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Phase singularities and defects in the Swift-Hohenberg equation. Preliminary report.

We are interested in understanding the structure of symmetric grain boundary solutions of a canonical pattern-forming model, the Swift-Hohenberg equation. We focus on the so-called strong bending limit (small angle between the roll patterns on each side of the defect), when dislocations are present along the core of the grain boundary. In this relatively simple situation, the latter takes the form of a straight line.

The geometry of this particular pattern allows one to approach the problem on the half plane bounded by the line of dislocations, and to view the solution as resulting from spatial dynamics in a direction perpendicular to the core of the grain boundary. Moreover, because the solution is periodic in the direction parallel to the line of dislocations, we consider its Poisson extension to the unit disc, together with its harmonic conjugate, which is built from the Hilbert transform of the real field. As a consequence, the appearance of phase singularities as one approaches the line of dislocations may be related to the dynamics of zeros of the resulting complex function defined on the unit disc.

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