Abstract Submitted
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Leidenfrost levitated liquid tori STÉPHANE PERRARD, Matière et Systèmes Complexes, Université Paris Diderot, CNRS - UMR 7057, MATTHIEU LABOUSSE, EMMANUEL FORT, Institut Langevin, ESPCI ParisTech and Université Paris Diderot, CNRS UMR 7587, JOHN BUSH, MIT, YVES COUDER, LAURENT LIMAT, Matière et Systèmes Complexes, Université Paris Diderot, CNRS - UMR 7057 — A drop of water deposited on a surface hotter than 150°C can levitate without any contact with a solid container. Indeed the evaporation of the fluid generates a thin vapour film, which supports the drop's weight by lubrication forces (Leidenfrost effect). This effect was until now limited to droplets. We propose here an original substrate geometry, a circular brass through, that allows us to maintain in levitation any quantity of fluid. It could be a good tool to study wave propagation without solid boundary condition and thus very low friction. We report here one possible application, and our most striking observation : when the substrate temperature is high enough, convective motion appears in the liquid torus and its inner side becomes polygonal. This periodic deformation of large amplitude propagates along the azimuthal direction. The geometry, the flow and the shape appear very similar to the polygonal destabilization of an hydraulic jump. We propose here an experimental and theorical characterization of these rotating polygons having from three to twelve sides. Moreover, we have found a model describing the shape for any number of sides. It appears closely related to the Korteweg de Vries equation describing the propagation of solitonic waves in shallow water

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None

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