"Multiscale Analysis, Modelling and Simulation", Top Global University Project, Waseda University
and Jenderal Soedirman University

Japanese-Indonesian International Workshop on Mathematical Fluid Dynamics

Date: March 12 - 13, 2018
Venue: Room 58-311, Nishi-Waseda Campus, Waseda University

Monday, March 12

- 10:30 - 11:20 **Yoshihiro SHIBATA** （Waseda University）

  $\mathcal{R}$-boundedness, Maximal Regularity and Navier-Stokes equations

- 11:30 - 12:20 **Budi PRATIKNO** （Jenderal Soedirman University）

  Power of the Tests in Testing Intercept with NSPI on Regression Linear Models

- 12:30 - 13:00 **Bambang Hendriya GUSWANTO**（Jenderal Soedirman University）

  THE ANALYSIS OF MULTIDIMENSIONAL ANOMALOUS DIFFUSION EQUATION

- 14:30 - 15:20 **Miho MURATA** （Kanagawa University）

  The global well-posedness for the Navier-Stokes-Korteweg system

- 15:30 - 16:00 **Hiroyuki TSURUMI** （Waseda University）

  Well-posedness and ill-posedness of the stationary Navier-Stokes equations
  in Besov spaces

- 16:30 - 17:00 **Sri Maryani** （Jenderal Soedirman University）

  On the $\mathcal{R}$ sectoriality for the compressible fluid flow of The Oldroyd-B Model
  with Surface Tension

- 17:10 - 17:40 **Keiichi WATANABE** （Waseda University）

  On strong solutions for compressible-incompressible two-phase flows with
  phase transitions

*Reception 18:00 – If you would like to participate in the reception,
　　　please e-mail Ms. Ikezaki (n.ikezaki @ kurenai.waseda.jp) by March 7.

Tuesday, March 13

- 11:00 - 11:50 **Xin ZHANG** （Waseda University）

  Global persistance of geometric structure for viscous flow

- 12:00 - 12:50 **Idha SIHWANINGRUM** （Jenderal Soedirman University）

  FRACTIONAL INTEGRAL OPERATORS ON THE GENERALIZED
  MORREY SPACES WITH GROWTH MEASURES

- 13:00 - 13:30 **Wuryatmo A. SIDIK** （Jenderal Soedirman University）

  Optimal Disease Control Policies for Preventing a Possible Future Pandemics
  in Indonesia

*Closing Reception 18:00–

Organized by

- Yoshihiro SHIBATA (Waseada University)
- Sri Maryani (Jenderal Soedirman University)

Supported by

TOP GLOBAL
UNIVERSITY
JAPAN

Last updated: March 13, 2018.

Japanese-Indonesian International Workshop on Mathematical Fluid Dynamics

Abstracts

THE ANALYSIS OF MULTIDIMENSIONAL ANOMALOUS DIFFUSION EQUATION

Bambang Hendriya GUSWANTO

Analysis and Algebra Laboratory, Department of Mathematics
Faculty of Mathematics and Natural Sciences
Jenderal Soedirman University

We derive a multidimensional anomalous diffusion equation from a random walk process. The equation describes a diffusion process with long rests and long jumps implying a nonlinear time dependence of the mean square displacement. It is different from usual diffusion which has a linear time dependence of the mean square displacement. The fundamental solution to the equation and its properties are studied in mathematical analysis approach.

The global well-posedness for the Navier-Stokes-Korteweg system

Miho MURATA

Kanagawa University

`m-murata@kanagawa-u.ac.jp`

In this talk, we consider the compressible fluid model of Korteweg type which was introduced by J. E. Dunn and J. Serrin in 1985. It is shown that the system admits a unique, global strong solution for small initial data in $\mathbb{R}^N$, $N \geq 2$. For the purpose, the main tools are the maximal L_p-L_q regularities and L_p-L_q decay properties to the linearized equations. This talk is based on a joint work with Professor Yoshihiro Shibata in Waseda University.

Power of the Tests in Testing Intercept with NSPI on Regression Linear Models

Budi PRATIKNO

Department of Mathematics, Faculty of Mathematics and Natural Sciences
Jenderal Soedirman University, Purwokerto, Jawa Tengah, Indonesia, 53122

`bpratikto@gmail.com`

Test of hypotheses on the intercep of parameters of linear regression models in the presence of non-sample prior information (NSPI) is considered. Based on the nature of the NSPI the unrestricted test (UT), restricted test (RT) and pre-test test (PTT) are defined for simple, multivariate, multiple, and parallel regression models. The sampling distributions of the test statistics and power functions of the test are derived. Here, the bivariate noncentral F (BNCF) distribution is derived and used to compute the power and size of the PTT. The maximum power and minimum size are choosen to obtain the best test. The UT has the lowest power and size; RT has the highest power and size; but pretest test is a reasonable compromise among UT and RT if the NSPI is close to the true value of the parameter.

$\mathcal{R}$-boundedness, Maximal Regularity and Navier-Stokes equations

Yoshihiro SHIBATA

Waseda University

The maximal regularity is one of characters of the parabolic equations. In this talk, I will talk about the method of using the $\mathcal{R}$-bounded solution operators to obtain the maximal $L_p - L_q$ regularity of Stokes equations with free boundary conditions and its application to the free boundary problem for the Navier-Stokes equations.

