

Global COE Program

# Sixth International Conference on

# Flow Dynamics

November **4-6, 2009**

**Hotel Metropolitan Sendai, Sendai, Japan**

*Program*

## Preface

The people living in the 21st century are facing at big risks as global warming, shortage of food and energy, epidemic diseases, local starvation, poverty, and so on. In the mean time, we are always dreaming and making very best efforts for the progress of civilization by realizing higher quality of life and welfare. For those reasons, people are placing high expectations on the technology development in the frontier fields as state-of-the-art medical sciences, life sciences, IT, space technology, aviation technology, oceanology, and so forth.

"Flow Dynamics" is a comprehensive scientific field which deals with the flow and transport phenomena concerning to quantum wave, air, any fluid, any material, energy and information. Research on "Flow Dynamics" is expected to contribute to the society by challenging such crucial and unexplored tasks as above, and, by producing solutions for people's better life and dreams.

"The Sixth International Conference on Flow Dynamics", from 4<sup>th</sup> to 6<sup>th</sup> of November in Sendai, is now planned, aiming to explore new science horizon and cutting edge technologies of "Flow Dynamics", and to provide young researchers with unique opportunities of experience and self-development in this very attractive and competitive field of science and technology.

The Conference is comprised of a General Session and 11 Organized Sessions as follows:

### General Session

- Current Topics in Flow Dynamics; organized by N. Tomita, H. Yamashita and Z. Fuadi

### Organized Sessions

- Hybrid Rocket Propulsion and Related Fluid Dynamics; organized by T. Shimada and K. Sawada
- Functionality Design of the Contact Dynamics; organized by T. Takagi, T. Uchimoto and H. Miki
- Advanced Control of Smart Fluids and Fluid Flows; organized by M. Nakano and Y. Fukunishi
- Energy and Environmental Systems over Nano/Meso/Macro Scales; organized by A. Miyamoto and N. Hatakeyama
- Supersonic Technology Workshop (AFI/TFI-2009); organized by S. Obayashi
- IFS Collaborative Research Forum (AFI/TFI-2009) & IFS Research Exhibition (AFI/TFI-2009) organized by J. Ishimoto, S. Jeong.
- The Fifth International Students/Young Birds Seminar on Multi-scale Flow Dynamics; organized by Y. Saito and H. Takeda, and is supervised by K. Sato, J. Mizusaki and Y. Iga
- The 10<sup>th</sup> Japan-Korea Students' Symposium—Fast Ion Transport in Solids and Through Interfaces—The Related Materials and Phenomena; organized by E. Niwa and H.S. Kwon, and is supervised by J. Mizusaki and H. I. Yoo
- GCOE, IFS-Tsinghua University Joint Workshop 2009; organized by S. Maruyama, X. Liang and J. Ishimoto
- Liaison Office Session  
Topics: Possibility of International Joint Education for Higher Research; organized by T. Takagi and M. Ohta
- Alumni Session; organized by S. Maruyama

On behalf of the organizing committee of the Sixth International Conference on Flow Dynamics, I express my best wishes for your very enjoyable participation, successful exchanges of fruitful information and interactions among the participants from all over the world.

Dr. Shigenao Maruyama  
Distinguished Professor and Program Leader  
Tohoku University Global COE Program  
"World Center of Education and Research for Trans-disciplinary Flow Dynamics"

# Sixth International Conference on Flow Dynamics

## Organized and Sponsored by:

The Global COE Program, "World Center of Education and Research for Trans-disciplinary Flow Dynamics"

## In cooperation with:

- Aoba Foundation for the Promotion on Engineering
- Atomic Energy Agency of Japan  
Computational Science and Engineering Division
- Brain korea 21, materials education and research division and WCU (world class university)
- Combustion Society of Japan
- Cryogenic Association of Japan
- The Japan Society of Applied Electromagnetics and Mechanics

## SCOPE:

We, the people living in the 21st century are now facing at big risks as global warming, shortage of food and energy, epidemic diseases, local starvation, poverty, and so on. In the mean time, we are always dreaming and making very best efforts for the progress of civilization by realizing higher quality of life and welfare. For that reason, people are placing high expectations on the technology development in the frontier fields as state-of-the-art medical sciences, life sciences, IT, space technology, aviation technology, oceanology, and so forth.

"Flow Dynamics" is a comprehensive scientific field which deals with the flow and transport phenomena concerning to quantum wave, air, any fluid, any material, energy and information. "Flow Dynamics" is expected to contribute to the society by challenging such crucial and unexplored tasks as above, and producing solutions for people's better life and dreams.

"The Sixth International Conference on Flow Dynamics", from 4<sup>th</sup> to 6<sup>th</sup> of November in Sendai, is now planned, aiming to explore new science horizon and cutting edge technologies of "Flow Dynamics", and to provide young researchers with unique opportunities of experience and self-development in this very attractive and very competitive field of "Flow Dynamics".

We cordially invite you, the researchers and technologists, to participate in this conference.

## Organizing Committee Members:

Shigenao Maruyama (General Chair)	Hideyuki Aoki	Keisuke Asai
Yu Fukunishi	Hidetoshi Hashizume	Nozomu Hatakeyama
Yuka Iga	Jun Ishimoto	Takatoshi Ito
Tetsuya Kodama	Atsuki Komiya	Kaoru Maruta
Goro Masuya	Hiroyuki Miki	Hideo Miura
Takatoshi Miura	Akira Miyamoto	Junichiro Mizusaki
Kazuhiro Nakahashi	Masami Nakano	Hideya Nishiyama
Shigeru Obayashi	Taku Ohara	Katsuhide Ohira
Makoto Ohta	Seiji Samukawa	Mamiko Sasao
Kazuhisa Sato	Takehiko Sato	Keisuke Sawada
Toshiyuki Takagi	Yuriko Takeshima	Takashi Tokumasu
Michio Tokuyama	Shigeru Yonemura	Hiroo Yugami

## Executive Committee Members:

Junichiro Mizusaki (6th ICFD chair), Shigeru Obayashi (AFI/TFI chair), Toshiyuki Takagi (CEO)  
Toshiyuki Hayase (IFS Director)

## Conference Secretariat:

COE Building, Institute of Fluid Science, Tohoku University  
2-1-1, Katahira, Aoba, Sendai, 980-8577, Japan  
Phone&Fax: +81-22-217-5301 E-mail: icfd2009@gcoe.ifs.tohoku.ac.jp

## Administrative Staff

Zahrul Fuadi, Natsuko Hatakeyama, Naoko Hosoyachi, Hisanori Masuda, Tomomi Nagayoshi, Fumio Saito, Yuko Sasaki, Yuko Shimokawara, Ryoko Suzuki, Aki Taguchi, Masashi Takeyama, Noriko Tomita, Naoto Wada, Yukie Yamakawa, Hiroshi Yamashita

## Plenary Lectures



### **Rheology for Efficient Energy Production, Transportation, and Conservation**

Rongjia Tao (Temple University)  
(9:20-10:10, November 4, at Sendai East)



### **An Odyssey to Experimentally Verify the Onsager Reciprocity in Flow of Charged Particles in Solids**

Han-Il Yoo (Seoul National University)  
(10:15-11:05, November 4, at Sendai East)



### **Ultimate Nanofabrication Technology by Neutral Particle Beam**

Seiji Samukawa (Tohoku University)  
(11:10-12:00, November 4, at Sendai East)



## Sessions

### General Session

Current Topics in Flow Dynamics

Organizer: Noriko Tomita, Hiroshi Yamashita and Zahrul Fuadi

### Organized Session

Hybrid Rocket Propulsion and Related Fluid Dynamics

Organizer: Toru Shimada, Keisuke Sawada

Functionality Design of the Contact Dynamics

Organizer: Toshiyuki Takagi, Tetsuya Uchimoto and Hiroyuki Miki

Advanced Control of Smart Fluids and Fluid Flows

Organizer: Masami Nakano, Yu Fukunishi

Energy and Environmental Systems over Nano/Meso/Macro Scales

Organizer: Akira Miyamoto, Nozomu Hatakeyama

Supersonic Technology Workshop (AFI/TFI-2009)

Organizer: Shigeru Obayashi

IFS Collaborative Research Forum (AFI/TFI-2009) & IFS Research Exhibition (AFI/TFI-2009)

Organizer: Jun Ishimoto, Shinkyu Jeong

The Fifth International Students/Young Birds Seminar on Multi-scale Flow Dynamics

Organizer: Yasuhiro Saito, Hiroki Takeda

Supervisor: Kazuhisa Sato, Junichiro Mizusaki, Yuka Iga

The 10th Japan-Korea Students' Symposium

–Fast Ion Transport in Solids and Through Interfaces –The Related materials and Phenomena –

Organizer: Eiki Niwa, Hyung-Soon Kwon

Supervisor: Junichiro Mizusaki, Han-Il Yoo

GCOE, IFS-Tsinghua University Joint Workshop 2009

Organizer: Shigenao Maruyama, X. Liang, Jun Ishimoto

Liaison Office Session

Topic: Possibility of International Joint Education for higher research

Organizer: Toshiyuki Takagi, Makoto Ohta

Alumni Session

Organizer: Shigenao Maruyama

## General Information

### Registration:

8:00 - , Wednesday, November 4

The conference registration desk is located in the lobby, 4<sup>th</sup> floor in the morning. It will be moved to 3<sup>rd</sup> floor in the afternoon.

7:30 - , Thursday, November 5

The conference registration desk is located in the lobby, 3<sup>rd</sup> floor.

8:00 - , Friday, November 6

The conference registration desk is located in the lobby, 3<sup>rd</sup> floor.

### Opening: (at SENDAI (EAST))

9:00 - , Wednesday, November 4

### Students/Young Birds Friendship Night: (at SAKURA Hall, Tohoku University)

18:00 – 20:00, Wednesday, November 4

All students and young researchers can attend to Students/Young Birds Friendship Night.

### Banquet: (at SENDAI (SOUTH WEST))

19:00 – 21:00, Thursday, November 5

### Internet access corner

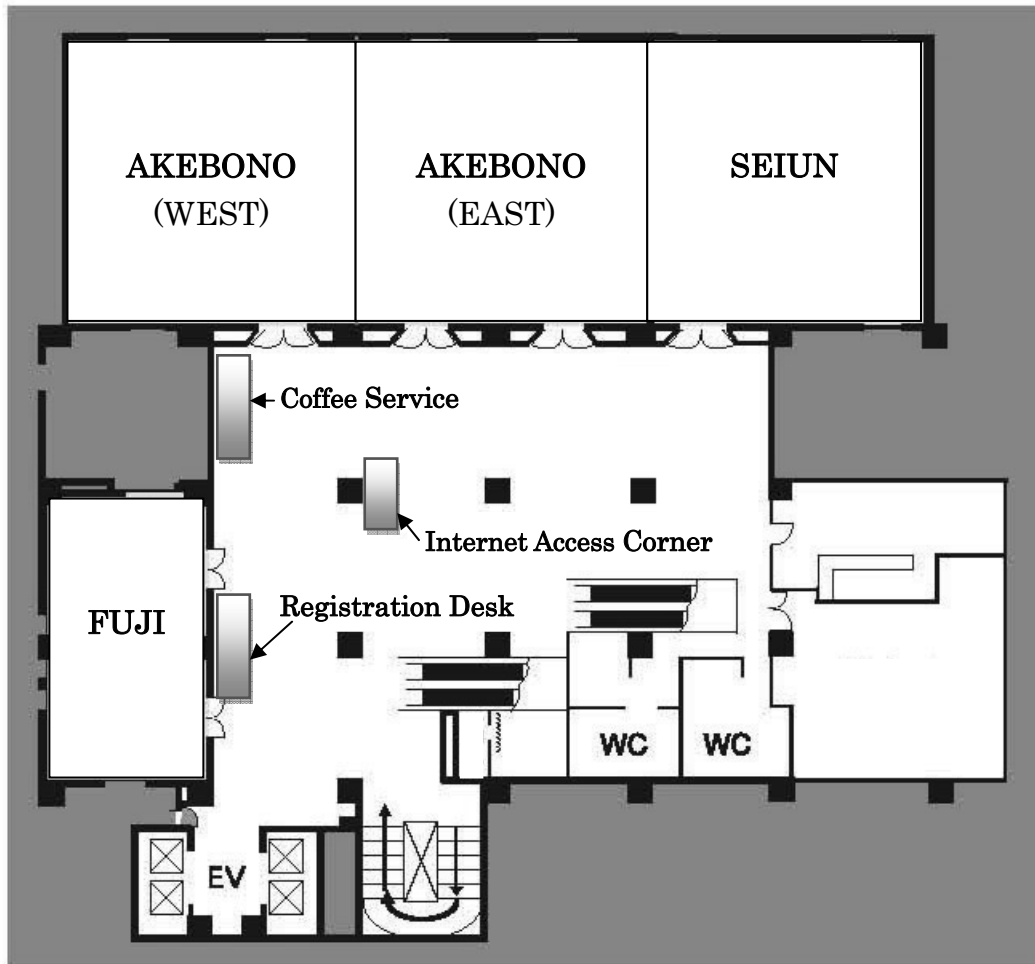
All conference attendees may use internet for free. Free Ethernet access will be possible during the conference at 3<sup>rd</sup> floor. Standard wired hubs (with RJ45 sockets) will be provided for networking.

