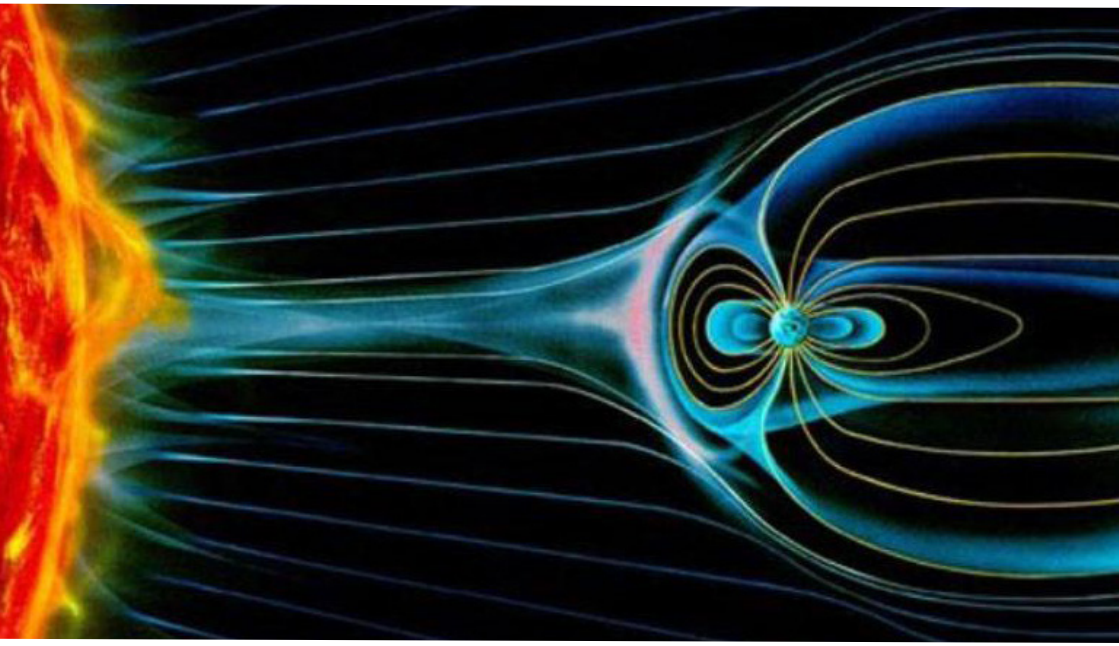
INTERNATIONAL SPACE SCIENCE INSTITUTE - BEIJING

国际空间科学研究所—北京

CROSS-SCALE MEASUREMENTS OF SPACE PLASMAS TO EXPLORE MAGNETIC RECONNECTION

September 5-6, 2019

Saturn Hall, Room A418



FORUM

HANDBOOK

CONTENTS

Cover source: NASA - Editor/Graphic Design: Laura BALDIS, ISSI-BJ

ABOUT ISSI-BJ

The International Space Science Institute in Beijing (ISSI-BJ) was jointly established by the National Space Science Center (NSSC) and the International Space Science Institute (ISSI) with the support of the International Cooperation Bureau and the Space Science Strategic Project of the Chinese Academy of Sciences (CAS). ISSI-BJ is a close cooperation partner of ISSI in Bern. The two institutes share the same Scientific Program Committee, the same study tools, and other information of mutual relevance and interest. However, both use independent operational methods and different funding sources.

ISSI-BJ is a non-profit research institute. Our main mission is to contribute to the **achievement of a deeper scientific and technological understanding of future space missions** as well as of the scientific results from current and past missions through **multidisciplinary research**, possibly involving, whenever felt appropriate, ground based observations, modelling, numerical simulation and laboratory experiments, using the same tools as ISSI, i.e. **Forums, International Teams, Workshops, Working Groups or individual Visiting Scientists.**

The Program of ISSI-BJ covers a widespread spectrum of space science disciplines, including astrophysics, solar and space physics, planetary science, astrobiology, microgravity science and Earth observation from space.