Optimal Disease Control Policies for Preventing a Possible Future Pandemics in Indonesia

Wuryatmo A. SIDIK

Department of Mathematics, Faculty of Mathematics and Natural Sciences
Jenderal Soedirman University, Purwokerto, Indonesia

It has been suspected that the disease persistent of avian flu (H5N1) in Indonesia is mostly due to un-healthy farming practices among the people of Indonesia such as domesticated poultry and wet market. Simultaneous infection of humans by H5N1 and other influenza A viruses could theoretically generate novel influenza viruses with pandemic potential. This work presents model and methods for analyzing the emergence of a hypothetical virulent and contagious mutated virus arising in the human population that may cause a possible future pandemic. A reproduction number has been widely used as a threshold value of disease transmission. Our asymptotic studies of uncontrolled systems showed that, even if there are disease free equilibria, it takes a long time for the disease to disappear. On which the diseases may already result in a large number of casualties of birds and humans. Therefore, it is of interest to devise disease control policies such that the disease can be contained in a relatively short period but economically visible. While administering a disease control, a reproduction number has been widely considered as a constant, which is not quite true. This study considers the reproduction numbers as variables and utilized it while designing disease controls. We develop disease control policies as functions of the reproduction numbers. The necessary conditions for the existence of optimal control policies are given.

Keywords: Mathematical epidemiology, virus recombination, optimal disease control policies.

FRACTIONAL INTEGRAL OPERATORS ON THE GENERALIZED MORREY SPACES WITH GROWTH MEASURES

Idha SIHWANINGRUM

Department of Mathematics, Faculty of Mathematics and Natural Sciences
Jenderal Soedirman University, Purwokerto, Indonesia

Some estimates of the fractional integral operators have been studied by many researchers under the doubling measures. For certain condition, fractional integral operator is a solution of Poisson equation. In this talk, under the growth measures, the weak and strong estimates of the fractional integral operators

are presented on the generalized Morrey spaces. Such estimates involve some properties of maximal operator as well as Hedberg and Chebyshev inequalities.

On the $\mathcal{R}$ sectoriality for the compressible fluid flow of The Oldroyd-B Model with Surface Tension

Sri Maryani

Department of Mathematics, Faculty of Mathematics and Natural Sciences
Jenderal Soedirman University, Indonesia

We investigated the $\mathcal{R}$-boundedness of solution operator families for compressible viscous barotropic fluid flow of the Oldroyd-B type with surface tension in general domain which combined with Weis's operator valued multiplier theorem. This $\mathcal{R}$-boundedness implies the generation of analytic semigroup and the maximal $L_p - L_q$ regularity for the initial value problem.

Keywords: $\mathcal{R}$-boundedness of solution operator, Oldroyd-B type, surface tension, generation of analytic semigroup, maximal $L_p - L_q$ regularity

Well-posedness and ill-posedness of the stationary Navier-Stokes equations in Besov spaces

Hiroyuki TSURUMI

Waseda University

We consider the stationary Navier-Stokes equations in $\mathbb{R}^n$ for $n \geq 3$. First, we show existence and uniqueness of solutions in Besov spaces $\dot{B}_{p.q}^{-1+\frac{n}{p}}$ for $1 \leq p < n$, which are continuously dependent on small external forces in $\dot{B}_{p.q}^{-3+\frac{n}{p}}$. We can show this well-posedness by the boundedness of the Riesz transform, the para-product formula, and the embedding theorem in homogeneous Besov spaces. On the other hand, it is proved that external forces whose $\dot{B}_{\infty,q}^{-3}$ norms are arbitrary small can produce solutions whose $\dot{B}_{\infty,q}^{-1}$ norms are arbitrary large. This ill-posedness is shown by constructing the sequence of external forces, as similar to those of initial data proposed by Bourgain-Pavlović in the non-stationary problem.

We also consider the same problem as above in the torus $\mathbb{T}^n$ for $n \geq 3$. By similar arguments, we can show the well-posedness of solutions in $\dot{B}_{p.q}^{-1+\frac{n}{p}}(\mathbb{T}^n)$ for $1 \leq p < n$ and the ill-posedness for $n < p \leq \infty$.

On strong solutions for compressible-incompressible two-phase flows with phase transitions

Keiichi WATANABE

Waseda University

We consider the free boundary problem for compressible-incompressible two-phase flows with phase transitions in a general domain. Two fluids are separated by a sharp interface and a surface tension is taken into account. The free surface is parameterized over the sphere by means of a height function. We use the Navier-Stokes-Korteweg equation for the compressible fluid and the Navier-Stokes equation for the incompressible fluid, respectively, whose model is thermodynamically correct. We show that for given $T > 0$ the problem admits a unique strong solution on $(0, T)$ provided the initial data are suitably small in their natural norms.

Global persistance of geometric structure for viscous flow

Xin ZHANG

Waseda University

In this talk, we will discuss the temperature patch problem for incompressible Boussinesq equation for 2-D and 3-D cases. Our work is based on the so-called striated regularity technique, which was first applied for the 2-D vortex patch problem by J.-Y. Chemin around1990. As the solutions in our work with critical regularity in Besov spaces, it is also necessary to review the works by H.Abidi & T.Hmidi and R.Danchin & M. Paicu.