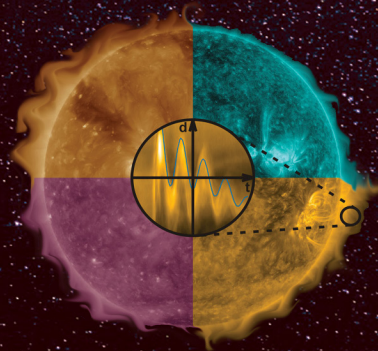


OSCILLATORY PROCESSES IN SOLAR AND STELLAR CORONAE

OCTOBER 14-18, 2019
EARTH HALL A0401



WORKSHOP
HANDBOOK

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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.

ISSI-BJ CALL FOR PROPOSALS

ISSI-BJ Activities

ISSI-BJ organizes a wide range of activities, such as Forums, Workshop, Working Groups, and International Teams. **Applications to join our programs are always welcome.** More info available at issibj.ac.cn.



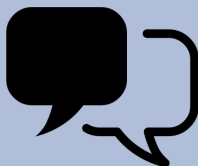
International Teams *Annual call in January*

Goal: Research focus, 10-15 scientists
Duration: 1-2 years
Result: Publications
Support: Living costs while in Beijing, travel support to team leader



Workshops

Goal: Research focus, 30-40 scientists
Duration: 5 days
Result: Book
Support: Living costs while in Beijing



Forums

Goal: Open discussion among 20-30 scientists
Duration: 2 days
Result: Taikong Magazine
Support: Living costs while in Beijing



Visiting Scientists

Goal: Research focus
Duration: As long as needed
Result: Book and publications
Support: Living costs while in Beijing, travel support if needed

ORGANIZERS

The Workshop on “Oscillatory Processes in Solar and Stellar Coronae” is organized by the International Space Science Institute - Beijing (ISSI-BJ).

Conveners

- Valery Nakariakov, University of Warwick, UK
- Dipankar Banerjee, Indian Institute for Astrophysics, India
- Bo Li, Shandong University, China
- Tongjiang Wang, NASA-Goddard Space Flight Center, USA
- Ivan Zimovets, Space Research Institute of RAS, Russia
- Maurizio Falanga, ISSI-BJ, China

Sponsors



WORKSHOP OUTLINE AND PROGRAM

Context and Objectives of the Forum

In 2019 there will be the 50th anniversary of the first detection of oscillatory processes in the solar corona as a quasi-periodic pulsation (QPP) of an X-ray and radio emission produced by a solar flare (Parks & Winckler, 1969). Nowadays, the study of oscillatory phenomena in the solar corona has reached its maturity. Coronal oscillations are detected and analysed in all observational bands, from radio to gamma-rays, and with ground-based and spaceborne instruments. The study of oscillatory phenomena is now considered as an important aim in almost every upcoming space mission dedicated to solar physics. Analysis and modelling of solar coronal oscillations and waves resulted in the successful implementation of the wave-based plasma diagnostic techniques ("magnetohydrodynamic (MHD) seismology"), contributed to the solution of the enigmatic problems of solar coronal heating and fast solar wind acceleration, and created a solid ground for the exploitation of solar-stellar and coronal-magnetospheric analogies.

The successful exploitation of the abundant information

on oscillatory processes in the solar corona, obtained with the current generation of spaceborne and ground-based observational instruments (especially SDO/AIA, Hinode/EIS, STEREO/EUVI, NoRH and IRIS), and comprehensive theoretical numerical and analytical modelling, and the need for the identification of the future research avenues being opened up by the upcoming new generation of the solar instruments (Parker Solar Probe, DKIST, Proba-3 ASPIICS, ASO-S, Aditya, Solar Orbiter, Siberian Radio Heliograph, MUSER, InterHelioProbe, and ARKA) requires consolidated efforts of the international research community.

