

**“Multiscale Analysis, Modelling and Simulation”
Top Global University Project, Waseda University
REPORT ON STUDY ABROAD**

Date: December 23, 2018

Name: Keiichi Watanabe

- 1. Study abroad destination: Imperial College London, United Kingdom**
- 2. Dates of stay: September 9, 2018 – December 16, 2018 (99days)**
- 3. Purpose:** To participate in the Ph.D. program: EPSRC Center for Doctoral Training in the Mathematics of Planet Earth created by Imperial College London and the University of Reading.
- 4. Host Professor: Prof. Dan Crisan (Imperial College London)**
- 5. Education and research activity in the destination**

I. Lectures

- (1) Prof. Darryl Holm (Imperial College London) and Dr. Tristan Pryer (University of Reading), “Partial differential equations,” from October 3 until December 12.
- (2) Prof. Dan Crisan (Imperial College London) and Prof. Valerio Lucarini (University of Reading), “Dynamical systems,” from October 5 until December 12.
- (3) Dr. Ben Calderhead (Imperial College London) and Dr. Jochen Broecker (University of Reading), “Data and Uncertainty,” from October 4 until December 12.
- (4) Dr. Colin Cotter (Imperial College London) and Dr. Hilary Weller (University of Reading), “Numerical methods,” from October 10 until December 12.

II. Seminars and Conference

- (1) Cécile Penland (National Oceanic and Atmospheric Administration), “A Brief, Incomplete, and Biased View of Stochastic Dynamics in Weather and Climate,” October 3.
- (2) Owen Jones (Cardiff University), “Runoff processes on trees,” October 10.
- (3) Jonathan Rougier (University of Bristol), “Apocalyptic volcanic super eruption that could DESTROY civilization in much closer than we thought, say experts,” October 31.
- (4) Jeroen Wouters (University of Reading), “Modelling of slow-fast

dynamical systems,” November 7.

- (5) Pippa Whitehouse (Durham University), “Modelling a glacial cycle using three equations,” November 21.
- (6) Classical and Modern Results in Nonlinear Filtering and applications: Event Information, November 28.
- (7) Hugo Winter (Lancaster University), “Finding a job after CDT life - the industry route,” December 7.
- (8) Remus Gabriel Hanea (University of Stavanger), “Decision making under uncertainties,” December 14.

6. Research Results:

I participated in the Ph.D. program: EPSRC Center for Doctoral Training in the Mathematics of Planet Earth given by Imperial College London and the University of Reading. Especially, I attended all the lectures of Partial Differential Equations, Dynamical Systems, Data and Uncertainty, and Numerical Methods and several seminars. Each core lecture has 20 hours lectures and 6 hours tutorials. These lectures and seminars are related to the geophysics and mathematical theory to planet earth and quite helpful to understand climate change and so on. Thanks to the program, I got more understanding of the background of my research topics. Inspired to the program, I have just started to study the Navier-Stokes equations with the Coriolis force.

7. Other comments:

I was glad to participate in the program and have many lectures about some mathematical theory of planet earth. I hope this experiment will help my research project. In addition, it was very interesting to discuss the contents of the lecture and seminars with other students because they were major in not only mathematics but also physics. I really enjoy the discussion with them. I am, finally, grateful to Prof. Yoshihiro Shibata, Prof. Martin Guest, Prof. Dan Crisan, and Top Global University project (Waseda University) for giving me such a great opportunity to join the program.



Figure 1: Picture with Prof. Dan Crisan and Prof. Darryl Holm at Imperial College London.