ORGANIZERS

The Forum on "Cross-scale Measurements of Space Plasmas to Explore Magnetic Reconnection" is organized by the International Space Science Institute - Beijing (ISSI-BJ).

Conveners

- Walter Gonzalez, INPE, Brazilian Academy of Science, Brazil
- Vytenis Vasyliunas, Max Planck Institute, Germany
- Chi Wang, NSSC, CAS, China
- Lei Dai, NSSC, CAS, China
- Malcolm Dunlop, RAL and BUAA, UK and China
- Philippe Escoubet, ESTEC, ESA
- Vassilis Angelopoulos, UCLA, United States
- Giovanni Lapenta, KU Leuven, Belgium
- Tai Phan, UK Berkeley, United States
- Larry Kepko, NASA/GSFC, United States
- Alessandro Retino, LPP, école Politechnique, France
  Michael Hesse, University of Bergen, Norway
- Maurizio Falanga, ISSI-BJ, China

Sponsors

FORUM OUTLINE AND PROGRAM

Context and Objectives of the Forum

Magnetic Reconnection refers to conversion of magnetic energy into particle energy as two magnetic field lines tangle and "reconnect" in the plasma. Magnetic reconnection is a findamental process in the solar atmosphere, astrophysical systems, the laboratory plasmas and the terrestrial magnetosphere. It is the central question regarding energy transfer in the solar-terrestrial connection.

The in-situ measurement is crucial to understanding magnetic reconnection. Our Earth's magnetosphere is an ideal laboratory for in-situ detection of magnetic reconnection. Thanks to ESA's Cluster mission, NASA's THEMIS mission and MMS mission, these spacecraft missions provides precious measurements on the electron-kinetic scale (MMS), the ion-kinetic scale (Cluster), or the Macro-scale (THEMIS) of magnetic reconnection. However, we still lack an unified picture of the mechanism and consequence of magnetic reconnection on these fundamental spacial scales of plasmas. Investigations of important questions such as when magnetic reconnection occurs (the onset problem) rely on simultaneous measurements of electron-ion-macro scales.

Since 2016, the national space science center (NSSC) started to carry out concept studies on a mission proposal named "Self-Adaptive Magnetic Reconnection Microscope Mission" (SAMRM). SAMRM aims to make simultaneous and self-adaptive measurements of plasmas at electron-ion-macro scales with a fleet of 12+ cubesats and one mother satellite. The proposed SAMRM is currently in the pre-phase-A in the Strategic Priority Research Program on Space Science II, Chinese Academy of Sciences.

Since the proposed constellation mission using multiple cubsats, in addition to the main satellite, will have the capability of measuring reconnection related plasmas and fields simultaneously at the electro-ion scales as well as at several MACRO scales, we believe that such a capability will represent an important advance in magnetospheric reconnection research. Although the reconnection physics at the electron-ion scales is an important subject for investigation, as shown by the

CLUSTER, THEMIS and MMS missions, the reconnection processes and structures defined at several MACRO scales are expected to finally define the main magnetospheric plasmas and fields changes due to reconnection.

The main aim of this ISSI-BJ forum is to gather input from the space physics community on the science goals for future investigations of magnetic reconnection. We would like to elucidate the importance of science questions of magnetic reconnection and space plasma physics that can be resolved by the proposed new mission in combination with other existing missions (Cluster, THEMIS, MMS, SWARM, etc). The proposed new mission is also open for international collaborations.