### Coffee service:

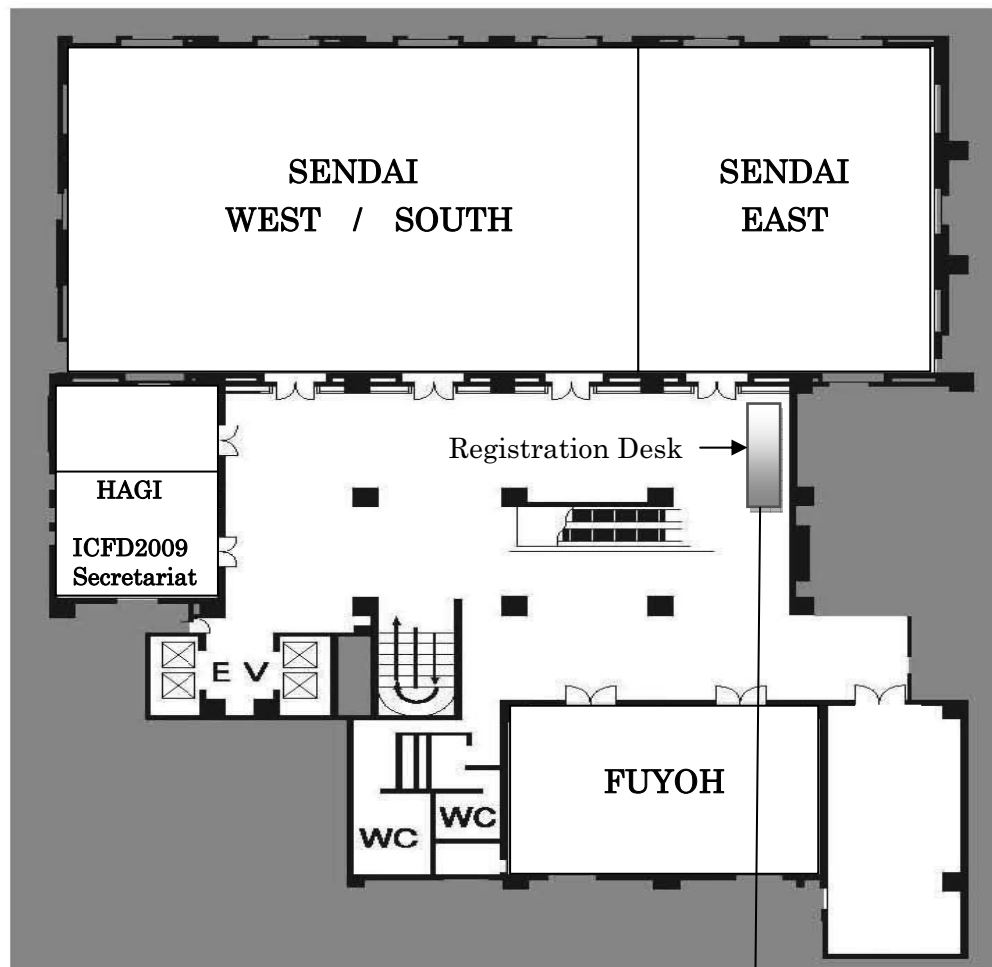
Coffee is served in the lobby, 3<sup>rd</sup> floor.

### ICFD2009 Secretariat: (at Hagi, 4<sup>th</sup> floor)

# 3<sup>rd</sup> floor (AKEBONO, SEIUN, FUJI)



## 4<sup>th</sup> floor (SENDAI, FUYOH, HAGI)



The conference registration desk is located in the lobby, on 4<sup>th</sup> floor in the morning of November 4. Then, it will be moved to 3<sup>rd</sup> floor in the afternoon onwards.



# 6th ICFD (2009) Time Table

Wednesday, November 4, 2009

OS	Opening Address Plenary Lectures	Hybrid Rocket Propulsion and Related Fluid Dynamics	Energy and Environmental Systems over Nano/Meso/Macro Scales	Supersonic Technology Workshop (AFI/TFI-2009)
ROOM	SENDAI (EAST)	FUJI	FUYOH	AKEBONO (EAST)
8:00				
9:00	9:00-9:20 <b>Opening Address @SENDAI (EAST)</b>			
10:00	9:20-10:10 <b>Plenary Lecture @SENDAI (EAST)</b> "Rheology for Efficient Energy Production, Transportation, and Conservation" Rongjia Tao (Temple University, USA)			
	BREAK			
11:00	10:15-11:05 <b>Plenary Lecture @SENDAI (EAST)</b> "An Odyssey to Experimentally Verify the Onsager Reciprocity in Flow of Charged Particles in Solids" Han-Il Yoo (Seoul National University, KOREA)			
	BREAK			
12:00	11:10-12:00 <b>Plenary Lecture @SENDAI (EAST)</b> "Ultimate Nanofabrication Technology by Neutral Particle Beam" Seiji Samukawa (Tohoku University, JAPAN)			
13:00		13:00-13:40 2-1 Keynote Lectures Daniele Barbagallo (Invited)		13:00-13:40 SST-1 Mikhail S. Ivanov (Invited)
14:00		13:40-14:20 2-2 Keynote Lectures Fulvio Stella (Invited)		13:45-14:05 SST-2 Shunsuke Shimizu 14:05-14:25 SST-3 Kazuaki Hatanaka
		BREAK		BREAK
15:00		14:30-14:50 2-3 Harunori Nagata 14:50-15:10 2-4 Ichiro Nakagawa 15:10-15:30 2-5 Seungwon Ha		14:45-15:30 SST-4 Domenico Quagliarella (Invited)
		15:30-15:50 2-6 Masami Tomita	15:30-15:45 5-1 Seigo Sakai (Invited)	15:30-15:50 SST-5 Yusuke Naka
16:00		BREAK	15:45-16:00 5-2 Sudarshan Kumar (Invited)	15:50-16:10 SST-6 Takeharu Sakai (Invited)
		16:00-16:20 2-7 Rajesh K. Sharma 16:20-16:40 2-8 Fulvio Stella (Invited)	16:00-16:15 5-3 Wenguang Zhang (Invited) 16:15-16:30 5-4 Jafar Ali 16:30-16:45 5-5 Yuko Amo	16:10-16:30 SST-7 Hiroshi Yamashita
17:00		16:40-17:00 2-9 Nobuyuki Tsuboi	BREAK	BREAK
		17:00-17:20 2-10 Keiichi Ishiko	17:00-17:15 5-6 Sergey Minaev	16:50-17:10 SST-8 Chae-hyoung Kim
		BREAK	17:15-17:30 5-7 Roman Fursenko	17:10-17:30 SST-9 Takashi Matsuno
		17:30-17:50 2-11 Kazuki Yoshimura	17:30-17:45 5-8 Nikolay A. Lutsenko	17:30-17:50 SST-10 Atsushi Matsuda (Invited)
18:00		17:50-18:10 2-12 Mikiro Motoe 18:10-18:30 2-13 Yuki Funami	17:45-18:00 5-9 Nikolay A. Lutsenko	17:50-18:10 SST-11 Atsushi Matsuda (Invited) 18:10-18:30 SST-12 Atsushi Tovoda
19:00				
20:00				

The Fifth International Students/Young Birds Seminar on Multi-scale Flow Dynamics	The 10th Japan-Korea Students' Symposium -Fast Ion Transport in Solids and Through Interfaces - The Related Materials and Phenomena -	Current Topics in Flow Dynamics	Students /Young Birds Friendship Night	OS
AKEBONO (WEST)	SEIUN	FUYOH	SAKURA HALL(Katahira, Tohoku Univ.)	ROOM
				8:00
9:00-9:20 <b>Opening Address @SENDAI (EAST)</b>				9:00
9:20-10:10 <b>Plenary Lecture @SENDAI (EAST)</b> "Rheology for Efficient Energy Production, Transportation, and Conservation" Rongjia Tao (Temple University, USA)				10:00
BREAK				
10:15-11:05 <b>Plenary Lecture @SENDAI (EAST)</b> "An Odyssey to Experimentally Verify the Onsager Reciprocity in Flow of Charged Particles in Solids" Han-Il Yoo (Seoul National University, KOREA)				11:00
BREAK				
11:10-12:00 <b>Plenary Lecture @SENDAI (EAST)</b> "Ultimate Nanofabrication Technology by Neutral Particle Beam" Seiji Samukawa (Tohoku University, JAPAN)				12:00
				13:00
13:00-13:05 Opening	13:00-13:20 10-1	13:00-13:20 11-1		
13:05-13:41 9-1 - 9-9	N. -J. Heo	Wu-Shung Fu (Invited)		
Session1 -Award Session-	13:20-13:40 10-2	13:20-13:40 11-2		
Short Oral Presentation	H. -S. Kwon	Koutaro Tsubaki (Invited)		
13:41-14:20 9-1 - 9-9	13:40-14:00 10-3	13:40-14:00 11-3		
Poster Presentation	E. Niwa	Gota Kikugawa		14:00
	14:00-14:20 10-4	14:00-14:20 11-4		
	H. Jang	Jongsoo Ha		
BREAK	BREAK	14:20-14:40 11-5		
	14:30-14:50 10-5	Jinhao Qiu (Invited)		
	S. Nakayama	14:40-15:00 11-6		
	14:50-15:10 10-6	Gabor Vértessy (Invited)		15:00
15:00-15:36 9-10 - 9-18	Y. Kim			
Session2 -Award Session-	15:10-15:30 10-7			
Short Oral Presentation	S. Yuyama			
15:36-16:16 9-10 - 9-18	15:30-15:50 10-8			
Poster Presentation	Mohd. Ashrol Bin Haji Ini			
	BREAK			
	16:00-16:20 10-9			16:00
	H. Watanabe			
	16:20-16:40 10-10			
	Y. Chen			
	16:40-17:00 10-11			
	S. Osugi			17:00
	17:00-17:20 10-12			
	L. Nakano			
	BREAK			
	17:30-17:50 10-13			
	C. -H. Kim			
	17:50-18:10 10-14			
	S. Nakagawa		18:00-20:00	18:00
	18:10-18:30 10-15		Students / Young Birds	
	S. Nam		Friendship Night	
	18:30-18:50 10-16		@SAKURA HALL, Katahira, Tohoku	
	A. Suzuki		University	19:00
				20:00

