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Spatial Coherence Resonance for Maximizing Self-Organization and Pattern Fidelity in Free Surface Films SANDRA TROIAN, NAN LIU, California Institute of Technology, MC 128-95, Pasadena, CA 91125 — The influence of external modulation on pattern formation can offer significant insight into hydrodynamic behavior and provide an alternate means of optimizing the self-organization process. While temporal modulation has been used to great effect for decades, there has been less emphasis on external spatial forcing as a way of enhancing pattern uniformity. The majority of studies investigated in the context of spatial coherence phenomena have involved systems undergoing pattern formation in 2D. In this talk, we call attention to hydrodynamic instabilities in thin films in which microarray structures emerge spontaneously in 3D with no intrinsic steady states unless film depletion occurs. However, these structures are highly prone to defects and difficult to control over large areas. For this talk, we focus on an example involving the deformation of a free surface nanofilm exposed to a large transverse thermal gradient whose magnitude is spatially modulated near the resonance point. By a combination of weakly nonlinear analysis and numerical simulations, we demonstrate the existence of a spatial coherence regime leading to rapid growth of perfectly uniform microarrays with high pattern fidelity and even denser packing than possible without spatial forcing.

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