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Instabilities in axisymmetrically constrained sheets¹

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We propose to describe three different situations where a circular sheet is submitted to axisymmetric loads resulting from capillary forces or constrained boundary conditions. In a first case, a thin annulus floating on water is radially compressed by a surface pressure induced by the addition of surfactant molecules outside the annulus. As a consequence the annulus is compressed in the orthoradial direction and wrinkles are observed beyond a critical load. In a second situation, a planar disk is deposited on an adhesive sphere. Can the sheet accommodate the change in gaussian curvature? Wrinkles actually appear at the edge of the disk if the diameter exceeds a critical value. A third experiment finally involves a planar disk squeezed in a spherical mold. While low confinement induces the formation of localized folds, these folds eventually evolve into a cascade of orthoradial wrinkles.

¹with B. Roman, M. Piñeirua and J. Hure