

## *Week 9 (Nov.6 - Nov.10)*

**Topic:** Complex Fluids

**Workshop Room:** Room 2201, Guanghai East Building, Fudan University

**Lecture Series Speakers:** Eduard Feireisl (Academy of Sciences of the Czech Republic)  
Josef Malek (Charles University in Prague)

**Invited Speakers:**

Yong Lu (Nankai University)

Nader Masmoudi (New York University, Courant Institute)

Michael Renardy (Virginia Tech)

**Organizing Committee:**

Peter Constantin (Princeton University)

Yoshikazu Giga (University of Tokyo)

Hao Jia (University of Chicago)

Carlos Kenig (University of Chicago)

Zhen Lei (Fudan University)

Fanghai Lin (Courant Institute of Mathematical Sciences)

Gregory Seregin (University of Oxford)

Vladimir Sverak (University of Minnesota)

Edriss Titi (Texas A & M University)

Sijue Wu (University of Michigan)

***Sponsored by***

Shanghai Center for Mathematical Sciences  
School of Mathematical Sciences, Fudan University

***For further information, please contact***

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# Schedule

2017 Fall Program on Analysis of PDE (Sept. 11 – Dec. 2, 2017)

Week 9 (Nov.6-Nov.10)	
Topic: Complex Fluids	
Monday (November 6) Room 2201, Guanghua East Building, Fudan University	
Morning Session	
9:30 – 9:35	Chair: Fanghua Lin
9:35 – 10:25	Josef Malek
10:25 – 10:45	Tea Break
10:45 – 10:50	Chair: Hao Wu
10:50 – 11:40	Michael Renardy
Lunch Break	
Afternoon Session	
14:30 – 14:35	Chair: -
14:35 – 15:25	-
15:25 – 15:45	Tea Break
15:45 – 15:50	Chair: -
15:50 – 16:40	-
Tuesday (November 7) Room 2201, Guanghua East Building, Fudan University	
Morning Session	
9:30 – 9:35	Chair: Michael Renardy
9:35 – 10:25	Josef Malek
10:25 – 10:45	Tea Break and Group Photo
10:45 – 10:50	Chair: Josef Malek
10:50 – 11:40	Yong Lu
Lunch Break	

<b>Afternoon Session</b>	
14:30 – 14:35	Chair: -
14:35 – 15:25	-
15:25 – 15:45	Tea Break
15:45 – 15:50	Chair: -
15:50 – 16:40	-
<b>Wednesday (November 8) Room 2201, Guanghua East Building, Fudan University</b>	
<b>Morning Session</b>	
9:30 – 9:35	Chair: Zhen Lei
9:35 – 10:25	Nader Masmoudi
10:25 – 10:45	Tea Break
10:45 – 10:50	Chair: Peng Qu
10:50 – 11:40	Josef Malek
<b>Lunch Break</b>	
<b>Afternoon Session</b>	
14:30 – 14:35	Chair: Josef Malek
14:35 – 15:25	Eduard Feireisl
15:25 – 15:45	-
15:45 – 15:50	Chair: -
15:50 – 16:40	-
<b>Thursday (November 9) Room 2201, Guanghua East Building, Fudan University</b>	
<b>Morning Session</b>	
9:30 – 9:35	Chair: Nader Masmoudi
9:35 – 10:25	Eduard Feireisl
10:25 – 10:45	Tea Break
10:45 – 10:50	Chair: Eduard Feireisl
10:50 – 11:40	Josef Malek
<b>Lunch Break</b>	
<b>Afternoon Session</b>	

14:30 – 14:35	Chair: -
14:35 – 15:25	-
15:25 – 15:45	-
15:45 – 15:50	Chair: -
15:50 – 16:40	-
<b>Friday (November 10) Room 2201, Guanghai East Building, Fudan University</b>	
<b>Morning Session</b>	
9:30 – 9:35	Chair: Josef Malek
9:35 – 10:25	Eduard Feireisl
10:25 – 10:45	Tea Break
10:45 – 10:50	Chair: Josef Malek
10:50 – 11:40	Eduard Feireisl
<b>Lunch Break</b>	
<b>Afternoon Session</b>	
14:30 – 14:35	Chair: -
14:35 – 15:25	-
15:25 – 15:45	-
15:45 – 15:50	Chair: -
15:50 – 16:40	-

