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Scaling laws for the wavelength of tensional wrinkle patterns
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— Thin sheets under uni-axial tension often exhibit periodic patterns of wrinkles parallel to the tension lines, that are characterized by small wavelength and relax the induced compression in the direction perpendicular to the exerted tension. As the sheet gets thinner, it becomes more and more bendable, signifying the emergence of an asymptotically compression-free state in the singular limit of vanishing thickness. What is the dependence of the wrinkle wavelength on the sheet's thickness, characteristic lateral scales, and exerted tensile loads? In simple set-ups, such as a stretched rectangular sheet, simple scaling law is available. However, a general law, which can be implemented also to more complex set-ups, is still lacking. In this talk, we will use the Lame set-up, an annular sheet subjected to radial tension gradient, as a prototypical example to address this problem. We analyze various characteristic parameter regimes and obtain analytic scaling laws for the wrinkle wavelength, which may be generalizable to describe more complex problem.

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