This ISSI-BJ workshop will become a long-awaited forum gathering the most active researchers and promising young fellows in the field, which will allow us to summarise the main research achievements reached in the last decade, identify important gaps in our knowledge and discrepancies between observations and theory and the ways for their resolution, assess existing data analysis and modelling tools and approaches, and identify the most promising

future research avenues in our research field. Putting the many recent results and new developments into the broader context of the physics driving plasma diagnostics based upon MHD oscillations is the next step, which will benefit from the combined efforts of theorists, observers and modellers working on a large variety of spatial scales, and spanning a wide range of expertise. We will specifically address future efforts in this field, both theoretically and observationally. In particular, the topics of the high priority are the exploitation of the complementarity of multi-instrumental and multi-wavelength observations, development and benchmarking of modern data analysis tools, accounting for the recently established nonlinear effects, and creating and using a link between analytical theory, numerical modelling and the

interpretation of observations.

In addition, for the first time, we shall debate the solar-stellar analogy in the study of solar and stellar coronal oscillations, based on the recent detections of quasi-periodic patterns in stellar flaring energy releases with Kepler and XMM-Newton, and the striking similarity of the properties of those oscillatory patterns in solar and stellar flares. The identification of the solar-stellar analogy is especially timely now in the context of the TESS space mission.

An important outcome will be the publication of a Topical Issue of the Space Science Reviews and an ISSI monograph, summarising the current state-of-the-art in the field, identifying future research avenues, and reflecting on discussions on the proposed workshop.

Main Themes of the Workshop

The workshop will cover a wide range of fields related to coronal physics:

- Seismology of coronal plasma structures;
- Novel data analysis techniques, addressing the intrinsically non-stationary nature of the observed oscillatory patterns;
- Nonlinear effects: manifestation in observations and theoretical modelling;
- Complementarity and exploitation of multi-instrumental and multi-wavelength observations;
- The similarity of quasi-periodic pulsations detected in solar and stellar flares, and its importance for revealing the mechanisms for those pulsations and the energy releases.

Program

MONDAY, October 14

| | Subject | Contributor |
|-------------|--|----------------------|
| | Session 1a | Chair: V. Nakariakov |
| 8:30-9:00 | <i>Registration</i> | |
| 9:00-9:15 | Welcome and introduction to ISSI-BJ and to the workshop | Xiaolong Dong |
| 9:15-9:30 | Welcome; Introduction to the Activity Plan; Structure of the TI/Monograph | Valery Nakariakov |
| 09:30-10:00 | Vision of Chapter 2: "Kink oscillations and waves in the corona" | Valery Nakariakov |
| 10:00-10:30 | Vision of Chapter 1: "Novel techniques in coronal seismology data analysis" | Sergey Anfinogentov |
| 10:30-11:00 | <i>Coffee Break</i> | |
| | Session 1b | Chair: L. Ofman |
| 11:00-11:30 | Vision of Chapter 3: "Slow waves in coronal loops" | Tongjiang Wang |
| 11:30-12:00 | Vision of Chapter 4: "MHD waves in open coronal structures" | Dipankar Banerjee |
| 12:00-12:30 | Vision of Chapter 5: "Quasi-periodic pulsations in solar and stellar flares" | Ivan Zimovets |
| 12:30-14:00 | <i>Lunch</i> | |
| | Session 1c | Chair: P. Antolin |
| 14:00-14:30 | Vision of Chapter 6: "Sausage oscillations and waves in the corona" | Bo Li |
| 14:30-15:00 | Vision of Chapter 7: "Coronal heating by MHD waves" | Tom Van Doorselaere |
| 15:00-15:30 | <i>Coffee Break</i> | |

MONDAY, October 14

| | Subject | Contributor |
|-------------|--|----------------------------|
| | Session 1d | Chair: H. Tian |
| 15:30-15:50 | High-resolution Diagnostic Techniques for the Solar Corona | David Pascoe |
| 15:50-16:10 | Properties of sausage and kink modes in the solar corona | Soheil Vasheghani Farahani |
| 16:10-16:30 | MHD waves in coronal arcades: some theoretical aspects | Rekha Jain |
| 16:30-17:30 | Open Discussion | |

