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Drop orbiting in a circular hydraulic jump LUC LEBON, ANTOINE FRULEUX, CLEMENT SAVARO, Laboratoire Matiere et Systemes Complexes, UMR 7057 of CNRS and Univ. Paris Diderot, Paris, France, CHRISTOPHE PIRAT, Laboratoire Physique Matiere Condensee et Nanostructures, UMR 5586 of CNRS and Univ. Lyon 1, Lyon, France, LAURENT LIMAT, Laboratoire Matiere et Systemes Complexes, UMR 7057 of CNRS and Univ. Paris Diderot, Paris, France
— In our experiment, a circular hydraulic jump is formed by a viscous jet impacting a horizontal or slightly tilted glass disk. A drop of the same liquid, deposited in the jump does not coalesce, and remains trapped at its periphery, because of the air entrainment linked to the high drop rotation speed. In this strange state of non-wetting, a gyroscopic instability occurs that tends to induce orbital motions of the drop around the jump perimeter. For a slightly inclined substrate, the drop oscillates around the lowest equilibrium position, while for a rigorously horizontal disk, the drop exhibits two distinct motions depending on the ratio between drop and jump radius: (1) a orbital motion at constant speed, and (2) a irregular (chaotic?) motion involving random inversions of the velocity. A simple model in which the drop is treated as a rigid sphere sliding on the free surface of the liquid allows us to recover the orbital motion, but not the irregular phase, that seems to involve distorsions of the jump shape.

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