Main Themes of the Forum

1. Overview of magnetic reconnection
2. Overview of Constellation missions
3. Cross-scale Science of Magnetic Reconnection
4. Cross-scale Science in the solar-terrestrial connection
5. Discussions on mission profiles and International Collaborations

PROGRAM

Thursday, September 5

	Introduction	Chair: C. Wang
8:30-9:00	*Registration*	
9:00-9:10	Welcome and introduction to ISSI-BJ	M. Falanga
9:10-9:20	Introduction to CAS Space Science Program	C. Wang
9:20-9:30	A brief introduction of the Forum and its Goals	L. Dai
Session I	Overviews of reconnection and constellation missions	Chair: M. Falanga
9:30-10:00	General review on Reconnection: Concept and Theory	V. Vasyliunas
10:00-10:30	Magnetic Reconnection in solar-terrestrial connection	W. Gonzalez
10:30-10:50	*Group Photo and Coffee Break*	
10:50-11:20	The Cross-Scale mission proposal	P. Escoubet
11:20-11:40	SAME (Self-Adaptive Magnetic reconnection Explorer) mission	L. Dai
11:40-12:00	Free Discussion	
12:00-13:30	*Lunch*	
Session II	Overviews of Constellation missions	Chair: W. Gonzalez
13:30-13:50	Cluster-MMS mission conjunctions	P. Escoubet
13:50-14:10	MagCon constellation mission	L. Kepko
14:10-14:30	PROSPERO and constellation mission	A. Retino
14:30-15:00	Free Discussion	
15:00-15:20	*Coffee Break*	

Thursday, September 5

Session II	Cross-scale Science of Reconnection	Chair: V. Vasyliunas
15:20-15:40	Multiple-scale science of reconnection	M. Hesse
15:40-16:00	Multi-scale science of reconnection with focus on open questions	T. Phan
16:00-16:20	The cross-scale observations for understanding the role of reconnection in energy conversion and flux transport	A. Runov
16:20-16:40	Free discussion	
16:40-17:00	Need for cross-scale measurements of reconnection and shocks	Y. Khotyaintsev
17:00-17:20	Multiple-scale science of reconnection	Q. Lu
18:00	*Dinner offered by ISSI-BJ*	

Friday, September 6

Sesssion III	Cross-scale Science in Reconnection	Chair: M. Dunlop
8:30-8:50	Reconnection and turbulence: what would bring multiscale aspects?	A. Retino
8:50-09:10	Electron acceleration in reconnection: what would bring multiscale aspects?	H. Fu
09:10-09:30	Reconnection and waves with multi-spacecraft observations	D. Graham
09:30-09:50	Diagnosis methods of waves and turbolence associated with magnetic reconnection based on multiple-spacecraft constellation	J. He
09:50-10:00	Free discussion	
10:00-10:30	*Coffee Break*	

Friday, September 6

Session IV	Cross-scale Science in Reconnection and solar-terrestrial connection	Chair: A. Retino
10:30-10:50	Inner magnetosphere with focus on MI-coupling	M. Dunlop
10:50-11:10	Multi-scale process of magnetotail reconnection and limitations of Cluster/MMS 4 point measurements	R. Nakamura
11:10-11:30	FTE and K-H waves: what would bring multiscale aspects?	J. Hwang
11:30-11:50	Sub-ion scale current sheets in magnetosphere	M. Zhou
11:50-12:00	Free Discussion	
12:00-13:30	*Lunch*	
Session V	**Discussion**	**Chair: P. Escoubet**
13:30-13:50	Thin Current sheet in Space Plasma	L. Zeleny
13:50-15:00	Analysis and discussion of the SAME mission profile	Z. Cai
15:00-15:20	Multiple-scale perspective of reconnection (Skype presentation)	G. Lapenta
15:20-16:00	*Coffee Break*	
16:00-16:30	Free discussion - Key science goals of SAME - Design and instruments (Talks from SIM-CAS on SC design and mission profile) - Observation strategy *Coffee Break (30 min)* - International collaboration	

Friday, September 6

16:30-17:00	Forum report: outline, structure, publication	M. Falanga, L. Dai
17:00-17:15	Summary of the Forum	
18:00	*Dinner offered by the project team*	

Note: The time interval includes 5 minutes discussion

PRACTICAL INFORMATION

Venue

The Forum will be held in the Saturn Hall, NSSC building A, 4th Floor.