**Thursday, November 5, 2009**

OS	Functionality Design of the Contact Dynamics	Advanced Control of Smart Fluids and Fluid Flows	IFS Collaborative Research Forum (AFI/TFI-2009) & IFS Research Exhibition (AFI/TFI-2009)	The Fifth International Students/Young Birds Seminar on Multi-scale Flow Dynamics
ROOM	FUJI	FUJI	AKEBONO (EAST)	FUYOH
8:00				
			8:30-9:30 CRF-1 - CRF-16 <i>Short Oral Presentation</i>	
9:00	9:00-9:35 3-1 Keynote Lecture Staffan Jacobson (Invited)			9:00-9:36 9-19 - 9-27 Session3 <i>Short Oral Presentation</i>
	9:35-10:00 3-2 Boyko Stoimenov (Invited)		BREAK	
10:00	10:00-10:15 3-3 Zahrul Fuadi		9:40-11:00 CRF-17 - CRF-37 <i>Short Oral Presentation</i>	9:36-10:16 9-19 - 9-27 <i>Poster Presentation</i>
	BREAK			BREAK
	10:25-10:50 3-4 Julien Fontaine (Invited)			10:30-11:06 9-28 - 9-36 Session4 <i>Short Oral Presentation</i>
11:00	10:50-11:15 3-5 Koji Matsumoto (Invited)		BREAK	
	11:15-11:40 3-6 Minoru Goto (Invited)		11:10-12:00 CRF-38 - CRF-42 REX-1 - REX-9 <i>Short Oral Presentation</i>	11:06-11:46 9-28 - 9-36 <i>Poster Presentation</i>
	BREAK			
12:00	11:50-12:15 3-7 Sung-Jin Song (Invited)		BREAK	
	12:15-12:30 3-8 Hiroyuki Miki		12:20-14:30 CRF-1 - CRF-42 REX-1 - REX-9 <i>Poster Session</i>	
13:00		13:00-13:05 Opening Address Masami Nakano		13:00-13:40 9-37 - 9-46 Session5 <i>Short Oral Presentation</i>
		13:05-13:45 4-1 Keynote Lecture Seung-Bok Choi (Invited)		
14:00		13:45-14:15 4-2 Miklós Zrinyi (Invited)		13:40-14:20 9-37 - 9-46 <i>Poster Presentation</i>
		14:15-14:35 4-3 Takahiro Murakami		
		14:35-14:55 4-4 Hiroshi Kobayashi		BREAK
15:00		14:55-15:15 4-5 Xiao-Dong Niu		15:00-15:40 9-47 - 9-56 Session6 <i>Short Oral Presentation</i>
		15:20-15:50 4-6 Hitoshi Ishikawa (Invited)		
16:00		15:50-16:20 4-7 Hiroshi Higuchi (Invited)		15:40-16:20 9-47 - 9-56 <i>Poster Presentation</i>
		16:20-16:40 4-8 Tameo Nakanishi		
		16:40-17:00 4-9 Mikael A. Langthjem		
17:00	<b>Liaison Office Session @ SENDAI (EAST)</b>			
18:00	17:00-17:20 State and Plan of International Education in Tohoku University Goro Masuya (Tohoku University)			
	17:20-19:00 Part1: Panel Discussion  Part2: Questions and Discussion			
19:00				
20:00	19:00-21:00 <b>Banquet @SENDAI (SOUTH WEST)</b>			
21:00				

The 10th Japan-Korea Students' Symposium -Fast Ion Transport in Solids and Through Interfaces - The Related Materials and Phenomena -	Current Topics in Flow Dynamics	GCOE, IFS-Tsinghua University Joint Workshop 2009	Liaison Office Session	OS
SEIUN	AKEBONO (WEST)	AKEBONO (WEST)	SENDAI (EAST)	ROOM
8:10-8:30 10-17 S. Jung		8:00-8:24 12-1 Xingang Liang (Invited)		
8:30-8:50 10-18 T. Lee		8:24-8:48 12-2 Li Luming (Invited)		
8:50-9:10 10-19 J. I. Yeon		8:48-9:12 12-3 Guo Yincheng (Invited)		9:00
BREAK		9:12-9:36 12-4 Xu Xianghua (Invited)		
9:30-9:50 10-20 Y. Mori		9:36-10:00 12-5 Ke-Qin Zhu (Invited)		
9:50-10:10 10-21 M. S. Lee		10:00-10:24 12-6 Zhang Huiqiang (Invited)		10:00
10:10-10:30 10-22 T. H. Kwon				
BREAK		10:30-10:43 12-7 Yuji Hattori		
10:40-11:00 10-23 Y. Park		10:43-10:56 12-8 Weiming Song		
11:00-11:20 10-24 Y. Oh		10:56-11:09 12-9 Hideaki Kobayashi		11:00
11:20-11:40 10-25 W. S. Chang		11:09-11:22 12-10 Hisashi Nakamura		
11:40-12:00 10-26 Y. Hwa		11:22-11:35 12-11 Quan-Wen Hou		
		11:35-11:48 12-12 Taku Ohara		12:00
		11:48-12:01 12-13 Takashi Tokumasu		
13:00-13:20 10-27 H. I. Ji		13:00-13:24 12-14 Bing Wang (Invited)		13:00
13:20-13:40 10-28 K. Nagao		13:24-13:37 12-15 Shigeru Yonemura		
13:40-14:00 10-29 Y. Gova		13:37-13:50 12-16 Jing-Bo Huang		
14:00-14:20 10-30 M. Y. Oh		13:50-14:03 12-17 Genki Yamamoto		14:00
14:20-14:40 10-31 T. Izumi		BREAK		
14:40-15:00 10-32 D. R. Jung		14:08-14:21 12-18 Atsuki Komiya		
15:00-15:20 10-33 Y. Nagara	15:00-15:20 11-7 Andrew J. Meade (Invited)	14:21-14:34 12-19 Xue-Wei Sun		
15:20-15:40 10-34 K. R. Lee	15:20-15:40 11-8 Viren Menezes	14:34-14:47 12-20 Kazuo Matsuura		
BREAK	15:40-16:00 11-9 Lucia Parussini (Invited)	14:47-15:00 12-21 Jun Ishimoto		15:00
16:00-16:20 10-35 Y. Takeyama	16:00-16:20 11-10 Chih-Yung Huang (Invited)			
16:20-16:40 10-36 H. Ito	16:20-16:40 11-11 Thilanka Munasinghe			
16:40-17:00 10-37 T. Kushi	16:40-17:00 11-12 James W. Gregory (Invited)			17:00
<b>Liaison Office Session @ SENDAI (EAST)</b>				
17:00-17:20 State and Plan of International Education in Tohoku University Goro Masuya (Tohoku University)				18:00
17:20-19:00 Part1: Panel Discussion  Part2: Questions and Discussion				19:00
19:00-21:00 <b>Banquet @SENDAI (SOUTH WEST)</b>				20:00
				21:00

Friday, November 6, 2009

OS	Advanced Control of Smart Fluids and Fluid Flows		The Fifth International Students / Young Birds Seminar on Multi-scale Flow Dynamics	The 10th Japan-Korea Students' Symposium -Fast Ion Transport in Solids and Through Interfaces - The Related Materials and Phenomena -	Alumni Session	OS
ROOM	FUJI	FUYOH	FUYOH	SEIUN	AKEBONO (WEST)	ROOM
8:00						8:00
9:00	9:00-9:30 4-10 Deivandren Sivakumar (Invited)		9:00-9:40 9-57 - 9-66 Session7 Short Oral Presentation	9:00-9:20 10-38 Y. Fukuda	9:00-9:05 Opening Address	9:00
	9:30-10:00 4-11 Katsufumi Tanaka (Invited)		9:40-10:20 9-57 - 9-66 Poster Presentation	9:20-9:40 10-39 M. -B. Choi	9:05-10:45 Session1-1 Introduction of Institution and Research (14-1 - 14-15)	
10:00	10:00-10:20 4-12 Sanjeev Sharma		BREAK	9:40-10:00 10-40 M. Nagai		10:00
	10:25-10:55 4-13 Hyung Jin Sung (Invited)		10:30-11:10 9-67 - 9-76 Session8 Short Oral Presentation	10:00-10:20 10-41 S. -Y. Jeon		
11:00	10:55-11:25 4-14 Fredrik Lundell (Invited)		11:10-11:50 9-67 - 9-76 Poster Presentation	10:20-10:40 10-42 M. Shimizu	10:45-12:00 Session1-2 Poster Presentation (14-1 - 14-15)	11:00
	11:25-11:45 4-15 Yusuke Tokura			BREAK		
	11:45-12:05 4-16 Yusuke Suzuki			11:00-11:20 10-43 E. -C. Shin		
12:00				11:20-11:40 10-44 D. Kim		12:00
				11:40-12:00 10-45 Y. Iwai		
13:00		13:00-13:45 4-17 - 4-25 Short Oral Presentation		13:00-13:20 10-46 J. Chun	13:00-13:54 Session2-1 Introduction of Institution and Research (14-16 - 14-24)	13:00
				13:20-13:40 10-47 H. Takahashi		
14:00		13:50-14:40 4-26 - 4-35 Short Oral Presentation		13:40-14:00 10-48 T. Nakamura	13:54-15:00 Session2-2 Poster Presentation (14-16 - 14-24)	14:00
				14:00-14:20 10-49 H. -S. Kim		
				14:20-14:25 Closing Remark		
15:00		BREAK 14:50-15:50 4-17 - 4-35 Poster Presentation			15:00-16:00 Alumni Reunion Session	15:00
16:00						16:00
17:00						17:00
18:00						18:00
19:00						19:00
20:00						20:00
21:00						21:00

# Sixth International Conference on Flow Dynamics

## Program

### Plenary Lectures

#### SENDAI (EAST)

November 4, 2009

9:20-10:10	<b>Rheology for Efficient Energy Production, Transportation, and Conservation</b> <u>Rongjia Tao</u> (Temple University, USA)	56
10:15-11:05	<b>An Odyssey to Experimentally Verify the Onsager Reciprocity in Flow of Charged Particles in Solids</b> <u>Han-Il Yoo</u> and Woo-Seok Park (Seoul National University, Korea)	58
11:10-12:00	<b>Ultimate Nanofabrication Technology by Neutral Particle Beam</b> <u>Seiji Samukawa</u> (Tohoku University, Japan)	60

## Hybrid Rocket Propulsion and Related Fluid Dynamics

### FUJI

November 4, 2009

#### **Keynote Lectures**

Chair: Toru Shimada (Japan Aerospace Exploration Agency, Japan)

- 2-1                    **Development of Throtttable Hybrid Rockets (*Invited*)**                    66  
13:00-13:40        Daniele Barbagallo (Italian Space Agency, Italy), Nicola Ierardo (AVIO SpA, Italy), E. D'Aversa and A. De Lillis (Italian Space Agency, Italy)
- 2-2                    **Roll Torque Prediction in SRM; a Numerical Approach (*Invited*)**                    68  
13:40-14:20        Fulvio Stella, M. Giangi (University of Rome "La Sapienza", Italy), Daniele Barbagallo and A. Scaccia (Italian Space Agency, Italy)

#### **Regression Rate and Ablation**

Chair: Keisuke Sawada (Tohoku University, Japan)

- 2-3                    **Effect of Local O/F on Regression Rate of Solid Fuels in CAMUI Hybrid Rocket Motor**                    70  
14:30-14:50        Harunori Nagata, Kenta Uejima, Shunsuke Hagiwara, Masashi Wakita, Tsuyoshi Totani (Hokkaido University, Japan), and Tsutomu Uematsu (Camuispaceworks Co., Ltd., Japan)
- 2-4                    **Study on the Regression Rate of Some Hybrid Rocket Fuels**                    72  
14:50-15:10        Ichiro Nakagawa and Satoshi Hikone (Tokai University, Japan)
- 2-5                    **Application of Temperature-Sensitive Paint to Heat Flux Measurement in High Temperature Gas Flow**                    74  
15:10-15:30        Seungwon Ha, Ryosuke Sawamura, Hiroaki Sakamoto, Daiju Numata, Hiroki Nagai, and Keisuke Asai (Tohoku University, Japan)
- 2-6                    **Charring Behavior within Thermal Protection Material**                    76  
15:30-15:50        Masami Tomita, Mitsunobu Kuribayashi (Nagoya University, Japan), Toshiyuki Suzuki, Kazuhisa Fujita (Japan Aerospace Exploration Agency, Japan), Kazutaka Kitagawa (Aichi Institute of Technology, Japan), Kenichi Hirai (IHI Aerospace, Co., Ltd., Japan) and Takeharu Sakai (Nagoya University, Japan)

15:50-16:00        BREAK

#### **Simulation I**

Chair: Harunori Nagata (Hokkaido University, Japan)

- 2-7                    **Element Free Galerkin Modeling of Unsteady Convection Flow and Heat Transfer Past a Semi-Infinite Vertical Porous Moving Plate with Viscous Heating**                    78  
16:00-16:20        Rajesh K. Sharma, R. Bhargava and I. V. Singh (IIT-Roorkee, India)
- 2-8                    **Numerical Study of VEGA Third Stage Re-Entry Phase (*Invited*)**                    80  
16:20-16:40        Fulvio Stella, M. Giangi (University of Rome "La Sapienza", Italy), Daniele Barbagallo and A. Scaccia (ESA-ESRIN Frascati, Italy)



