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Curvature-induced symmetry breaking selects elastic wrinkling patterns NORBERT STOOP, ROMAIN LAGRANGE, DENIS TERWAGNE[1], PEDRO REIS, JOERN DUNKEL, Massachusetts Institute of Technology — Wrinkling in curved bilayer surfaces is a ubiquitous phenomenon, including embryogenesis, biological tissue differentiation or structure formation in heterogenous thin films. Due to curved substrate and the strong nonlinearities in the elastic strains, predictions for the wrinkling morphology are notoriously difficult to obtain using classical analysis. Here, we derive a generalized Swift-Hohenberg theory to describe these morphologies and their pattern selection. Testing the theory against experiments on spherically shaped surfaces, we find quantitative agreement with analytical predictions for the phase transition curves separating labyrinth, hybrid and hexagonal wrinkling phases. Our approach builds on general differential-geometric principles and can be extended to arbitrarily shaped surfaces.

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