Address
N°1 Nanertiao, Zhongguancun, Haidian District, Beijing, 100190
北京市海淀区中关村南二条一号

ISSI-BJ Office
The ISSI-BJ office is located at NSSC, Building A, 4th Floor. It is equipped with computers (MS Windows) with CD/DVD drives and USB ports, connected to high-speed network and printer.

WIFI Access

Login via web: NSSC-guest

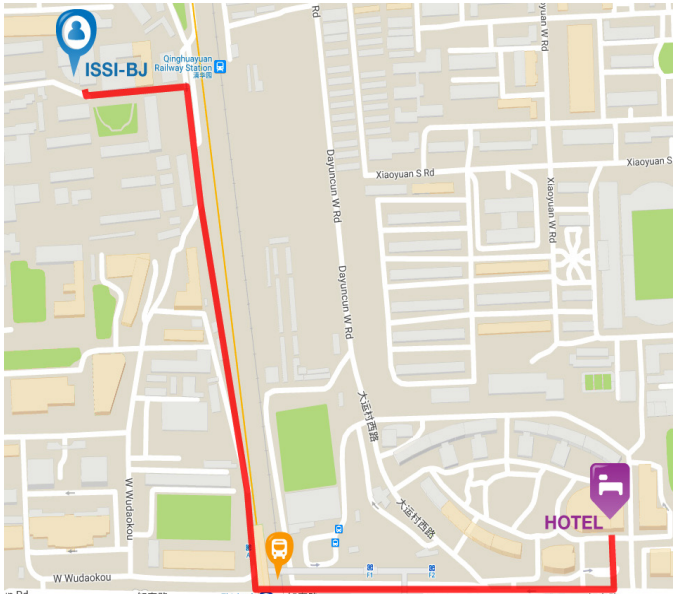
Username: issi-bj
Password: issi-bj

Accommodation

ISSI-BJ covers the cost of the accommodation and breakfast. Please kindly note that all the other expenses in hotel will be deducted from your check-in deposit.

Park Plaza Hotel Beijing Science Park
No.25, Zhichun Road, Haidian District, 100083, Beijing China
北京市海淀区知春路25号

Directions: Turn right on Zhichun Rd. (知春路) when going out of the hotel. Climb the stairs to the entrance of the metro station ZhiChunLu (Exit A), turn left and walk straight for about two minutes. Then turn right on West Wudaokou (西五道口), following the northbound elevated subway. Walk for about 10 minutes, towards the direction of Liaoning International Hotel (辽宁大厦) or the National Microgravity Laboratory Tower, finding NSSC (国家空间科学中心) on the left. The way is highlighted in red on the map.



Lunch

Lunch buffet for all participants of the ISSI-BJ Forum will be available at the canteen on the -1 floor of the NSSC buidling A.

Coffee Breaks

Coffee breaks will be provided in the ISSI-BJ Office, across from the meeting room, see Program to check the coffee break times.

Useful Information

Credit Cards: Credit and debit cards can be used in ATMs displaying the appropriate sign. Credit cards are increasingly becoming accepted in major shopping zones and high level restaurants but keep some cash handy just in case.
You can find two ATMs at the NSSC lobby of Building A.

Currency: Chinese Yuan Renminbi (RMB)
(1 USD = approx. 6.6 RMB)
(1 EUR = approx. 7.8 RMB)

Drinking Water: Avoid drinking tap water directly. Bottled water and mineral water can be found in convenience stores and drink stalls. The price is 2-10 yuan RMB per bottle.

Electricity: 220 volts AC

Taxi: Please contact Ms. Lijuan EN: +86-139-1139-7464 if you need to book a taxi.

