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Capillary wrinkling of elastic membranes DOMINIC VELLA, University of Cambridge, MOKHTAR ADDA-BEDIA, LPS de l'ENS, Paris, ENRIQUE CERDA, Universidad de Santiago, Chile — We present a physically-based model for the deformation of a floating elastic membrane caused by the presence of a liquid drop. Starting from the equations of membrane theory modified to account for the three surface tensions in the problem, we show that the presence of a liquid drop causes an azimuthal compression over a finite region. This explains the origin of the wrinkling of such membranes observed recently [J. Huang et al., Science 317, 650 2007] and suggests a single parameter that determines the extent of the wrinkled region. While experimental data supports the importance of this single parameter, our theory under-predicts the extent of the wrinkled region observed experimentally. We suggest that this discrepancy is likely to be due to the wrinkling observed here being far from threshold and discuss other, related, geometries.

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