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Controlling the Dynamics of the Five-Mode Truncation System of the 2-d Navier-Stokes Equations[1] NEJIB SMAOUI, MOHAMED ZRIBI, Kuwait University — The dynamics and the control problem of the two dimensional (2-d) Navier-Stokes (N-S) equations with spatially periodic and temporally steady forcing is addressed. At first, the Fourier Galerkin method is applied to the 2-d N-S equations to obtain a fifth order system of nonlinear ordinary differential equations (ODE) that approximates the behavior of these equations. Simulation studies indicate that the obtained ODE system captures the behavior of the 2-d N-S equations. Then, a control law is proposed to drive the states of the ODE system to a desired fixed point. Next, a second control law is developed to synchronize two reduced order ODE models of the 2-d N-S equations having the same Reynolds number and starting from different initial conditions. Finally, simulation results are undertaken to validate the theoretical developments.

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