A scaling law for a model of epitaxial growth with dislocations

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Epitaxy is a special form of crystal growth and of great importance in modern technology. We consider a crystalline film on a (rigid) substrate. The misfit between the crystal structures of the film and the substrate can lead to dislocations and can have an influence on the morphology of the film. Dislocations are topological defects of the crystallographic lattice.

In this talk we will study a variational model from the literature. It is based on linearized elasticity and additionally takes into account the surface energy of the film's free surface as well as the dislocation nucleation energy. In particular we will discuss a new scaling law for the infimum of the energy. This includes a new construction for the upper bound and a new variant of a ball-construction combined with thorough local estimates for the lower bound. The results indicate that in certain parameter regimes, the formation of dislocations is expected.