Meeting: 1000, Albuquerque, New Mexico, SS 11A, Special Session on Nonlinear Partial Differential Equations Applied to Materials Science

1000-35-194 **Dmitry Glotov*** (dglotov@math.uconn.edu), Department of Mathematics, 196 Auditorium Road, University of Connecticut, U-3009, Storrs, CT 06269-3009. *Vortices and current in the three-dimensional thin-film Ginzburg-Landau model of superconductivity.* Preliminary report.

We study the variable thickness Ginzburg-Landau equations describing type-II superconducting thin films in the regime in which the thickness of the film tends to zero. While the convergence of the order parameter is discussed in a paper by Chapman, Du, and Gunzburger, analyzing the equation for the magnetic potential, we obtain results on convergence of the current and the magnetic potential. We show that the limiting order parameter is a minimizer of the two-dimensional thin-film energy. The regularity of the solutions to the three-dimensional problem presents another interest for us. Using regularity, we obtain uniform convergence of the three-dimensional minimizers. This in turn allows us to conclude that, for sufficiently small thickness, the three-dimensional minimizers exhibit the vortex structure of the limiting two-dimensional minimizer. As an illustration, we discuss two regimes for the Ginzburg-Landau parameter studied by Ding and Du: one in which the minimizers have no vortices and another in which the minimizers have vortices and their number is proportional to the applied magnetic field. (Received August 24, 2004)