## 2017 Fall Program on Analysis of PDE

Week 9 (Nov.6 – Nov.10)

**Topic:** Complex Fluids

### **Titles and Abstracts:**

**Speaker:** Eduard Feireisl

**Title:** Weak solution approach in fluid mechanics

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**Speaker:** Yong Lu

**Title:** Some mathematical study for a compressible Oldroyd-B model.

**Abstract:** A compressible Oldroyd-B type model with stress diffusion is derived from a compressible Navier-Stokes-Fokker-Planck system arising in the kinetic theory of dilute polymeric fluids.

We show the derivation of this model. We then prove the existence of large data global-in-time weak solutions in two space dimensions. We also give the local-in-time well-posedness result and blow-up criterion. Again in two dimensional setting, we give a (refined) blow-up criterion involving only the upper bound of the fluid density. By exploring a relative entropy inequality, we show a weak-strong uniqueness result. As a corollary, a conditional regularity result is given. Moreover, we show the global existence of strong solutions for small data by exploring the decay estimates for the linearized equations.

This talk is based on three papers: a paper co-written with J. Barrett and E. Suli, a preprint co-written with Zhifei Zhang, and a preprint co-written with Guilong Gui and Chao Wang.

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**Speaker:** Josef Malek

**Title:** Non-Newtonian fluids: modeling and analysis

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**Speaker:** Nader Masmoudi

**Title:** Stability and instability of the Couette flow in Gevrey spaces

**Abstract:** I will talk about a joint result with Yu Deng where we give an example of instability of Couette flow in low regularity Gevrey spaces. The stability holds in high regularity Gevrey spaces and was proved in collaboration with J. Bedrossian.

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**Speaker:** Michael Renardy

**Title:** On controllability of linear viscoelastic flows

**Abstract:** Controllability is the ability to steer a system from a given initial state to a desired final state. In this talk, we consider linear viscoelastic flow in a bounded domain. The control is a body force acting in a subdomain.

We consider Maxwell or Jeffrey's models with several, possibly infinitely many, relaxation modes. Results on approximate null controllability of the stresses as well as the motion are established. We also show that exact null controllability is not possible. Nonlinear viscoelastic flows are not controllable. It then becomes a challenging and mostly unsolved problem how to characterize the states to which a flow can be controlled.

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## **Participants:**

Yuan Cai (Fudan University)  
Tuowei Chen (Fudan University)  
Xiufang Cui (Fudan University)  
Eduard Feireisl (Academy of Sciences of the Czech Republic)  
Zaihui Gan (Tianjin University)  
Daoyin He (Fudan University)  
Bobo Hua (Fudan University)  
Zhentao Jin (Fudan University)  
Zhen Lei (Fudan University)  
Fanghua Lin (Courant Institute)  
Guowei Liu (Shanghai Jiaotong University)  
Song Liu (Chinese Academy of Science)  
Yong Lu (Nankai University)  
Junren Luo (Fudan University)  
Xiang Luo (University of Science and Technology of China)  
Josef Malek (Charles University in Prague)  
Nader Masmoudi (New York University, Courant Institute)  
Yun Pu (Fudan University)  
Peng Qu (Fudan University)  
Michael Renardy (Virginia Tech)  
Jiajun Tong (Courant Institute)  
Chenmu Wang (Fudan University)  
Xiaoming Wang (Fudan University & Shanghai Center for Mathematical Sciences)  
Yanyan Wang (Fudan University)  
Yucong Wang (Xiamen University)  
Hao Wu (Fudan University)  
Sijue Wu (University of Michigan)  
Xiaochun Wu (Fudan University)  
Zhouping Xin (Chinese University of Hong Kong)  
Meng Yuan (Nanjing University)  
Lan Zhang (Wuhan University)  
Jing Zhang (Fudan University)  
Na Zhao (Fudan University)  
Wenjing Zhao (Northeastern University)  
Yi Zhou (Fudan University)