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The Stability and Evolution of Curved Domain Arising From One Dimensional Localized Patterns

In many pattern forming systems, narrow two dimensional domains can arise whose cross sections are roughly one dimensional localized solutions. This talk will present an investigation of this phenomenon for the variational Swift-Hohenberg equation. Stability of straight line solutions is analyzed, leading to criteria for either curve buckling or curve disintegration. A high order matched asymptotic expansion reveals a two-term expression for the geometric motion of curved domains which includes both elastic and surface diffusion-type regularizations of curve motion. This leads to novel equilibrium curves and space-filling pattern proliferation. A key ingredient in the generation of the labyrinthine patterns formed, is the non-local interaction of the curved domain with its distal segments. Numerical tests are used to confirm and illustrate these phenomena.