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**Wrinkle-to-crumple transition in thin films on curved surfaces**

YOUSRA TIMOUNAY, JOSEPH D. PAULSEN, Syracuse University — When a thin yet stiff film is placed on a liquid droplet, a deformation structure emerges, termed "crumples" [1]. These crumples occur as wrinkles break up into segments, and they appear to focus stress at their tips. However, their mechanism and threshold are not known. To address this problem, we study the behavior of thin polystyrene sheets (thickness  $\sim 100$  nm) placed on a cylindrical liquid-air interface that is subjected to longitudinal compression. This setup allows us to independently control both the curvature of the cylindrical meniscus and lateral confinement. We find that wrinkles give way to crumples beyond a threshold value of curvature. We study how this threshold depends on other parameters such as compression, surface tension, aspect ratio and sheet thickness. Our results are summarized in phase diagrams that demarcate wrinkles, crumples, and folds. [1] King, Schroll, Davidovitch, Menon, PNAS 109 (2012).

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