

Application of Spectral Method for Investigation of the Profiles of the Optimum Fields for Variational Problems Connected to the Turbulent Thermal Convection

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The optimum theory of turbulence is one of the few tools for obtaining analytical results for the characteristic quantities of the turbulent flows and turbulent thermal convection. This is achieved on the basis of analytical asymptotic theory which is valid for large values of the dimensionless numbers of the corresponding fluid system. For small and intermediate values of the numbers such as Rayleigh or Taylor numbers we have to solve numerically the Euler - Lagrange equations of the corresponding variational problems. The spectral methods are very suitable for obtaining the profiles of the optimum fields connected to the fluid velocity and temperature as well as for obtaining the thickness of the boundary layers of the optimum fields. In this presentation we discuss the application of the Galerkin method for solution of the Euler - Lagrange equations of a variational problem connected to the turbulent convection. We obtain several profiles of the optimum fields, describe the evolution of the thickness of the boundary layers, and finally discuss the limits of the application of Galerkin method to this system.