Time: UTC/GMT +8 hours

Emergency Contact Person in China

Ms. Lijuan EN +86-139 1139 7464

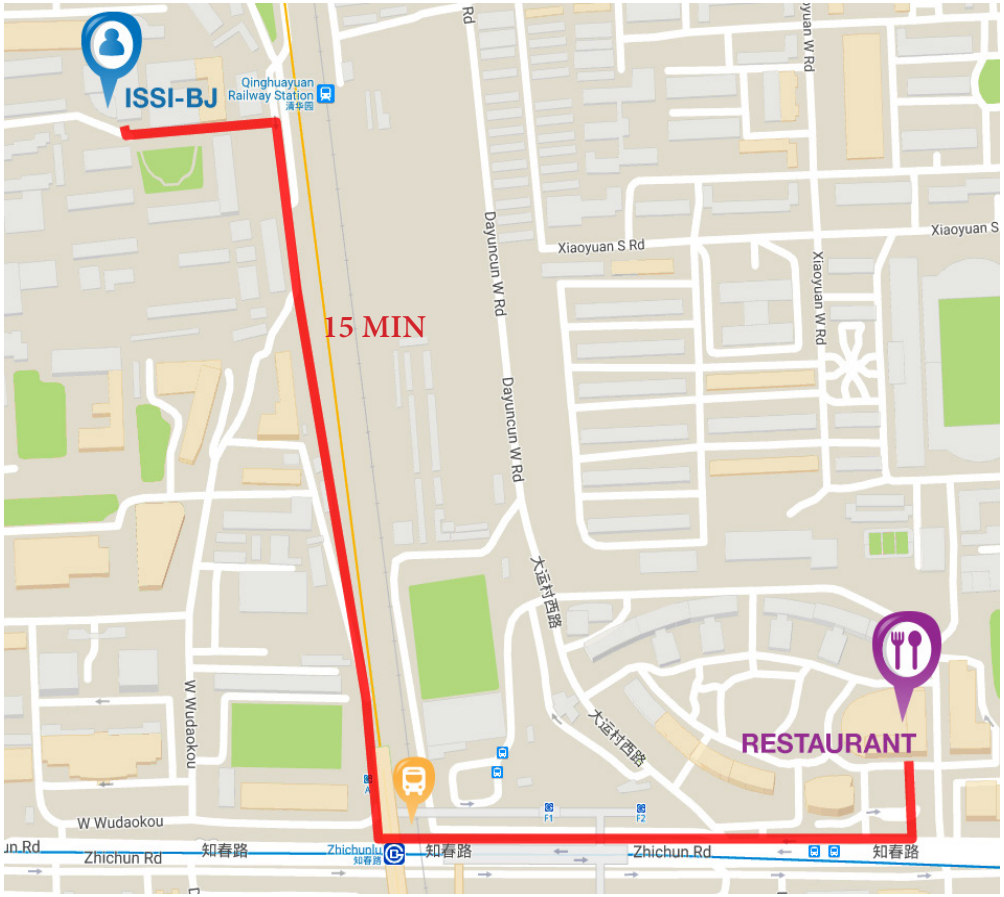
Ms. Laura BALDIS +86-157 2667 3953

ISSI-BJ Dinner Location - September 5, 2019

Dinner offered by ISSI-BJ on Thursday, September 5 at 18:30.

Restaurant:
Amber 6, 2nd Floor of Park Plaza
Beijing Science Park
丽亭华苑酒店金辉6厅

Address:
No. 25 Zhichun Rd. (知春路),
Haidian District, Beijing
北京市海淀区知春路25号



Project Team Dinner Location - September 6, 2019

Dinner on Friday, September 6 at 18:30.

Restaurant:
Wumingju Restaurant
(Zhongguancun)
无名居 （中关村店）

Address:
Chun'an room, Liaoning Building
3rd floor, No. 2 Sibeihuan West Road, Haidian District
海淀区，北四环西路甲2号辽宁大厦3层, 春安厅

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6	Escoubet, Philippe	ESTEC, ESA
7	Falanga, Maurizio	ISSI-BJ, China
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26	Zelenyi, Lev	IKI, RAS, Russia
27	Zhou, Meng	Nanchang University, China

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Forum website:
http://www.issibj.ac.cn/Program/Forums/CrossScale/201904/t20190402_207495.html

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Advancing Space Science Research by Worldwide Collaboration

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