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Stability of marginal pinching in soap films.¹ CORENTIN TREGOUET, ISABELLE CANTAT, Univ Rennes, CNRS, IPR (Institut de Physique de Rennes)UMR 6251, F-35000 Rennes — The stability of soap bubbles and hence of liquid foams is set by the film thinning, which is known to occur locally: round patches of thin films appear at the edges of the film before moving to the top of the film by buoyancy. This phenomenon, the marginal regeneration, has been observed for decades, but its origin has not yet been established. It involves the appearance of a localized pinch between the film and the meniscus, whose dynamics has been entirely characterized by assuming its invariance in the direction of the meniscus. We identify a limit in which the bulk drainage and the surface rearrangements are decoupled, the film thus evolving in a sliding-puzzle-like dynamic. In this frame, we study theoretically and numerically the stability of this straight marginal pinch, and show that it is unstable to long wavelengths. We predict a critical wavelength of fastest destabilization and a thickness ratio between the thin and thick parts of the film, both in good agreement with experimental observations.

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