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Rotating Polygon Instability on the free surface of rotating liquid nitrogen in Leidenfrost state TOMAS BOHR, JACOB BACH, ALEXIS DUCHESNE, Physics Department, Technical University of Denmark, MARTIJN V. D. OUDERAA, Physics of Fluids Group, University of Twente — When liquid nitrogen is poured into a warm pot, film boiling will create a Leidenfrost effect insulating the liquid from the pot by a thin air-layer strongly reducing the friction. Stirring the fluid layer in a cylindrical pot will thus create a long-lived vortex whose free surface can deform into polygons as described in Tophøj *et al.*, Phys. Rev. Lett. **110**, 194502 (2013). We have investigated the relation of these instabilities to the stationary rotating polygons described in Vatistas, J. Fluid Mech. **217**, 241 (1990) and Jansson *et al.*, Phys. Rev. Lett. **96**, 174502 (2006) as well as to the theory by Tophøj et al. We further discuss the possible relation to the hexagonal north polar vortex of Saturn (D. A. Godfrey, Icarus, **76**. 335 (1988)). Compared to earlier experiments, the nitrogen flows appear strongly turbulent with violent bursts generating droplets. It is remarkable that they can still maintain well-defined polygonal structures that appear to be rotating like a solid body. We quantify the shape changes by the spectral dynamics of the contact line in the bottom of the pot.

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