Abstract Submitted
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Multiple lengthscales elastic instability via period-doubling bifurcations[1] FABIAN BRAU, HUGUES VANDEPARRE, ABBAS SABBAH, University of Mons, CHRISTOPHE POULARD, University of Paris-Sud 11, AREZKI BOUDAOUD, Ecole Normale Superieure Paris, PASCAL DAMMAN, University of Mons — Spatially confined rigid membranes reorganize their morphology in response to the imposed constraints. A crumpled elastic sheet presents a complex pattern of random folds focusing the deformation energy while compressing a membrane resting on a soft foundation creates a regular pattern of sinusoidal wrinkles with a broad distribution of energy. We have studied the energy distribution for highly confined membranes resting on an elastomer and showed the emergence of a new morphological instability triggered by a period-doubling bifurcation. A periodic self-organized focalization of the deformation energy is observed provided a symmetry breaking, induced by the elastic foundation, occurs. The period-doubling bifurcation is induced by a parametric resonance similar to those observed in nonlinear oscillators. The model developped may prove to be useful for understanding the morphology of various confined systems, such as coated materials or living tissues. Moreover, it opens the way to new kind of microfabrication design of multiperiodic or chaotic (aperiodic) surface topography via self-organization.

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