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Controlling chaos by the domain size MAHDI GHADIRI MOTLAGH, ROUSLAN KRECHETNIKOV, University of Alberta — As part of the recent effort to understand dynamics and evolution on time-dependent spatial domains, we present an experimental investigation on how domain deformation may serve as a mechanism regularizing chaotic motion. Faraday waves – standing waves formed on the free surface of a liquid layer due to its vertical vibration – are chosen here as a paradigm owing to their historical use in testing new theories and ideas. In our experimental setup of a vibrating water container with controlled positions of lateral walls, the Faraday patterns are visualized using the Fourier transform profilometry and the wave amplitude is measured using a high accuracy laser displacement sensor: these techniques allow us to reconstruct a time history of the pattern three-dimensional landscape. Data analysis reveals that domain deformation is not only able to transform the chaotic state of two competing modes into a regular (periodic) one, but also to isolate one of the competing modes in the regime, which on a time-fixed domain of the same size would otherwise correspond to a regular or chaotic pattern competition. These experimental findings are interpreted with appropriate theoretical arguments and insights.

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