TUESDAY, October 15

| | Subject | Contributor |
|-------------|--|----------------------|
| | Session 2a | Chair: D. Pascoe |
| 09:00-09:20 | Spectroscopic observations of decayless kink oscillations in coronal loops and sausage oscillations in flare loops | Hui Tian |
| 09:20-09:40 | Amplitudes and energy fluxes of simulated decayless kink oscillations | Tom Van Doorsselaere |
| 09:40-10:00 | Doppler shift oscillations at flaring loops observed by IRIS | Dong Li |
| 10:00-10:20 | Oscillations of Tornado observed by SDO/AIA | Yuzong Zhang |
| 10:20-11:10 | <i>Coffee Break</i> | |
| | Session 2b | Chair: A. Srivastava |
| 11:10-11:30 | Determining the structure of the solar corona from cometary tails | Giuseppe Nistico |

TUESDAY, October 15

| | Subject | Contributor |
|-------------|---|-----------------------------|
| 11:30-11:50 | Effect of the thermodynamical activity of the coronal plasma on the dynamics of MHD waves | Dmitrii Kolotkov |
| 11:50-12:10 | The damping of propagating slow waves in coronal loops | Sayamanthula Krishna Prasad |
| 12:10-12:30 | Modeling Flare-Associated Waves in Coronal Active Regions | Leon Ofman |
| 12:30-14:00 | <i>Lunch</i> | |
| | Session 2c | Chair: D. Yuan |
| 14:00-14:20 | Observational Studies of Low Frequency Coronal Waves | Yuandeng Shen |
| 14:20-14:40 | Excitation of MHD waves by plasmoid ejection in solar corona reconnection | Liping Yang |
| 14:40-15:00 | Forward modeling of transverse MHD waves in coronal holes | Vaibhav Pant |
| 15:00-15:20 | Probing temperature structure of coronal fans by propagating slow MHD waves | Sergey Anfinogentov |
| 15:20-15:40 | High resolution observations of Sunspot Oscillation with BBSO/GST | Jiangtao Su |
| 15:40-16:10 | <i>Coffee Break</i> | |
| | Session 2d | Chair: Z. Ning |
| 16:10-16:30 | Modelling Quasi-Periodic Pulsations in Solar and Stellar Flares | James McLaughlin |
| 16:30-16:50 | Modulation of radio emission mechanisms by MHD waves | Alexey Kuznetsov |
| 16:50-17:10 | Problems and challenges of studying the non-stationary properties of QPPs | Elena Kupriyanova |

TUESDAY, October 15

| | Subject | Contributor |
|-------------|--|---------------|
| 17:10-17:30 | Forward modeling of a simulated flux rope ejection | Xiaozhou Zhao |
| 18:30 | <i>ISSI-B7 Welcome Dinner</i> | |

WEDNESDAY, October 16

| | Subject | Contributor |
|-------------|--|-----------------|
| | Session 3a | Chair: Dong, Li |
| 9:00-9:20 | The AFINO approach to finding oscillations in solar and stellar flares: latest results and updates | Andrew Inglis |
| 9:20-9:40 | Comparison of Damped Oscillations in Solar and Stellar X-Ray flares | Il-Hyun Cho |
| 9:40-10:00 | X-ray flare periodic pulsations from sloshing wavefronts along star-disk magnetic tubes in the Orion star-forming region | Fabio Reale |
| 10:00-10:20 | Spatial extent of a QPP during a M-class flare | Ding Yuan |
| 10:20-10:50 | <i>Coffee Break</i> | |
| | Session 3b | Chair: F. Reale |
| 10:50-11:10 | Radio QPPs Occurred in Precursor Phase of Solar Flares | Baolin Tan |
| 11:10-11:30 | MUSER Observations associated with Coronal Oscillations in Flare Events | Yihua Yan |
| 11:30-11:50 | Quasi-periodic Pulsations before and during a Solar Flare in AR 12242 | Xingyao Chen |

