body were measured throughout the fall. Translatory and angular motions, as well as the force and torque induced by the flow were determined. A new helical motion type was observed for moment of inertia  $I^* < 5 \times 10^{-4}$  and Reynolds number in the range of 500 – 3000. This type of helical motion is distinct from the one caused by eccentricity. For the eccentricity case, the angular motion of the disk is purely precession whereas gyration and precession were both present for the low  $I^*$  case. The wake structure of the zigzag motion and spiral motion were visualized in combine with PIV measurement. The instability mechanism of the wake structure, which cause the zigzag to spiral transition, is discussed.

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