Study on the change of patterns of vortices and waves in fluid flow.

2005 Fiscal Year Final Research Report Summary

Study on the change of patterns of vortices and waves in fluid flow.

Research Project

Project/Area Number

15340054

Research Category

Grant-in-Aid for Scientific Research (B)

Allocation Type

Single-year Grants

Section

一般

Research Field

Global analysis

Research Institution

Kanazawa University

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Project Period (FY)

2003 – 2005

Keywords

Navier-Stokes equations / Initial value problem / Free surface / Group-symmetry / Stability / Vortex filament / Vortex ring / Singular integral

Research Abstract

MIYAKAWA studied the flows of a viscous incompressible fluid in two and three-dimensional exterior domains and clarified explicit relationship between the space-time decay rates of flows and the symmetry of solutions of the equations of motion. He obtained almost complete results in the case of two space dimensions. FUKUMOTO studied the evolution of viscous vortices, applying the singular perturbation method to the non-local induction model, and obtained new results on the topological change of vortex filaments and rings. HISHIDA studied the viscous flow around a rotating body and proved for the first time the existence of stationary and nonstationary flows by

finding a new class of singular integral operators. He also gave a new existence result for flows in domains with apertures. IGUCHI applied the method for treating free-surface problem to the equation of one-dimensional gas dymanics and gave a completely new approach to this problem which has wide applications to equations of similar types. He also classified the shape of free surfaces associated with shallow water flow with periodic bottom, applying the bifurcation theory.

Research Products (24 results)

All | 2006 | 2004 | 2003 | Other

All | Journal Article

- [Journal Article] Nonstationary Navier-Stokes flows in a two-dimensional exterior domain with rotational symmetries — 2006
- [Journal Article] D'Alembert's paradox and the integrability of pressure for two-dimensional in compressible Euler flows — 2006
- [Journal Article] Nonstationary Navier-Stokes flows in a two-dimensional exterior domain with rotational symmetries. — 2006
- [Journal Article] D'Alembert's paradox and the integrability of pressure for two-dimensional incompressible Euler flows in an exterior domain. — 2006
- [Journal Article] Conservation laws of circulation and helicity as Noether's theorem — 2004
- [Journal Article] The nonstationary Stokes and Navier-Stokes flows through an aperture — 2004
- [Journal Article] L^g theory of a singular "winding" operator arising from fluid dynamics — 2004
- [Journal Article] Conservation laws of circulation and helicity as Noether's theorem. — 2004
- [Journal Article] The nonstationary Stokes and Navier-Stokes flows through an aperture. — 2004
- [Journal Article] L^q-theory of a singular "winding" integral operator arising from fluid dynamics. — 2004
- [Journal Article] On L^1-summability and asymptotic profiles of smooth solutions to Navier-Stokes equations in a 3D exterior domain — 2003
- [Journal Article] The three-dimensional instability of a strained vortex tube revisited — 2003
- [Journal Article] Short-wavelength stability analysis of thin vortex rings — 2003
- [Journal Article] On steady surface waves over a periodic bottom — 2003
- [Journal Article] Existence theory for hyperbolic systems of conservation laws with general flux-functions — 2003
- [Journal Article] On L^1-summability and asymptotic profiles of smooth solutions to Navier-Stokes equations in a 3D exterior domain. — 2003
- [Journal Article] The three-dimensional instability of a strained vortex tube revisited. — 2003
- [Journal Article] Short-wavelength stability analysis of thin vortex rings. — 2003
- [Journal Article] On steady surface waves over a periodic bottom : relations between the pattern of imperfect bifurcation and the shape of the bottom. — 2003
- [Journal Article] Existence theory for hyperbolic systems of conservation laws with general flux-functions. — 2003
- [Journal Article] L^g estimates of weak solutions to the stationary stokes equations around a rotating body
- [Journal Article] A Mathematical justification of the forced Korteweg-de Vries equation
- [Journal Article] L^q estimates of weak solutions to the stationary Stokes equations around a rotating body.
- [Journal Article] A mathematical justification of the forced Korteweg-de Vries equation for capillary-gravity waves.

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