

We investigate a system of nonlinear partial differential equations, specifically the so-called Ladyzhenskaya model, in three spatial dimensions. It will be shown that after inclusion of a perturbation of a higher order, the model exhibits a considerably better behavior, in particular it will become quite straightforward to prove differentiability of solutions with respect to the initial condition. Due to this fact we may consequently employ the method of Lyapunov exponents to estimate the fractal dimension of the exponential attractor. First, however, it will be necessary to show existence and uniqueness of solutions, improved regularity and existence of a compact invariant set for the entire system.