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Fluctuations in power dissipation in a gravity driven system

ZRINKA GREGURIC, MIGUEL CERVONI, JOHN CRESSMAN, George Mason University — We have studied the three dimensional motion of a disk falling through a column of water. The disk's position and orientation are measured with a high speed video camera enabling an analysis of the fluid forces acting on the disk. On average the fluid exerts a dissipative drag on the falling body. However, these forces are dynamic and lead to fluctuations in the kinetic energy of the disk. The resulting power fluctuations are of the same magnitude as the mean power dissipated by the fluid and can be large enough to cause the disk to move upward against the force of gravity. We have analyzed these fluctuations and compared their statistics to those predicted by non-equilibrium statistical theory.

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