

Energy concentrated on lines and their application to the modeling of crystal defects

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Abstract: I will present some recent results related to the study, within the calculus of variations, of energies concentrated on lines. These energies arise in the asymptotic analysis of variational models involving vector-valued fields with topological singularities and find a natural application in the modeling of material defects. This is the case of one-dimensional crystal defects, dislocations, as well as vortices in the study of Ginzburg-Landau type energies for superconductors. The analysis from the point of view of the direct method requires the use of Geometric Measure Theory and the characterization of such defects as 1-rectifiable currents with vector-valued multiplicity. I will show a characterization of the necessary and sufficient conditions for the lower semicontinuity, as well as examples, relevant from the point of view of applications, in which there is lack of semi-continuity and a non-trivial relaxation is required.