2-9 16:40-17:00	<b>Numerical Simulation on Unsteady Compressible Low-Speed Flow Using Preconditioning Method: <math>Re</math> Effects on Drag for 2D Cylinder</b> <u>Nobuyuki Tsuboi</u> (Kyushu Institute of Technology, Japan), Katsuyoshi Fukiba (Muroran Institute of Technology, Japan) and Toru Shimada (Japan Aerospace Exploration Agency, Japan)	82
2-10 17:00-17:20	<b>A Numerical Simulation Using Hyperbolic Tangent Approximation Model for Diffusion Combustion in a Laminar Boundary Layer on a Flat Plate</b> <u>Keiichi Ishiko</u> , Vaily Novozhilov, and Toru Shimada (Japan Aerospace Exploration Agency, Japan)	84
17:20-17:30	BREAK	
<b>Simulation II</b>		
Chair: Ichiro Nakagawa (Tokai University, Japan)		
2-11 17:30-17:50	<b>Higher-Order Accurate Numerical Simulation of Swirling Flowfield in Combustion Chamber for Hybrid Rocket Engine</b> <u>Kazuki Yoshimura</u> and Keisuke Sawada (Tohoku University, Japan)	86
2-12 17:50-18:10	<b>Reynolds Averaged Numerical Simulation for Swirling-Oxidizer-Type Hybrid Rocket Engine</b> <u>Mikiro Motoe</u> (Tokai University, Japan), Toru Shimada (Japan Aerospace Exploration Agency, Japan), Saburo Yuasa (Tokyo Metropolitan University, Japan) and Katumi Hiraoka (Tokai University, Japan)	88
2-13 18:10-18:30	<b>Quasi-1D Simulation of Hybrid Rocket Flow with a Fast Chemistry Nonpremixed Flame Model</b> <u>Yuki Funami</u> (The University of Tokyo, Japan), Vasily Novozhilov and Toru Shimada (Japan Aerospace Exploration Agency, Japan)	90

## Functionality Design of the Contact Dynamics

### **FUJI**

November 5, 2009

Chair: Julien Fontaine (Ecole Centrale de Lyon, France)

- |                    |   |    |
|--------------------|---|----|
| 3-1<br>9:00-9:35   | <b><i>Keynote Lecture</i></b><br><b>On the Vital Importance of Dynamics and Modifications in Tribological Surfaces – Illustrating Examples from Practical Applications (<i>Invited</i>)</b><br><u>Staffan Jacobson</u> and Sture Hogmark (Uppsala University, Sweden) | 94 |
| 3-2<br>9:35-10:00  | <b>Dynamic Aspects of the Contact of Rough Surfaces (<i>Invited</i>)</b><br><u>Boyko Stoimenov</u> (Ecole Centrale de Lyon, France), Koshi Adachi (Tohoku University, Japan) and K. Kato (Nihon University, Japan)  | 96 |
| 3-3<br>10:00-10:15 | <b>Effect of Surface Texture on Frictional Sound</b><br><u>Zahrul Fuadi</u> , Toshiyuki TAKAGI, Koshi ADACHI and Hiroyuki MIKI (Tohoku University, Japan)   | 98 |

10:15-10:25      BREAK

Chair: Staffan Jacobson (Uppsala University, Sweden)

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|--------------------|---|-----|
| 3-4<br>10:25-10:50 | <b>Tribological Properties of Nanocomposite Metal-Containing DLC Coatings: the Key-Role of Metal Flow Between Sliding Surfaces (<i>Invited</i>)</b><br><u>Julien Fontaine</u> , M. Ruet, S. Bec, C. Guerret-Piécourt, M. Belin (Ecole Centrale de Lyon, France), H. Miki, T. Takeno (Tohoku University, Japan) and K. Ito (Nihon University, Japan) | 100 |
| 3-5<br>10:50-11:15 | <b>DLC Film for Space Application - Improvement of Tribological Properties by Metal Doping - (<i>Invited</i>)</b><br><u>Koji Matsumoto</u> (Japan Aerospace Exploration Agency, Japan), Takanori Takeno and Hiroyuki Miki (Tohoku University, Japan)  | 102 |
| 3-6<br>11:15-11:40 | <b>Critical Thickness of Polycrystalline Ag Layers Yielding Friction Reduction due to Tribo-assisted Reorientation (<i>Invited</i>)</b><br><u>Minoru Goto</u> (Ube National College of Technology, Japan) and Koichi Akimoto (Nagoya University, Japan)   | 104 |

11:40-11:50      BREAK

Chair: Koji Matsumoto (Japan Aerospace Exploration Agency, Japan)

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|--------------------|--|-----|
| 3-7<br>11:50-12:15 | <b>Ultrasonic Nondestructive Evaluation of CVD Diamond Coating with Various Deposition Condition (<i>Invited</i>)</b><br>Dong-Yeol Kim, <u>Hak-Joon Kim</u> , Sung-Jin Song (Sungkyunkwan University, Korea), Sung Duk Kwon (Andong National University, Korea), Toshiyuki Takagi, Tetsuya Uchimoto and Hiroyuki Miki (Tohoku University, Japan) | 106 |
| 3-8<br>12:15-12:30 | <b>Tribological Behavior of Partly Polished CVD Diamond Films Against Stainless Steel in Humid Environment</b><br><u>Hiroyuki Miki</u> , Kotaro Bando, Takanori Takeno, Toshiyuki Takagi and Takeshi Sato (Tohoku University, Japan)   | 108 |

## Advanced Control of Smart Fluids and Fluid Flows

### FUJI

November 5, 2009

13:00-13:05	<b>Opening Address</b> Masami Nakano (Tohoku University, Japan)	
Chair: Masami Nakano (Tohoku University, Japan)		
4-1 13:05-13:45	<b>Keynote Lecture</b> <b>Control Applications of Smart Electrorheological and Magnetorheological Fluids (<i>Invited</i>)</b> <u>Seung-Bok Choi</u> and Young-Min Han (Inha University, Korea)	112
4-2 13:45-14:15	<b>Development of Micro-motor for MEMS utilizing Novel Smart Polymers (<i>Invited</i>)</b> <u>Miklós ZRÍNYI</u> (Semmelweis University, Hungary), Masami NAKANO and Tepei TSUJITA (Tohoku University, Japan)	114
4-3 14:15-14:35	<b>Experimental and Analytical Evaluation of Passive Type MR Damper</b> <u>Takahiro Murakami</u> , Michiya Sakai (CRIEPI, Japan) and Masami Nakano (Tohoku University, Japan)	116
4-4 14:35-14:55	<b>Development of Passive Force Display and Rehabilitation System for Upper Limbs Using Redundant Number of ER Fluid Brakes</b> <u>Hiroshi Kobayashi</u> , Junji Furusho and Makoto Haraguchi (Osaka University, Japan)	118
4-5 14:55-15:15	<b>Characteristic Evaluation of a MHD Power Generator Using Low-Melting-Point Gallium Alloy</b> <u>Xiao-Dong Niu</u> and Hiroshi Yamaguchi (Doshisha University, Japan)	120
15:15-15:20	BREAK	
Chair: Masaya Shigeta (Tohoku University, Japan)		
4-6 15:20-15:50	<b>Flow Control by Sway Motion of Pliant Rectangular Plate (<i>Invited</i>)</b> Toshihiro Abe, Kazumichi Okajima, Takatoshi Hamada, Shunsuke Yamada and <u>Hitoshi Ishikawa</u> (Tokyo University of Science, Japan)	122
4-7 15:50-16:20	<b>Disk Wake: From Open-Loop To Closed-Loop Controls (<i>Invited</i>)</b> <u>Hiroshi Higuchi</u> , Makan Fardad, Mark N. Glauser, Rory Bigger, Zacharay Berger and Aaron J. Orbaker (Syracuse University, USA)	124
4-8 16:20-16:40	<b>Experimental and Numerical Investigations of Droplet Patterns from a Continuous Ink Jet</b> <u>Tameo NAKANISHI</u> (Yamagata University, Japan), Masami NAKANO (Tohoku University, Japan) and Masafumi YOKOYAMA (Yamagata University, Japan)	126

4-9  
16:40-17:00      **Numerical Study on Sound Generation from the Three-Dimensional Hole-Tone Jet Subjected to Non-Axisymmetric Flow Perturbations**      128  
Mikael A. Langthjem (Yamagata University, Japan) and Masami Nakano (Tohoku University, Japan)

## **FUJI**

November 6, 2009

Chair: Hidemasa Takana (Tohoku University, Japan)

4-10  
9:00-9:30      **Impact of Low Weber Number Molten Tin Droplets on Solid Surfaces Comprising Microgrooves**      130  
*(Invited)*  
Deivandren Sivakumar (Indian Institute of Science, India), Kazunari Katagiri, Tomoki Nakajima, Hidemasa Takana, and Hideya Nishiyama (Tohoku University, Japan)

4-11  
9:30-10:00      **Flow Behavior and Microstructure of Electro-Rheological Nano-Suspensions before and after Yielding**      132  
*(Invited)*  
Katsufumi Tanaka, Ryuichi Akiyama (Kyoto Institute of Technology, Japan) and Masami Nakano (Tohoku University, Japan)

4-12  
10:00-10:20      **Numerical Solution of Magneto-micropolar Fluid Past a Continuously Moving Plate with Varying Surface Conditions**      134  
Lokendra Kumar and Sanjeev Sharma (Jaypee Institute of Information Technology University, India)

10:20-10:25      BREAK

Chair: Yu Fukunishi (Tohoku University, Japan)

4-13  
10:25-10:55      **Effects of Inflow Pulsation on a Turbulent Coaxial Jet**      136  
*(Invited)*  
Seong Jae Jang and Hyung Jin Sung (Korea Advanced Institute of Science and Technology, Korea)

4-14  
10:55-11:25      **Experimental and Numerical Flow Control of Bypass Transition**      138  
*(Invited)*  
Fredrik Lundell, Antonios Monokrousos and Luca Brandt (KTH Royal Institute of Technology, Sweden)

4-15  
11:25-11:45      **Effect of Wall Temperature Condition on the Evolution of a Supersonic Turbulent Boundary Layer**      140  
Yusuke Tokura, Hiroshi Maekawa, Daisuke Watanabe and Youichi Ogata (Hiroshima University, Japan)

4-16  
11:45-12:05      **Influence of a DBD Plasma Actuator on Aerodynamic Characteristics and Flow Field of Wings**      142  
Yusuke SUZUKI, Yuta YANASE, Oho KIDA, Tomohisa OHTAKE, Akinori MURAMATSU and Tatsuo MOTOHASHI (Nihon University, Japan)

## **FUYOH**

November 6, 2009

Chair: Kazuo Matsuura (Tohoku University, Japan)

- 13:00-13:45      **Short Oral Presentation**  
(4 min for Short Oral Presentation)
- 4-17              **Multiparametric Problems of Boundary Control for Boussinesq Model of Heat Convection**      144  
Gennady V. Alekseev and Dmitry A. Tereshko (IAM FEB RAS, Russia)
- 4-18              **Experimental Evaluation of a CFD-based Flow Observer Applied to the Case of a Turbulent Jet in a Co-flowing Stream**      146  
Gabriele Bellani (KTH Royal Institute of Technology, Sweden), Kentaro Imagawa (Tohoku University, Japan), Hiroshi Higuchi (Syracuse University, USA), Fredrik Lundell (KTH Royal Institute of Technology, Sweden) and Toshiyuki Hayase (Tohoku University, Japan)
- 4-19              **Turbulence Transition in Two-Dimensional Boundary Layer Flow: Linear Instability**      148  
Jim C Chen and Chen Weijia (Nanyang Technological University, Singapore)
- 4-20              **Thermal Effect on Recirculation Region of Supercritical CO<sub>2</sub> Sudden Expansion Flow at Low Reynolds Numbers**      150  
Bili Deng and Xin-Rong Zhang (Peking University, China)
- 4-21              **Cancelation of Instability Waves in a Flat-Plate Boundary Layer by Feedforward Control**      152  
Hajime Okawa, Michiharu Watanabe, Masaya Shigeta, Seiichiro Izawa and Yu Fukunishi (Tohoku University, Japan)
- 4-22              **PIV and PLIF Measurement of Regular and Fractal Grid Turbulence with Scalar Transfer**      154  
Hiroki Suzuki, Kouji Nagata, Yasuhiko Sakai and Ryota Ukai (Nagoya University, Japan)
- 4-23              **Integrated Parametric Study of Hybrid-Stabilized Argon-Water Arc under Subsonic and Supersonic Regimes (*Invited*)**      156  
Jiri Jeništa (Institute of Plasma Physics AS CR, Czech Republic), Hidemasa Takana, Hideya Nishiyama (Tohoku University, Japan), Milada Bartlová, Vladimír Aubrecht (Brno University of Technology, Czech Republic), Petr Křenek, Milan Hrabovský, Tetyana Kavka, Viktor Sember and Alan Mašláni (Institute of Plasma Physics AS CR, Czech Republic)
- 4-24              **Analyses of Deformation and Damage of Erythrocytes in Shear Flow**      158  
Tetsuya Yano, Norio Takahashi, Seiichi Sudo (Akita Prefectural University, Japan), and Yoshinori Mitamura (Tokai University, Japan)

