Dynamics and Control of the 2-d Navier-Stokes Equations[1] NEJIB
SMAOUI, MOHAMED ZRIBI, Kuwait University — The control problem of the
dynamics of the two-dimensional (2-d) Navier-Stokes (N-S) equations with spatially
periodic and temporally steady forcing is studied. First, we devise a dynamical
system of several nonlinear differential equations by a truncation of the 2-d N-
S equations. Then, we study the dynamics of the obtained Galerkin system by
analyzing the system's attractors for different values of the Reynolds number, R_e.
By applying the symmetry of the equation on one of the system's attractors, a
symmetric limit trajectory that is part of the dynamics is obtained. Next, a control
strategy to drive the dynamics from one attractor to another attractor for a given R_e
is designed. Finally, numerical simulations are undertaken to validate the theoretical
developments.

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