Linear feedback control problems for the Boussinesq equations

Hyung-Chun Lee

Department of Mathematics
Ajou University

Abstract

The control of viscous flows is very crucial to many technological and scientific applications. So many mathematicians and scientists have been studied in mathematical analysis and computations of the optimal control problems for fluid flow. But the computation of optimally controlled flows based on solving the derived optimality system is expensive in terms of CPU time and memory space. This is due to the fact that such an approach involves a coupled system of state and adjoint equations with initial and final conditions. This system has to be solved on the entire time-space cylinder and it can not be solved by marching in time. Therefore, there are practical interests and we need to develop other approach which gives similar results and less expensive solutions. In this talk, we consider a dynamics of linear feedback control for Boussinesq equations that describe the viscous incompressible fluid flow coupled to thermal dynamics. Our goal is to steer over time a candidate velocity field u and fluid temperature θ to a target velocity field U and fluid temperature Θ by appropriately controlling the body forces of the velocity and temperature field.