Convergent discretizations of the Ericksen-Leslie Model for Nematic Liquid Crystal Flow

Andreas Prohl
Mathematisches Institut, Universität Tübingen
prohl@na.uni-tuebingen.de

Abstract

The Ericksen-Leslie model describes dynamics of low molar-mass nematic liquid crystals, where the spatial-temporal distribution of defects defining texture is represented by the director unit vector field $\mathbf{d} : \Omega_T \to \mathbb{S}^2$. It consists of the Navier-Stokes equations with an extra viscous stress tensor, and a convective harmonic map heat flow equation to govern the dynamics of the director field.

In the first part, we discuss different projection-based discretizations, which converge for locally existing strong solutions. Then, energy-based discretizations will be proposed which converge for globally existing weak solutions.

This is joint work with R. Becker (U Pau, France), X. Feng (U Tennessee, USA), and N. Walkington (CMU Pittsburgh, USA).