WEDNESDAY, October 16

| | Subject | Contributor |
|-------------|--|---------------------|
| 11:50-12:10 | Intermittent Sequence of Decimetric type U solar radio bursts and EUV Jet Phenomena on 2011 February 9 | Guannan Gao |
| 12:10-12:30 | Chromospheric Condensation and Quasi-periodic Pulsations in a Circular-ribbon Flare | Qingmin Zhang |
| 12:30-14:00 | <i>Lunch and Group Photo</i> | |
| | Session 3c | Chair: R. Jain |
| 14:00-14:20 | On Flare-associated, Fast-mode Coronal Wave Trains | Wei Liu |
| 14:20-14:40 | Accurate measurement of sausage oscillations | Zhong Liu |
| 14:40-15:00 | Synthetic Ultraviolet Emissions from Coronal Loops experiencing Fast Sausage Modes | Mijie Shi |
| 15:00-15:20 | Filament longitudinal oscillations and their decay | Pengfei Chen |
| 15:20-15:50 | <i>Coffee Break</i> | |
| | Session 3d | Chair: P. Chen |
| 15:50-16:10 | Aspects of MHD wave heating in the complex solar atmosphere | Ineke De Moortel |
| 16:10-16:30 | Influence of Resonant Absorption on the Generation of the Kelvin-Helmholtz instability | Patrick Antolin |
| 16:30-16:50 | Novel Heating Candidates for the Localized Solar Corona: High-frequency Torsional Alfvén Waves, Pseudo-shocks, and Forced Reconnection | Abhishek Srivastava |

WEDNESDAY, October 16

| | Subject | Contributor |
|-------------|--|--------------------|
| 16:50-17:10 | A novel prospect on coronal heating by MHD turbulence | Norbert Magyar |
| 17:10-17:30 | Wave heating in simulated multistranded coronal loops | Mingzhe Guo |
| 17:30-17:50 | MHD wave modes in magnetic flux tubes with elliptical cross-section (remote) | Gary Verth |

THURSDAY, October 17

| | Subject | Contributor |
|-------------|---|------------------------|
| 09:00-09:45 | Co-authors and material of Chapter 1: "Novel techniques in coronal seismology data analysis" | Chair: S. Anfinogentov |
| 09:45-10:30 | Co-authors and material of Chapter 2: "Kink oscillations and waves in the corona" | Chair: V. Nakariakov |
| 10:30-11:00 | <i>Coffee Break</i> | |
| 11:00-11:45 | Co-authors and material of Chapter 3: "Slow waves in coronal loops" | Chair: T. Wang |
| 11:45-14:00 | <i>Lunch</i> | |
| 14:00-14:45 | Co-authors and material of Chapter 4: "MHD waves in open coronal structures" | Chair: D. Banerjee |
| 14:45-15:30 | Co-authors and material of Chapter 5: "Quasi-periodic pulsations in solar and stellar flares" | Chair: I. Zimovets |
| 15:30-16:00 | <i>Coffee Break</i> | |
| 16:00-16:45 | Material and Co-authors of Chapter 6: "Sausage oscillations and waves in the corona" | Chair: B. Li |

THURSDAY, October 17

| | Subject | Contributor |
|-------------|---|----------------|
| 16:45-17:00 | Recent results in Bayesian coronal and prominence seismology (remote) | Inigo Arregui |
| 17:00-17:15 | Transverse loop oscillations from 3D MHD simulations (remote) | Jaume Terradas |

FRIDAY, October 18

| | Subject | Contributor |
|-------------|--|---------------------------|
| 9:00-09:45 | Co-authors and material of Chapter 7: "Coronal heating by MHD waves" | Chair: T. Van Doorselaere |
| 09:45-10:30 | Material of Chapter 8: "Future and outlook" and wrapping up comments | Chair: V. Nakariakov |
| 10:30-11:00 | <i>Coffee Break</i> | |
| 11:00-12:30 | Open Discussion and Concluding Remarks | Chair: V. Nakariakov |
| 12:30-14:00 | <i>Lunch</i> | |

PRACTICAL INFORMATION

Venue

The Workshop will be held in the Earth Hall (A0401), 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 USB ports, connected to high-speed network and printer.