4-25	<b>Finite Element Solution of Stagnation Flow of a Micropolar Fluid towards a Vertical Permeable Surface with Variable Surface Conditions</b> <u>Lokendra Kumar</u> (Jaypee Institute of Information Technology University, India)	160
13:45-13:50	BREAK	
Chair: Teppei Tsujita (Tohoku University, Japan)		
13:50-14:40	<b>Short Oral Presentation</b> (4 min for Short Oral Presentation)	
4-26	<b>Direct Computation for the Sound Control of a Hole-Tone Feedback System</b> <u>Kazuo Matsuura</u> and Masami Nakano (Tohoku University, Japan)	162
4-27	<b>Vibration Control of MR Suspension System Using Fuzzy Moving SMC with Hysteretic Compensator</b> <u>Min-Sang Seong</u> , Jung Woo Sohn and Seung-Bok Choi (Inha University, Korea)	164
4-28	<b>Stability Analysis of Railway Wheel-set Featuring MR Suspension System</b> <u>Sung Hoon Ha</u> and Seung-Bok Choi (Inha University, Korea)	166
4-29	<b>Design of Multiple-disk Brake Applying Electro-adhesive Sheet</b> <u>Hidetaka Tanaka</u> , Yasuhiro Kakinuma, Tojiro Aoyama (Keio University, Japan), and Hidenobu Anzai (Fujikura Kasei Co., Ltd., Japan)	168
4-30	<b>Damper Design and Experimental Results by Using Magnetic Responsive Fluids</b> Katsuaki Sunakoda and <u>Ren Ishiyama</u> (Akita University, Japan)	170
4-31	<b>Development of Compact MR Fluid Clutch / Brake (CMRFC/B)</b> <u>Kikuko Otsuki</u> , Takehito Kikuchi, Junji Furusho, Hiroya Abe (Osaka University, Japan), Junichi NOMA (KURIMOTO,LTD., Japan), and Makio Naito (Osaka University, Japan)	172
4-32	<b>Force Display and Rehabilitation for Upper Limbs System Using MR Fluid Brakes</b> <u>Kazuhiro Nishiwaki</u> , Junji Furusho, Makoto Haraguchi, and Ying Jin (Osaka University, Japan)	174
4-33	<b>Development of Muscle Training Machine “MEM-MRB” Using MR Fluid Brake</b> <u>Shiro Isozumi</u> , Junji Furusho (Osaka University, Japan), Kunihiko Oda (Osaka Electro-Communication University, Japan) and Takehito Kikuchi (Osaka University, Japan)	176

4-34	<b>Training Evaluation on Trajectory Tracking for Upper Limbs Using 3D Rehabilitation Robot "EMUL" with ER Fluid Actuator and a Functional NIRS</b>	178
	<u>Mayumi Sonobe</u> , Makoto Haraguchi, Takehito Kikuchi, Junji Furusho (Osaka University, Japan) Masahito Mihara, Megumi Hatakenaka, Ichiro Miyai (Morinomiya Hospital, Japan)	
4-35	<b>Synthesis of Single Crystalline Fe Fine Particles and Their Magnetorheology</b>	180
	<u>Junichi Noma</u> (Osaka University and Kurimoto,LTD., Japan), Hiroya Abe, Makio Naito, Takehito Kikuchi and Junji Furusho (Osaka University, Japan)	
14:40-14:50	BREAK	
14:50-15:50	<b>Poster Presentation</b>	



## Energy and Environmental Systems over Nano/Meso/Macro Scales

### FUYOH

November 4, 2009

5-1 15:30-15:45	<b>Numerical Analysis of Radiative Heat Transfer on Nocturnal Atmosphere in Consideration of Phase Transition (<i>Invited</i>)</b> <u>Seigo Sakai</u> (Yokohama National University, Japan) and Shigenao Maruyama (Tohoku University, Japan)	184
5-2 15:45-16:00	<b>Flame Stabilization Studies on a Backward Facing Step Configuration Based Microcombustor (<i>Invited</i>)</b> Bhupendra Khandelwal and <u>Sudarshan Kumar</u> (Indian Institute of Technology Bombay, India)	186
5-3 16:00-16:15	<b>Reducing Wear of Biomimetic Designed Artificial Joints through Nanotechnology (<i>Invited</i>)</b> <u>Wenguang Zhang</u> , Yun Luo, Chengtao Wang (Shanghai Jiao Tong University, China)	188
5-4 16:15-16:30	<b>The Diffusion of Thermal Discharge into Stagnant Water</b> <u>Jafar Ali</u> , John Fieldhouse, Chris Talbot and Rakesh Mishra (University of Huddersfield, UK)	190
5-5 16:30-16:45	<b>H<sub>2</sub> Production from Water Molecules Excited by Using Weak Infrared Laser at 2.8 Micrometer</b> Masayoshi Kitada (Automobile R&D Center, Honda R&D Co., Ltd., Japan), Tetsumi Sumiyoshi (Cyber Laser Inc., Japan), <u>Yuko Amo</u> , Yasuo Kameda, Takeshi Usuki (Yamagata University, Japan), Hiromitsu Takaba, Akira Endou, Nozomu Hatakeyama, Hokuto Hata, Kotaro Okushi, Ai Suzuki, Hideyuki Tsuboi, Momoji Kubo and Akira Miyamoto (Tohoku University, Japan)	192
16:45-17:00	BREAK	
5-6 17:00-17:15	<b>Characteristics of Radiative Heat Flux from Micro Channel with Gas Combustion</b> <u>Sergey Minaev</u> , Fedor Palessky, Roman Fursenko and Vladimir Baev (ITAM SB RAS, Russia)	194
5-7 17:15-17:30	<b>Flame Dynamics in Radiative Porous Media</b> <u>Roman Fursenko</u> , Sergey Minaev (ITAM SB RAS, Russia) and Kaoru Maruta (Tohoku University, Japan)	196
5-8 17:30-17:45	<b>Numerical Modeling of Unsteady Gas Flows through Porous Heat-Evolutional Objects</b> Vladimir Levin and <u>Nickolay A. Lutsenko</u> (FEB RAS, Russia)	198
5-9 17:45-18:00	<b>Gas Flow through Self-Heating Porous Media: Theory and Experiment</b> <u>Nickolay A. Lutsenko</u> (FEB RAS, Russia), Evgeniy Sereshchenko and Sergey Minaev (SB RAS, Russia)	200

## Supersonic Technology Workshop (AFI/TFI-2009)

### AKEBONO (EAST)

November 4, 2009

- SST-1  
13:00-13:40      **Hysteresis of the Transition between Regular and Mach Reflections of Steady Shock Waves** (*Invited*)  
Mikhail S. Ivanov, Dmitry V. Khotyanovsky and Alexey N. Kudryavtsev (Siberian Branch of the Russian Academy of Sciences, Russia)
- 13:40-13:45      BREAK
- SST-2  
13:45-14:05      **A Study based on Shock Dynamics for the Generation of Secondary Shock Wave in Shock-Vortex Interaction**  
Shunsuke SHIMIZU (Private, Japan)
- SST-3  
14:05-14:25      **Computations of Unsteady Flow Field around an Accelerating Sphere in the Transonic Flow Velocity Region**  
Kazuaki Hatanaka, Tsutomu Saito (Muroran Institute of Technology, Japan), Hiroshi Yamashita, Toshihiro Ogawa, Shigeru Obayashi and Kazuyoshi Takayama (Tohoku University, Japan)
- 14:25-14:45      BREAK
- SST-4  
14:45-15:30      **Evolutionary Optimization of Natural Laminar Flow Wing in Supersonic Regime** (*Invited*)  
E. Iuliano and Domenico Quagliarella (CIRA, Italy)
- SST-5  
15:30-15:50      **Fundamental Finite Element Analysis of Building Vibration Induced by Sonic Boom**  
Yusuke Naka (Japan Aerospace Exploration Agency, Japan)
- SST-6  
15:50-16:10      **CFD Simulation of Weak Shock Wave Propagation in an Atmosphere** (*Invited*)  
Takeharu Sakai (Nagoya University, Japan)
- SST-7  
16:10-16:30      **Global Sonic Boom Overpressure Variation under Realistic Meteorological Condition**  
Hiroshi Yamashita and Shigeru Obayashi (Tohoku University, Japan)
- 16:30-16:50      BREAK
- SST-8  
16:50-17:10      **Development of New Supersonic Mixer for Enhancement of Scramjet Engine**  
Chae-hyoung Kim, In-Seuck Jeung (Seoul National University, Korea), Byungil Choi, Yoshinori Matsubara, Toshinori Kouchi and Goro Masuya (Tohoku University, Japan)
- SST-9  
17:10-17:30      **An Application of DBD Plasma Actuator to Shock Wave Mitigation**  
Takashi Matsuno, Takashi Kanatani, Hiromitsu Kawazoe (Tottori University, Japan) and Shigeru Obayashi (Tohoku University, Japan)

- SST-10  
17:30-17:50      **Preliminary Study of Interaction between Weak Shock Wave and Turbulent Flow (*Invited*)**  
Atsushi Matsuda, Daisuke Takagi, J. Kim, Akihiro Sasoh, Shigeyoshi Ito, Koji Nagata and Yasuhiko Sakai (Nagoya University, Japan)
- SST-11  
17:50-18:10      **Three Dimensional Free Flight Experiment Using Square Bore Ballistic Range (*Invited*)**  
Atsushi Matsuda, Katsuya Shimizu, Kosuke Kikuchi, Kakuei Suzuki and Akihiro Sasoh (Nagoya University, Japan)
- SST-12  
18:10-18:30      **Numerical and Experimental Analysis on Shock Wave Interaction of the Supersonic Biplane Model**  
Atsushi Toyoda, Masayuki Okubo and Shigeru Obayashi (Tohoku University, Japan), Katsuya Shimizu, Atsushi Matsuda and Akihiro Sasoh (Nagoya University, Japan)

**IFS Collaborative Research Forum (AFI/TFI-2009)  
& IFS Research Exhibition (AFI/TFI-2009)**

**AKEBONO (EAST)**

November 5, 2009

Chair: Shinkyu Jeong (Tohoku University, Japan)

8:30-9:30

**Short Oral Presentation**

(3 min for Short Oral Presentation)

- CRF-1      **Blade Shape Optimization and Data mining for HSI Noise and Aerodynamics Performances of Helicopter**  
Shinkyu Jeong, Toru Sasaki (Tohoku University, Japan), Sanghyun Chae, Kwanjung Yee (Pusan National University, Korea), and Takashi Aoyama (Japan Aerospace Exploration Agency, Japan)
- CRF-2      **Thermo-Fluid Characteristics of Boiling Liquid Nitrogen Flowing in a Horizontal Pipe**  
Ryo Shimizu, Katsuhide Ohira, Koichi Takahashi (Tohoku University, Japan), Hiroaki Kobayashi, Hideyuki Taguchi, Takayuki Kojima and Motoyuki Hongo (Japan Aerospace Exploration Agency, Japan)
- CRF-3      **Experimental Study on Aerodynamic Characteristics of a Silent Supersonic Aircraft in Low Speed Flight**  
Hikomitsu Kawazoe, Takashi Matsuno (Tottori University, Japan), Shigeru Obayashi and Shinkyu Jeong (Tohoku University, Japan)
- CRF-4      **Numerical Simulations of Flow Field Around an Object Decelerating from Supersonic to Subsonic Velocity**  
Kazuaki Hatanaka, Tsutomu Saito (Muroran Institute of Technology, Japan) and Hiroshi Yamashita, Toshihiro Ogawa, Shigeru Obayashi, Kazuyoshi Takayama (Tohoku University, Japan)
- CRF-5      **Investigation of Hypersonic Flows about Leading Edges of Small Bluntness (*Invited*)**  
Mikhail Ivanov (ITAM, Russia), Shigeru Yonemura (Tohoku University, Japan), Yevgeniy Bondar and Dmitry Khotyanovsky (ITAM, Russia)
- CRF-6      **Study of Unstable Phenomena of Film Boiling in Superfluid Helium**  
Masakazu Nozawa (Tohoku University, Japan), Nobuhiro Kimura (High Energy Accelerator Research Organization, Japan), Shinichi Chiba and Katsuhide Ohira (Tohoku University, Japan)
- CRF-7      **Modelling of Supersonic and Turbulent Hybrid Arc for Biomass Gasification (*Invited*)**  
Jiri Jeništa (Institute of Plasma Physics AS CR, Czech Republic), Hidemasa Takana, Hideya Nishiyama (Tohoku University, Japan) and Milan Hrabovský (Institute of Plasma Physics AS CR, Czech Republic)

