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Vincent Millot: Torus and split solutions of the Landau-de Gennes model for nematic liquid crystals

lundi 19 juin 2023 11:00 (50 minutes)

In this talk, I will present the Q-tensor model of Landau-de Gennes for nematic liquid crystals in the so called Lyutsyukov regime dealing with maps with values in the 4-dimensional sphere. This model describes stable configurations of a liquid crystal as minimizers of a Ginzburg-Landau type energy in which the potential well is the real projective plane, seen as a submanifold of S4. In the case where the 3D domain is the unit ball and the Dirichlet boundary data is radially symmetric (equivariantly), one may expect that a minimizer inherits such symmetry. Simulations show that this is not the case and a certain toroidal structure is expected to appear. If (equivariant) axial symmetry is imposed to reduce the complexity of the problem, another type of « singular » solutions appears, the split solutions. By means of regularity results on this model, I will discuss the existence / geometry of torus and split solutions and explain the strong dependence of the type of solutions with respect to the boundary condition and the shape of the domain. This talk is based on recent works in collaboration with Federico Dipasquale and Adriano Pisante.