WIFI Access

Login via web: NSSC-guest

Username: issi-bj

Password: issi-bj



Accommodation

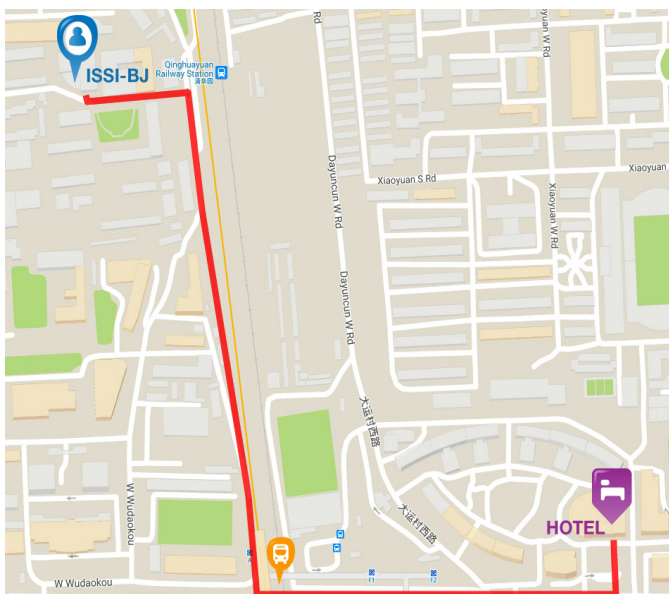
ISSI-BJ covers the cost of the accommodation and breakfast. Please kindly note that all the other expenses in hotel will be deducted from your check-in deposit.

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 Workshop will be

available at the canteen on the -1 floor of the NSSC Building A.

