Γ-convergence analysis of discrete topological singularities: metastability and dynamics

A. Garroni

The main mechanism for crystal plasticity is the formation and motion of a special class of defects, the dislocations. These are topological defects in the crystalline structure that can be identify with lines on which energy concentrates.

I will consider a discrete model for straight screw dislocations, that turns out to be very close to the model of vortices in spins systems. We exploit the relation with the Ginzburg Landau theory for vortices in superconductors and we give an asymptotic expansion of the discrete energy (in terms of Γ-convergence).

As a consequence of this asymptotic analysis we obtain the existence of many metastable configurations with given distributions of dislocations and hence a pinning effect for the associated dynamics. A notion of discrete dynamics associated to a crystalline dissipation will be also discussed.

The results are obtained in collaboration with R. Alicandro, L. De Luca and M. Ponsiglione.