

Spontaneous periodic orbits in the Navier-Stokes flow

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In this talk, we introduce a general method to obtain constructive proofs of existence of periodic orbits in the forced autonomous Navier–Stokes equations on the three-torus. After introducing a zero finding problem posed on a Banach space of geometrically decaying Fourier coefficients, a Newton–Kantorovich theorem is applied to obtain the (computer-assisted) proofs of existence. This requires analytic estimates to verify the contractibility of the operator and we use symmetries from the model to reduce the size of the problem to be solved. As applications, we present proofs of existence of spontaneous periodic orbits in the Navier–Stokes equations with Taylor-Green forcing.