- CRF-8            **Computational Simulation of Highly Reactive Air Plasma Jet under High Pressure Conditions**  
Hidemasa Takana (Tohoku University, Japan), Yasunori Tanaka (Kanazawa University, Japan) and Hideya Nishiyama (Tohoku University, Japan)
- CRF-9            **Dynamics of Premixed Flames Propagating in Non-Uniform Velocity Fields: Combined Effects of Intrinsic Instability and Radiation**  
Satoshi Kadowaki, Hidekazu Takahashi (Nagaoka University of Technology, Japan) and Hideaki Kobayashi (Tohoku University, Japan)
- CRF-10          **Investigations of Reacting Flow in Micro Channels Directed to Development of Eco-Friendly Technologies of Energy Conversion**  
Sergey Minaev (ITAM SB RAS, Russia), Kaoru Maruta (Tohoku University, Japan)
- CRF-11          **Use of Fluid Inclusions in Sludge Sample for the Estimation of Thermal History of Geothermal Fields**  
Kotaro Sekine (Tohoku University, Japan), Masaho Adachi, Hitoshi Ozeki (Okuaizu Geothermal Co., Ltd., Japan), and Brian Rusk (James Cook University, Australia)
- CRF-12          **Distinct Element Modeling for Hydraulic Fracturing in Unconsolidated Sands**  
Hiroyuki Shimizu, Sumihiko Murata (Kyoto University, Japan), Takatoshi Ito (Tohoku University, Japan), Tsuyoshi Ishida (Kyoto University, Japan)
- CRF-13          **The Effects of Radiative Heat Transfer in a Turbulent Channel Flow (*Invited*)**  
Atsushi Sakurai, Kenji Takakuwa, Koji Matsubara (Niigata University, Japan) and Shigenao Maruyama (Tohoku University, Japan)
- CRF-14          **Magnetic Dynamic Process of Magnetic Layers in Grain Boundary due to Fatigue for Material Degradation**  
Katsuhiko Yamaguchi, Kenji Suzuki, Osamu Nittono (Fukushima University, Japan), Tetsuya Uchimoto and Toshiyuki Takagi (Tohoku University, Japan)
- CRF-15          **Energy Transfer Simulation and Analysis on Mega-scale Environment**  
Noboru Yamada (Nagaoka University of Technology, Japan), Atsushi Sakurai (Niigata University, Japan), Atsuki Komiya and Shigenao Maruyama (Tohoku University, Japan)
- CRF-16          **Development of Nondestructive Evaluation Method for Characterization of Surface/Sub-surface Material Properties (*Invited*)**  
Hak-Joon Kim (Sungkyunkwan University, Korea), Ho-Sang Shin (Korea Institute of Nuclear Safety, Korea), Dong-Yeol Kim, Sung-Jin Song (Sungkyunkwan University, Korea), Sung-Duk Kwon (Andong National University, Korea), Toshiyuki Takagi and Tetsuya Uchimoto (Tohoku University, Japan)
- 9:30-9:40        BREAK

- 9:40-11:00      **Short Oral Presentation**  
(3 min for Short Oral Presentation)
- CRF-17      **Mechanism of Radical Generation and Sterilization by a Plasma Flow at Atmospheric Pressure**  
Takashi Miyahara (Shizuoka University, Japan), Shiroh Ochiai and Takehiko Sato (Tohoku University, Japan)
- CRF-18      **Research on Deep Brain Magnetic Stimulation**  
Toshihiko Abe, Toshiaki Ichihara, Kazumi Yashima (IFG., Ltd., Japan) and Toshiyuki Takagi (Tohoku University, Japan)
- CRF-19      **Atrial Vortex**  
Muneichi Shibata, Hisao Ito (Miyagi Cardiovascular and Respiratory Center, Japan), Tomoyuki Yambe, Ryo Koizumi, Kenichi Funamoto and Toshiyuki Hayase (Tohoku University, Japan)
- CRF-20      **Analysis of Reactive Species in a Plasma Flow for Medical Treatment**  
Tetsuji Shimizu (Max-Planck Institute for Extraterrestrial Physics, Germany), Takehiko Sato (Tohoku University, Japan), Gregor E. Morfill (Max-Planck Institute for Extraterrestrial Physics, Germany)
- CRF-21      **Development of Stent for Cerebral Aneurysm**  
Toshio Nakayama (Tohoku University, Japan), Karkenahalli Srinivas (The University of Sydney, Australia), Makoto Ohta (Tohoku University, Japan)
- CRF-22      **Fundamental Study of Convection-Enhanced Delivery Simulation in Rat Brain**  
Joshua H. Smith (Lafayette College, USA), Kenichi Funamoto (Tohoku University, Japan), Martin V. Racenis (Lafayette College, USA), and Toshiyuki Hayase (Tohoku University, Japan)
- CRF-23      **Convection-enhanced Delivery of ACNU Under MRI Monitoring Against Recurrent Gliomas-Development of Computational Simulation of Drug Distribution**  
Ryuta Saito, Yukihiro Sonoda, Toshihiro Kumabe, Ken-ichi Funamoto, Toshiyuki Hayase and Teiji Tominaga (Tohoku University, Japan)
- CRF-24      **Impact and Solidification of Molten Metal Droplets on Stainless Steel Surfaces Patterned with Unidirectional Parallel Microgrooves (*Invited*)**  
Deivandren Sivakumar (Indian Institute of Science, India), Kazunari Katagiri, Tomoki Nakajima, Hidemasa Takana and Hideya Nishiyama (Tohoku University, Japan)
- CRF-25      **Bio-templated Nanostructure Fabrication with Neutral Beam**  
Ichiro Yamashita (Nara Institute of Science and Technology, Japan), Seiji Samukawa and Tomohiro Kubota (Tohoku University, Japan)

- CRF-26      **Impact and Formation Mechanism of Line Edge Roughness(LER) for Advanced Interconnect**  
Shuichi Saito, Eiichi Soda (Semiconductor Leading Edge Technologies, Inc., Japan), Butsurin Jinnai, Koji Koyama and Seiji Samukawa (Tohoku University, Japan)
- CRF-27      **Development and Flow Evaluation of Electro-Rheological Nano-Suspensions**  
Katsufumi Tanaka, Masashi Komeda, Nozomi Nakagawa, Ryuichi Akiyama (Kyoto Institute of Technology, Japan), Masami Nakano and Teppei Tsujita (Tohoku University, Japan)
- CRF-28      **Transport Phenomena at Nano-Structured Interfaces**  
Taku Ohara (Tohoku University, Japan), Masahiko Shibahara (Osaka University, Japan), and Gota Kikugawa (Tohoku University, Japan)
- CRF-29      **Numerical Studies of the Reacting Rarefied Flows in Tubes**  
Yevgeniy Bondar (ITAM, Russia), Kaoru Maruta (Tohoku University, Japan), and Mikhail Ivanov (ITAM, Russia)
- CRF-30      **Fabrication of Composite Material by Compression Shearing Method under Room Temperature**  
Noboru Nakayama (Shinshu University, Japan), Hiroyuki Miki (Tohoku University, Japan) and Hiroyuku Takeishi (Chiba Institute of Technology, Japan)
- CRF-31      **Molecular Dynamics Study about Lubrication Phenomena of Liquid Bridges**  
Takashi Tokumasu (Tohoku University, Japan), Marie-Helene Meurisse, Nicolas Fillot and Philippe Vergne (INSA-Lyon, France)
- CRF-32      **Mechanism of Bubble Generation and Disappearance by Plasma**  
Takehiko Sato, Masanobu Oizumi (Tohoku University, Japan), Marc Tinguely, Mohamed Farhat (EPFL, Switzerland)
- CRF-33      **Production of Complex Plasma at Atmospheric Pressure**  
Takehiko Sato, Yutaka Iwafuchi (Tohoku University, Japan), Tetsuji Shimizu and Gregor E. Morfill (Max Planck Institute for Extraterrestrial Physics, Germany)
- CRF-34      **Optimization of Droplet Formation of Continuous Inkjet**  
Masami NAKANO (Tohoku University, Japan), Tameo NAKANISHI and Masafumi YOKOYAMA (Yamagata University, Japan)
- CRF-35      **A Molecular Study on the Thermodynamic and Transport Properties of Liquid Hydrogen**  
Hiroki Nagashima (Aoyama Gakuin University, Japan), Takashi Tokumasu (Tohoku University, Japan), Shinichi Tsuda (Japan Aerospace Exploration Agency, Japan), Nobuyuki Tsuboi (Kyusyu Institute of Technology, Japan) and K. A. Hayashi (Aoyama Gakuin University, Japan)



- CRF-36      **Tribological Behavior and Electrical Contact Resistance of Metal-Containing DLC Coating for Electrically Conductive Tribo-elements**  
Julien Fontaine (Ecole Centrale de Lyon, France), Hiroyuki Miki ,  
Takanori Takeno (Tohoku University, Japan), Kosuke Ito (Nihon  
University, Japan), Maxime Ruet, Michel Belin (Ecole Centrale de Lyon,  
France), Koshi Adachi and Toshiyuki Takagi (Tohoku University, Japan)
- CRF-37      **Fundamental Study on Spiking Neuron Devices**  
T. Morie, Y. Sun, H. Liang (Kyushu Institute of Technology, Japan), M.  
Igarashi, C. Huang, and S. Samukawa (Tohoku University, Japan)
- 11:00-11:10      BREAK
- 11:10-12:00      **Short Oral Presentation**  
(3 min for Short Oral Presentation)
- CRF-38      **Development of Bubble Generation Method by Plasma**  
Takehiko Sato, Masanobu Oizumi (Tohoku University, Japan), Takashi  
Miyahara (Shizuoka University, Japan) and Tatsuyuki Nakatani (Toyo  
Advanced Technologies Company, Ltd., Japan)
- CRF-39      **Kinetic Force Method for Rarefied Gas flows**  
Vladimir L. Saveliev (NCSRT, Institute of Ionosphere, Kazakhstan), S.A.  
Filko (Zhetysu State University, Kazakhstan), K. Tomarikawa and S.  
Yonemura (Tohoku University, Japan)
- CRF-40      **Realizing Scalable Visualization Through Hierarchical Provenance  
Management**  
Issei Fujishiro (Keio University, Japan), Yuriko Takeshima, Shigeru  
Obayashi and Toshiyuki Hayase (Tohoku University, Japan)
- CRF-41      **Numerical and Experimental Analysis of the Hole-Tone Feedback  
Problem**  
Mikael A. Langthjem (Yamagata University, Japan) and Masami Nakano  
( Tohoku University, Japan)
- CRF-42      **Direct Numerical Simulation on the Effects of Free-stream Turbulence  
on Neutral, Stably and Unstably Stratified Turbulent Boundary Layers**  
Kouji Nagata, Yasuhiko Sakai, Hiroki Suzuki (Nagoya University, Japan)  
and Toshiyuki Hayase (Tohoku University, Japan)
- REX-1      **Meteorological Influence on Sonic Boom**  
Hiroshi Yamashita, Shinkyu Jeong and Shigeru Obayashi (Tohoku  
University, Japan)
- REX-2      **In Situ Observation and Remote Sensing during Ocean Experiments  
of Perpetual Salt Fountain**  
Takashi Yabuki, Shigenao Maruyama, Mikihiro Watanabe and Atsuki  
Komiya (Tohoku University, Japan)

