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Dynamics and Control of a Reduced Order System of the 2-d Navier-Stokes Equations[1] NEJIB SMAOUI, MOHAMED ZRIBI, Kuwait University — The dynamics and control problem of a reduced order system of the 2-d Navier-Stokes (N-S) equations is analyzed. First, a seventh order system of nonlinear ordinary differential equations (ODE) which approximates the dynamical behavior of the 2-d N-S equations is obtained by using the Fourier Galerkin method. We show that the dynamics of this ODE system transforms from periodic solutions to chaotic attractors through a sequence of bifurcations including a period doubling scenarios. Then three Lyapunov based controllers are designed to either control the system of ODEs to a desired fixed point or to synchronize two ODE systems obtained from the truncation of the 2-d N-S equations under different conditions. Numerical simulations are presented to show the effectiveness of the proposed controllers.

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