

First Joint Meeting Brazil Italy of Mathematics Special Session: Recent Progress in Fluid Dynamics

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Title: The uncertain trajectory of a pilot-wave

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Abstract: This is a recent problem addressing a new dynamical system for a wave-particle pair. Yves Couder (Paris 7) and coworkers reported on walking droplets on the surface of a vibrating bath and discussed their properties previously thought to be peculiar to the microscopic, quantum realm. John Bush (MIT) and coworkers have also produced laboratory experiments which were compared to theoretical predictions. In this presentation I will briefly review some of their work and introduce our recent hydrodynamic pilot-wave model. Our model considers a wave equation coupled to a trajectory equation for the walking droplet/particle. The wave dynamics starts from rest while the fluid domain is vibrated according to the Faraday theory. The dynamical properties of this wave-particle pair depends on a memory parameter. When the pilot-wave is confined to bounded domains in the high memory regime interesting random dynamics arise. Examples will be presented from both laboratory experiments as well as numerical simulations. This work is in collaboration with John Bush (MIT/Math), Paul Milewski (Univ. Bath/Math) and Carlos Galeano Rios (IMPA).