- REX-3      **Assessment of Volume Penalization Method for Direct Numerical Simulation of Incompressible Flows**  
Yuji Hattori (Tohoku University, Japan)
- REX-4      **Chemistry Validation Using Simplified Modeling of Autoignition in Micro Flowreactor with Controlled Temperature Profile**  
Hisashi Nakamura, Hiroshi Oshibe, Kaoru Maruta (Tohoku University, Japan)
- REX-5      **Blood Flow Analysis by Measurement-Integrated Simulation**  
Kenichi Funamoto and Toshiyuki Hayase (Tohoku University, Japan)
- REX-6      **Computational and Experimental Studies on Supersonic Particulate Jet Process for Cavity Filling**  
Hidemasa Takana, HongYang Li, Kazuhiro Ogawa, Tsunemoto Kuriyagawa and Hideya Nishiyama (Tohoku University, Japan)
- REX-7      **Mechanism of a Molecular Gas-Film Lubrication of Micro-Structured Surface**  
Shigeru Yonemura, Susumu Isono, Masashi Yamaguchi, Takanori Takeno, Hiroyuki Miki and Toshiyuki Takagi (Tohoku University, Japan)
- REX-8      **Influence of Inlet and Outlet Pipe Lengths on Cavitation Surge**  
Yuka Iga (Tohoku University, Japan), Yoshiki Yoshida (Japan Aerospace Exploration Agency, Japan) and Toshiaki Ikohagi (Tohoku University, Japan)
- REX-9      **Topologically-Accentuated Realization of Wake Turbulence Datasets**  
Yuriko Takeshima, Yosuke Hoshi, Yuichi Maki (Tohoku University, Japan), Issei Fujishiro (Keio University, Japan), Shigeo Takahashi (The University of Tokyo, Japan), Takashi Misaka and Shigeru Obayashi (Tohoku University, Japan)
- 12:00-12:20      BREAK
- 12:20-14:30      **Poster Session**

**The Fifth International Students/ Young Birds Seminar  
on Multi-scale Flow Dynamics**

**AKEBONO (WEST)**

November 4, 2009

13:00-13:05	<b>Opening</b>	
Session 1 13:05-13:41	<b>-Award Session - Short Oral Presentation</b> (4 min for Short Oral Presentation including PC preparation)	
9-1	<b>Effect of Confinement on Wake Instability : Comparison of Local, Global Linear and Nonlinear Methods</b> <u>Outi Tammissola</u> , Fredrik Lundell, Daniel Söderberg (KTH Royal Institute of Technology, Sweden), Matthew Juniper (Cambridge University, UK), P. Schlatter (KTH Institute of Technology, Sweden)	208
9-2	<b>Carbon Particle Formation in Micro Flowreactor with Controlled Temperature Profile</b> <u>Ryu Tanimoto</u> , Takuya Tezuka, Susumu Hasegawa, Hisashi Nakamura, Kaoru Maruta (Tohoku University, Japan)	210
9-3	<b>An Infinite Elastic Plate Model of Atherosclerotic Plaque Rupture by Nonlinear Particle/Matrix Interfacial Decohesion</b> <u>Chien M. Nguyen</u> , Alan J. Levy (Syracuse University, USA)	212
9-4	<b>The Investigation into the Effect of Using Different Nano-micro Metallic Powders on Sunlight Reflectivity of Pigmented Coatings</b> <u>Mehdi Baneshi</u> , Shigenao Maruyama, Atsuki Komiya (Tohoku University, Japan)	214
9-5	<b>Magnetorheological Effect in Shear Mode of MR Rubber Composite</b> <u>Yutaka Takano</u> , Masami Nakano, Masashi Imai and Teppei Tsujita (Tohoku University, Japan)	216
9-6	<b>Investigation of the Effects of Cavitation on Atomization of a High Speed Liquid Jet</b> <u>Cameron Stanley</u> , Gary Rosengarten and Tracie Barber, B. Milton (UNSW, Australia)	218
9-7	<b>Numerical Study of Three-shock Intersection at Von Neumann Paradox Conditions</b> <u>Georgy V. Shoey</u> , Dmitry V. Khotyanovsky, Yevgeny A. Bondar, Alexey N. Kudryavtsev, and Mikhail S. Ivanov (Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Russia)	220
9-8	<b>Application of a Negative Capacitance Circuit in Synchronized Switch Damping Techniques for Vibration Suppression</b> <u>Hongli Ji</u> , Jinhao Qiu, and Jun Cheng (Nanjing University of Aeronautics and Astronautics, China)	222

9-9	<b>An Investigation of the Features of SMAC and SIMPLE for Incompressible Unsteady-state Fluid Flow Solutions</b> <u>Y. Saito</u> , K. Yasumura, Y. Matsushita, H. Aoki, T. Miura (Tohoku University, Japan), S. Ogasawara, M. Daikoku (Hachinohe Institute of Technology, Japan), T. Igarashi, K. Matsuyama, M. Shirota, T. Inamura (Hirosaki University, Japan)	224
13:41-14:20	<b>Poster Presentation</b>	
Session 2 15:00-15:36	<b>-Award Session – Short Oral Presentation</b> (4 min for Short Oral Presentation including PC preparation)	
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9-11	<b>Skin-Friction Measurement of Flow around Bluff Body Using Luminescent Oil-Film Technique</b> <u>Tomoya Kakuta</u> , Atsushi Koyama, Daisuke Yorita, Daiju Numata, Hiroki Nagai, Keisuke Asai (Tohoku University, Japan)	228
9-12	<b>Thermodynamic Properties of <math>Y_2Cu_2O_5</math></b> <u>Maslova I.</u> , Savelieva O., Volkova O., Vasiliev A. (Moscow State University, Russia)	230
9-13	<b>Analysis of CO<sub>2</sub>/DME Heat Pump Cycle with Consideration of Heat Transfer Degradation</b> <u>Yoji Onaka</u> , Akio Miyara, Koutaro Tsubaki, Shigeru Koyama (Saga University, Japan)	232
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9-15	<b>Measurement of Thermophysical Properties of Freezing Skin Using Peltier Modules for Cryosurgery</b> <u>Hiroki Takeda</u> (Tohoku University, Japan), Daniel Fingas (University of Toronto, Canada), Junnosuke Okajima, Atsuki Komiya and Shigenao Maruyama (Tohoku University, Japan)	236
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9-17	<b>A Numerical Investigation of the Effect of the Size of Painting Droplets on Transfer Efficiency with Rotary Bell-cup Atomizer</b> <u>K. Yasumura</u> , Y. Saito, Y. Matsushita, H. Aoki, T. Miura (Tohoku University, Japan), S. Ogasawara, M. Daikoku (Hachinohe Institute of Technology, Japan), T. Igarashi, K. Matsuyama, M. Shirota, and T. Inamura (Hirosaki University, Japan)	240

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Luthfi, Steven W. Armfield (The University of Sydney, Australia),  
Wenxian Lin (James Cook University, Australia) and Masud Behnia (The  
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15:36-16:16    **Poster Presentation**

**FUYOH**

November 5, 2009

Session 3

9:00-9:36

**Short Oral Presentation**

(4 min for Short Oral Presentation including PC preparation)

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**for Free-Flying Space Robot**  
Naohiro Uyama, Hiroki Nakanishi, Kazuya Yoshida (Tohoku University,  
Japan)

9-20            **Restoration of p53-DNA Interaction Loss upon R273H Mutation by**            246  
**CP-31398: An Ultra Accelerated Quantum Chemical Molecular Dynamics**  
**Approach**  
Shah Rauf, Ai Suzuki, Hideyuki Tsuboi, Nozomu Hatakeyama, Akira  
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University, Japan)

9-21            **Ultra-Low-Damage Surface Modification of Carbon Nanotube for P-type**            248  
**and N-type Field-Effect Transistor by Neutral Beam Process**  
Akira Wada, Yoshinori Sato (Tohoku University, Japan), Satoru Suzuki  
(NTT Corporation, Japan), Masahiko Ishida, Fumiyuki Nihey (NEC  
Corporation, Japan), Yoshihiro Kobayashi (NTT Corporation, Japan),  
Kazuyuki Tohji and Seiji Samukawa (Tohoku University, Japan)

9-22            **Theoretical Approach for Estimating Air Friction in Laser Scanning**            250  
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University, Japan)

9-23            **Evaluation of Fatigue Strength of Me-DLC Coating on NiTi Shape**            252  
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(Tohoku University, Japan)

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**Sharp Focusing Schlieren System**  
Masumi Hagiwara, Hiroki Nagai, Daiju Numata, Keisuke Asai (Tohoku  
University, Japan)

9-25	<p><b>Prediction of Secondary Electron Emission Coefficient Based on Quantum Chemistry for Improving Energy Flow in PDP</b></p> <p><u>Kazumi Serizawa</u>, Hiroaki Onuma and Itaru Yamashita (Tohoku University, Japan), Hiromi Kikuchi, Kazuma Suesada and Masaki Kitagaki (Hiroshima University, Japan), Ai Suzuki, Hideyuki Tsuboi, Nozomu Hatakeyama, Akira Endou, Hiromitsu Takaba and Momoji Kubo (Tohoku University, Japan), Hiroshi Kajiyama (Hiroshima University, Japan), and Akira Miyamoto (Tohoku University, Japan)</p>	256
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9-28	<p><b>Unsteady Pressure Distribution Measurement on a Square Cylinder using Pressure-Sensitive Paint</b></p> <p><u>Daisuke Yorita</u> (Tohoku University, Japan), Tomohiro Narumi (Kyushu Institute of Technology, Japan), Hiroki Nagai and Keisuke Asai (Tohoku University, Japan)</p>	262
9-29	<p><b>New Functional Device Characteristics with 2-Dimensional Array of Si Nanodisks Fabricated by Combination of Bio-Template and Ultimate Top-down Etching</b></p> <p><u>Makoto Igarashi</u>, Chi-Hsien Huang, Maju Tomura (Tohoku University, Japan), Masaki Takeguchi (National Institute for Materials Science, Japan), Susumu Horita (JAPAN Advanced Institute of Science and Technology, Japan), Yukiharu Uraoka, Takashi Fuyuki (Nara Institute of Science and Technology, Japan), Ichiro Yamashita (Nara Institute of Science and Technology &amp; Panasonic Co., Ltd., Japan), Takashi Morie (Kyushu Institute of Technology, Japan) and Seiji Samukawa (Tohoku University, Japan)</p>	264
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9-31	<p><b>Study on Multi-stage Oxidation of Hydrocarbon-Air Mixture in Micro Flowreactor with Controlled Temperature Profile</b></p> <p><u>Hiroshi Oshibe</u>, Akira Yamamoto, Takuya Tezuka, Susumu Hasegawa, Hisashi Nakamura and Kaoru Maruta (Tohoku University, Japan)</p>	268

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9-34	<p><b>Boundary Lubrication by C<sub>60</sub> Fullerene: Computational Chemistry and Experimental Investigations</b></p> <p><u>Tasuku Onodera</u> (Tohoku University, Japan), Vanessa Chauveau (Ecole Centrale de Lyon, France), Ai Suzuki, Hideyuki Tsuboi, Nozomu Hatakeyama, Akira Endou, Hiromitsu Takaba (Tohoku University, Japan), Thierry Le Mogne, C. Minfray, Fabrice Dassenoy (Ecole Centrale de Lyon, France) and Momoji Kubo (Tohoku University, Japan) and Jean Michel Martin (Ecole Centrale de Lyon, France), Akira Miyamoto (Tohoku University, Japan)</p>	274
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9-39	<p><b>Novel Prediction Method for Emission Efficiency of Eu<sup>2+</sup>-doped Phosphors Based on Quantum Chemistry</b></p> <p><u>Hiroaki Onuma</u>, Itaru Yamashita, Kazumi Serizawa, Ai Suzuki, Hideyuki Tsuboi, Nozomu Hatakeyama, Akira Endou, Hiromitsu Takaba, Momoji Kubo, Akira Miyamoto (Tohoku University, Japan)</p>	284



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**The 10<sup>th</sup> Japan-Korea Students' Symposium**  
**-Fast Ion Transport in Solids and Through Interfaces**  
**-The Related Materials and Phenomena-**

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## Current Topics in Flow Dynamics

