Research Report (September, 2017 - September, 2018)

Enrollment from September 2017

Department of Pure and Applied Mathematics Keiichi WATANABE

I. List of Papers

01. K. Watanabe, "Compressible-incompressible two-phase flows with phase transition: model problem", *J. Math. Fluid Mech.* **20** (2018), no. 3, 969--1011.

II. List of Talks

01. K. Watanabe, "Compressible-incompressible two phase flow of Korteweg type with phase transition: model problem", MSJ Autumn Meeting, Yamagata Univ., Yamagata, Japan, Sep. 14.

02. K. Watanabe, "Compressible-incompressible two-phase flows with phase transition: model problem", *IRTG seminar*, TU Darmstadt, Darmstadt, Germany, Oct. 26.

03. K. Watanabe, "Maximal Lp-Lq regularity of compressible-incompressible two-phase flows with phase transitions in general domains", *43rd Evolution Equations Workshop*, Japan Women's Univ., Tokyo, Japan, Dec. 27.

04. K. Watanabe, "Maximal regularity theorem of compressible-incompressible two-phase flows with phase transitions", *The 15th Japanese-German International Workshop on Mathematical Fluid Dynamics*, Waseda Univ., Tokyo, Japan, Jan. 9.

05. K. Watanabe, "On strong solutions for compressible-incompressible two-phase flows with phase transitions", *Japanese-Indonesian International Workshop on Mathematical Fluid Dynamics*, Waseda Univ., Tokyo, Japan, Mar. 12.

06. K. Watanabe, "Maximal regularity of compressible-incompressible two-phase flows with phase transitions", *MSJ Spring Meeting 2018*, The Univ. of Tokyo, Tokyo, Japan, Mar. 21.

07. K. Watanabe, "Modeling and mathematical analysis of compressible / incompressible viscous two-phase fluid with phase transition", *1st symposium of Interdisciplinary institute for thermal energy conversion engineering and mathematics*, Waseda Univ., Tokyo, Japan, Apr. 27.

08. K. Watanabe, "Local unique solvability for compressible-incompressible two-phase flows with phase transitions", *Workshop on Mathematical Fluid Dynamics*, Evangelische Akademie, Bad Boll, Germany, May 10.

09. K. Watanabe, "On the local solvability of compressible-incompressible two-phase flows with phase transitions in general domains", *40th Young Researchers Seminar on Evolution Equations*, Greenpia-Yame, Fukuoka, Japan, Sep. 1.

III. Research Results in 1st year

01. I proved a local and global in time unique existence theorem for the free boundary problem of compressible-incompressible two-phase flows with phase transitions in some domains.

02. I proved that the Stokes operator in an exterior domain generates an analytic semigroup. This result is based on joint work with Dr. P. Tolksdorf.

IV. Research Plan for 2nd year

01. I will prove a global in time unique existence theorem for the free boundary problem of compressible-incompressible two-phase flows with phase transitions in some unbounded domains.

02. I will prove a global well-posedness to the Navier-Stokes equations in exterior Lipschitz domains.