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Capillary induced buckling of floating sheets MIGUEL PINEIRUA, JOSE BICO, BENOIT ROMAN, PMMH-ESPCI, NARAYANAN MENON, Umass — When a water droplet is deposited over a thin floating sheet, radial wrinkles appear in the vicinity of the droplet as a result of capillary forces exerted at the contact line [1]. However, determining the stress state at the contact line is still challenging and limits the full description of the wrinkling pattern. In order to avoid this contact line ambiguities, we propose the experimental study of the buckling of a macroscopic annulus floating on the surface of water and submitted to a difference in surface tension between its inner and outer edges. This particular configuration allows to generate radial wrinkles on the membrane with well defined border conditions. The topography of the wrinkled patterns are precisely measured using a synthetic Schlieren technique. Based on the standard buckling theory, we develop scaling laws for the buckling threshold of the annulus as well as for the wave length and radial extension of the wrinkles, which are compared to our experimental results and numerical simulations.

[1] J. Huang, M. Juszkiewicz, W.H. de Jeu, E. Cerda, T. Emrick, N. Menon, and T.P. Russell. Capillary wrinkling of floating thin polymer films. Science, 317(5838):650-653, 2007.

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