Chemotaxis Compressible Navier–Stokes Equations Modeling Vascular Network Formation

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Abstract

This talk concerns the existence of global weak solutions to a compressible Navier–Stokes system for the density and velocity of endothelial cells, coupled with a reaction–diffusion equation for a chemoattractant. The model is posed on the three-dimensional torus and describes the self-organization of endothelial cells in the early stages of blood vessel formation. The existence result holds for adiabatic exponents $\gamma > 4/3$. This agrees with the exponent appearing in the degenerate Keller–Segel equations, which arise in the zero-inertia and zero-viscosity limit. The proof relies on an approximation with Korteweg and drag terms, the BD entropy inequality, and a notion of weak solutions renormalized in the velocity variable.