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Rigorous numerics for ill-posed PDEs: periodic orbits in the Boussinesq equation

In this talk, we introduce a computer-assisted technique for the analysis of periodic orbits of ill-posed PDEs. As a case study, our proposed method is applied to the Boussinesq equation, which has been investigated extensively because of its role in the theory of shallow water waves. The idea is to use the symmetry of the solutions and a Newton-Kantorovich type argument (the radii polynomial approach), to obtain rigorous proofs of existence of the periodic orbits in a weighted ell-one Banach space of space-time Fourier coefficients with geometric decay. We present computer-assisted proofs of existence of periodic orbits at different parameter values. This is joint work with Marcio Gameiro (USP, Brazil) and Roberto Castelli (VU Amsterdam, Netherlands).