### FUYOH

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14:00-14:20    Jongsoo Ha, Shinkyu Jeong, and Shigeru Obayashi (Tohoku University, Japan)
- 11-5            **Lamb Wave Generation and Sensing with Metal-core Piezoelectric Fibers for Structural Health Monitoring (*Invited*)**            538  
14:20-14:40    Jian Liu, Jinhao Qiu, Weijie Chang, Hongli Ji, Kongjun Zhu (Nanjing University of Aeronautics and Astronautics, China)
- 11-6            **Evaluation of Plastic Deformation in Steels by Magnetic Hysteresis Measurements (*Invited*)**            540  
14:40-15:00    Gabor Vértesy (Research Institute for Technical Physics and Materials Science, Hungary), S. Ueda (Japan Society of Maintenance, Japan), T. Uchimoto, T. Takagi (Tohoku University, Japan), I. Tomáš (Institute of Physics, Czech Republic)

### AKEBONO (WEST)

November 5, 2009

Chair: Michiko Furudate (Tohoku University, Japan)

- 11-7            **Use of Active Learning in Experimental Fluid Dynamics (*Invited*)**            542  
15:00-15:20    Andrew J. Meade and Ankur Srivastava (Rice University, USA)
- 11-8            **Accelerometer Balances for Force Measurement in Ultra-Short Duration Test Facilities**            544  
15:20-15:40    Viren Menezes and Abhinav Kumar (Indian Institute of Technology Bombay, India)

11-9 15:40-16:00	<b>Flow Past Immersed Bodies Solved By Least Squares Fictitious Domain Method With High-Order Approximation (<i>Invited</i>)</b> <u>Lucia Parussini</u> , V. Pediroda and Carlo Poloni (University of Trieste, Italy)	546
Chair: Keisuke Asai (Tohoku University, Japan)		
11-10 16:00-16:20	<b>Luminescent Molecular Sensors for Assessment of Temperature and Lubrication in Machining Processes (<i>Invited</i>)</b> <u>Chih-Yung Huang</u> (National Tsing Hua University, Taiwan), Srinivasan Chandrasekar and John P. Sullivan (Purdue University, USA)	548
11-11 16:20-16:40	<b>Bubble Flow Dynamics and Kinematic Characteristics of Bubble Flow Motion in a Paramagnetic Liquid Under Microgravity Conditions</b> <u>Thilanka Munasinghe</u> ( West Virginia University, USA)	550
11-12 16:40-17:00	<b>Recent Developments in Unsteady Pressure-Sensitive Paint Methods (<i>Invited</i>)</b> <u>James W. Gregory</u> , Di Peng, Pradeep Kumar, and Shuo Fang (The Ohio State University, USA)	552

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**AKEBONO (WEST)**

November 5, 2009

Chair: Shigenao Maruyama (Tohoku University, Japan)

12-1 8:00-8:24	<b>Investigation of Interfacial Thermal Resistance of Bi-layer Nanofilms by Nonequilibrium Molecular Dynamics (<i>Invited</i>)</b> Shenghong Ju, <u>Xingang Liang</u> , Shuaichuang Wang (Tsinghua University, China)	556
12-2 8:24-8:48	<b>Primary Experimental study on Patients' Safety with Deep Brain Stimulation in RF electromagnetic field (<i>Invited</i>)</b> Xu Jun, <u>Li Luming</u> and Hao Hongwei (Tsinghua University, China)	558
12-3 8:48-9:12	<b>Experimental Studies on Removal Efficiencies of Carbon Dioxide by Fine Spray of Aqueous Ammonia and MEA Solution (<i>Invited</i>)</b> <u>Guo Yincheng</u> , Niu Zhenqi and Lin Wenyi (Tsinghua University, China)	560
12-4 9:12-9:36	<b>Microchannel Heatsink Geometry Optimization By Genetic Algorithm (<i>Invited</i>)</b> <u>Xu Xianghua</u> , Liu Mingyan and Liang Xingang (Tsinghua University, China)	562
12-5 9:36-10:00	<b>Could We Obtain Fractional Lorenz Equations in Fluid Dynamics? (<i>Invited</i>)</b> Fan Yang and <u>Ke-Qin Zhu</u> (Tsinghua University, China)	564
12-6 10:00-10:24	<b>Investigation on the Shock-vortices Interaction in a Two-dimensional Spatially Developing Supersonic Mixing Layer (<i>Invited</i>)</b> <u>Zhang Huiqiang</u> , Xue Shuyan, Wang Bing and Wang Xilin (Tsinghua University, China)	566
10:24-10:30	BREAK	

Chair: Xin-Gang Liang (Tsinghua University, China)

12-7 10:30-10:43	<b>Nonlinear Dynamics of Disturbed Vortices</b> <u>Yuji Hattori</u> (Tohoku University, Japan) and Yasuhide Fukumoto (Kyushu University, Japan)	568
12-8 10:43-10:56	<b>Entransy and Its Application in Heat Exchanger Analysis</b> <u>Weiming Song</u> , Xiongbin Liu, Zhixin Li (Tsinghua University, China)	570
12-9 10:56-11:09	<b>Microgravity Experiment and Numerical Simulation on Droplet Combustion in Varying Forced Convection at Elevated Pressure</b> Yasuhiro Ogami, Mehdi Jangi and <u>Hideaki Kobayashi</u> (Tohoku University, Japan)	572

12-10 11:09-11:22	<b>Study on Combustion Chemistry Using Micro Flowreactor with Controlled Temperature Profile</b> <u>Hisashi Nakamura</u> , Hiroshi Oshibe and Kaoru Maruta (Tohoku University, Japan)	574
12-11 11:22-11:35	<b>Dynamics of Thermomass Fluid</b> <u>Quan-Wen Hou</u> , Zeng-Yuan Guo (Tsinghua University, China)	576
12-12 11:35-11:48	<b>Thermal Energy Transfer in Liquids with Ordered/Random Structures</b> <u>Taku Ohara</u> and Gota Kikugawa (Tohoku University, Japan)	578
12-13 11:48-12:01	<b>Molecular Simulation of Nanoscale Flow in Polymer Electrolyte Fuel Cell</b> <u>Takashi Tokumasu</u> (Tohoku University, Japan)	580
12:00-13:00	LUNCH	
Chair: Jun Ishimoto (Tohoku University)		
12-14 13:00-13:24	<b>Micro-scale Effects on Dry-gas Seal Performance (<i>Invited</i>)</b> <u>Bing Wang</u> , Hui-Qiang Zhang and Hong-Jun Cao (Tsinghua University, China)	582
12-15 13:24-13:37	<b>A Molecular Gas-Film Lubrication Expressed in Micro Gas Flow</b> <u>Shigeru Yonemura</u> , Susumu Isono, Masashi Yamaguchi, Takanori Takeno, Hiroyuki Miki and Toshiyuki Takagi (Tohoku University, Japan)	584
12-16 13:37-13:50	<b>Study of the Flow on a Supercritical Wing with Control Devices(VG)</b> <u>Jing-Bo Huang</u> , ZX Xiao and, Song Fu (Tsinghua University, China)	586
12-17 13:50-14:03	<b>Numerical Analysis of Turbulent Cavitation Around a Hydrofoil</b> <u>Genki Yamamoto</u> , Yuka Iga (Tohoku University, Japan) and Motohiko Nohmi (EBARA Corporation, Japan), Toshiaki Ikohagi (Tohoku University, Japan)	588
14:03-14:08	BREAK	
12-18 14:08-14:21	<b>Visualization of Absorption Process of Carbon Dioxide into Alkanolamine Solutions at Gas-liquid Surface</b> <u>Atsuki Komiya</u> , Kaoru Maruta, Yoshikatsu Nakano and Hisashi Nakamura (Tohoku University, Japan)	590
12-19 14:21-14:34	<b>The Linear Stability Analysis of Core-annular Flow of Two Power Law Fluids</b> <u>Xue-Wei Sun</u> , Jie Peng and Ke-Qin Zhu (Tsinghua University, China)	592
12-20 14:34-14:47	<b>The Sensing-based High-fidelity Risk Mitigation Control of Hydrogen Dispersion</b> <u>Kazuo Matsuura</u> , Masami Nakano and Jun Ishimoto (Tohoku University, Japan)	594

12-21

14:47-15:00

**Integrated Computation of Primary Atomization with Micro-Cavitation in  
Injector Nozzle**

Jun Ishimoto (Tohoku University, Japan), Fuminori Sato and Gaku Sato  
(KEIHIN Co., Japan)

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## Liaison Office Session

### SENDAI (EAST)

November 5, 2008

- 17:00-17:20      State and Plan of International Education in Tohoku University  
Goro Masuya (Tohoku University, Japan) Chair: Toshiyuki Takagi
- 17:20-19:00      Part 1: Panel Discussion on Education System to Joint Education and  
International Summer School, Chair: Toshiyuki Takagi  
Masud Behnia (The University of Sydney)  
Alexander Vasiliev (Moscow State University)  
Hyung jin Sung (KAIST)  
Hiroshi Higuchi (Syracuse University)  
Joël Courbon (INSA-Lyon)  
Fredrik Lundell (KTH Royal Institute of Technology)  
Shigenao Maruyama (Tohoku University)

Part 2: Questions and Discussion



## Alumni Session

### AKEBONO (WEST)

November 6, 2009

Chair: Shigenao Maruyama (Tohoku University, Japan)

9:00~9:05      **Opening Address**  
Shigenao Maruyama (Tohoku University, Japan)

*9:05~10:45      **Session1-1 Introduction of Institution and Research(14-1~14-15)***

14-1  
9:05~9:11      Goro Obinata  
(Nagoya University, Japan) *(Invited)*

14-2  
9:11~9:17      Wu-Shung Fu  
(National Chiao Tung University, Taiwan) *(Invited)*

14-3  
9:17~9:23      Shigeo Fujikawa  
(Hokkaido University, Japan) *(Invited)*

14-4  
9:23~9:29      Hideyuki Tanno  
(Japan Aerospace Exploration Agency, Japan) *(Invited)*

14-5  
9:29~9:35      Yasuhiro Egami  
(Nagoya University, Japan) *(Invited)*

14-6  
9:35~9:41      Vladimir Khovaylo  
(Moscow Institute of Steels and Alloys, Russia) *(Invited)*

14-7  
9:41~9:47      Satoyuki Kawano  
(Osaka Univeristy, Japan) *(Invited)*

14-8  
9:47~9:53      Xing-Rong Zhang  
(Peking University, China) *(Invited)*

9:53~10:03      BREAK

14-9  
10:03~10:09      Seigo Sakai  
(Yokohama National University, Japan) *(Invited)*

14-10  
10:09~10:15      Tsutomu Saito  
(Muroran Institute of Technology, Japan) *(Invited)*

14-11  
10:15~10:21      Yun Luo  
(Shanghai Jiao Tong University, China) *(Invited)*

14-12  
10:21~10:27      James W. Gregory  
(Ohio State University, USA) *(Invited)*

14-13  
10:27~10:33      Deivandren Sivakumar  
(Indian Institute of Science, India) *(Invited)*

14-14  
10:33~10:39      Nam Il Kim  
(Chung-Ang University, Korea) *(Invited)*

- 14-15  
10:39~10:45 Chih-Yung Huang  
(National Tsing Hua University, Taiwan) *(Invited)*
- 10:45~12:00 ***Session1-2 Poster presentation (14-1~14-15)***
- 12:00~13:00 LUNCH
- 13:00~13:54 ***Session2-1 Introduction of Institution and Research(14-16~14-24)***
- 14-16  
13:00~13:06 Mikhail Ivanov  
(Siberian Branch of the Russian Academy of Sciences, Russia) *(Invited)*
- 14-17  
13:06~13:12 Sudarshan Kumar  
(Indian Institute of Technology Bombay, India) *(Invited)*
- 14-18  
13:12~13:18 Hamid Hosseini  
(Kumamoto University, Japan) *(Invited)*
- 14-19  
13:18~13:24 Atsushi Sakurai  
(Niigata University, Japan) *(Invited)*
- 14-20  
13:24~13:30 Yoshio Wakamatsu  
(Japan Aerospace Exploration Agency, Japan) *(Invited)*
- 14-21  
13:30~13:36 Jinhao Qiu  
(Nanjing University of Aeronautics and Astronautics, China) *(Invited)*
- 14-22  
13:36~13:40 Kosuke Ito  
(Nihon University, Japan) *(Invited)*
- 14-23  
13:42~13:48 Takeshi Yokomori  
(Keio University, Japan) *(Invited)*
- 14-24  
13:48~13:54 Koutaro Tsubaki  
(Saga University, Japan) *(Invited)*
- 13:54~15:00 ***Session2-2 Poster presentation(14-16~14-24)***
- 15:00~16:00 ***Alumni Reunion Session***