Coffee Breaks

Coffee breaks will be provided at the entrance of Earth hall. See

the Program section 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

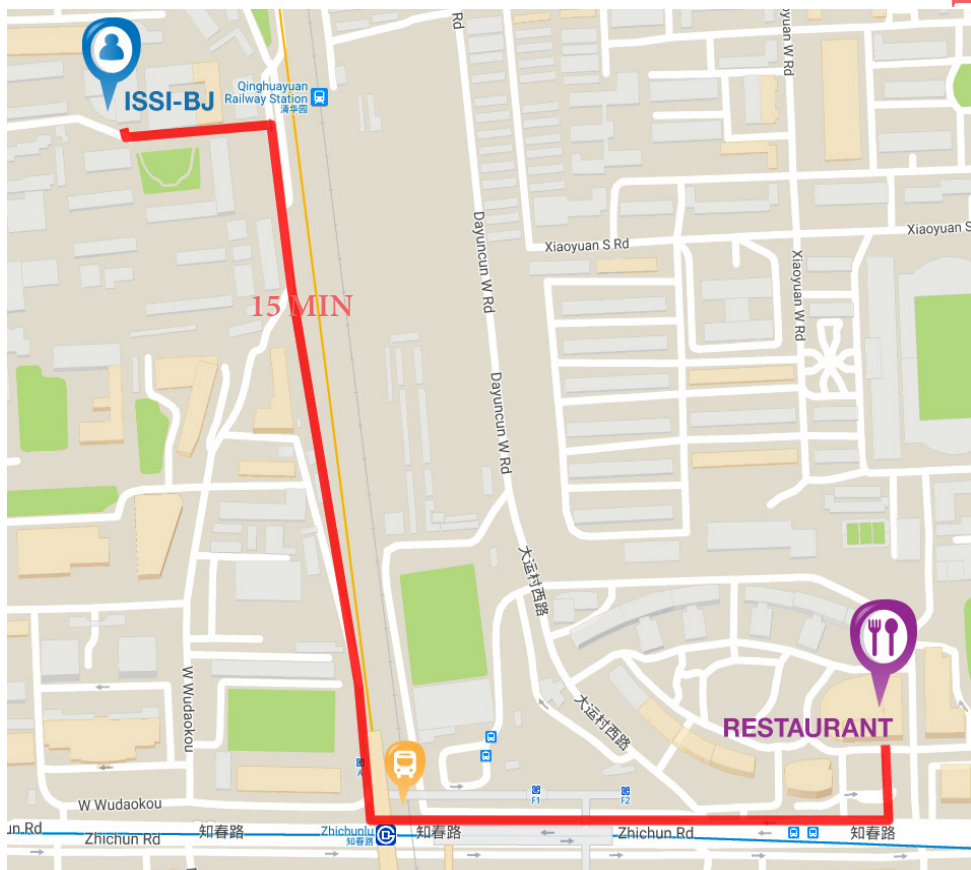
DINNER

Dinner on October 15, 2019

Dinner offered by ISSI-BJ on
Tuesday, October 15, 2019 at
18:30.

Restaurant:
Amber 5, 3rd Floor of Park Plaza
Beijing Science Park
丽亭华苑酒店金辉5厅

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



PARTICIPANTS

| No. | Name | Institution |
|----------------------------|------------------------|--|
| CONVENERS AND PARTICIPANTS | | |
| 1 | Antolin Patrick | University of St Andrews, UK |
| 2 | Anfinogentov Sergey | Institute of Solar-Terrestrial Physics of the Russian Academy of Sciences, Siberian Branch, Russia |
| 3 | Arregui Inigo (remote) | Universidad de La Laguna, Spain |
| 4 | Baldis Laura | ISSI-BJ, China |
| 5 | Banerjee Dipankar | Indian Institute for Astrophysics, India |
| 6 | Chen Pengfei | Nanjing University, China |
| 7 | Chen Xingyao | National Astronomical Observatory of the Chinese Academy of Sciences, China |
| 8 | Cho Il-Hyun | Kyung Hee University, Korea |
| 9 | De Moortel Ineke | University of St Andrews, UK |
| 10 | Dong Xiaolong | ISSI-BJ, China |
| 11 | En Lijuan | National Space Science Center, China |
| 12 | Falanga Maurizio | ISSI-BJ, China |
| 13 | Gao Guannan | Yunnan Observatories of the Chinese Academy of Sciences, China |
| 14 | Guo Mingzhe | Catholic University of Leuven, Belgium & Shandong University, China |
| 15 | Inglis Andrew | National Aeronautics and Space Administration (NASA), USA |
| 16 | Jain Rekha | University of Sheffield, UK |
| 17 | Kolotkov Dmitrii | University of Warwick, UK |

| No. | Name | Institution |
|-----|---------------------|--|
| 18 | Kupriyanova Elena | Central Astronomical Observatory of the Russian Academy of Sciences at Pulkovo, Russia |
| 19 | Kuznetsov Alexei | Institute of Solar-Terrestrial Physics of the Russian Academy of Sciences, Siberian Branch, Russia |
| 20 | Li Bo | Shandong University, China |
| 21 | Li Dong | Purple Mountain Observatory of the Chinese Academy of Sciences, China |
| 22 | Liu Wei | Lockheed-Martin, USA |
| 23 | Liu Zhong | Yunnan Observatories of the Chinese Academy of Sciences, China |
| 24 | Magyar Norbert | Catholic University of Leuven, Belgium |
| 25 | McLaughlin James | Northumbria University, UK |
| 26 | Nakariakov Valery | University of Warwick, UK |
| 27 | Ning Zongjun | Purple Mountain Observatory of the Chinese Academy of Sciences, China |
| 28 | Nistico Giuseppe | University of Gottingen, Germany |
| 29 | Ofman Leon | National Aeronautics and Space Administration (NASA), USA |
| 30 | Pant Vaibhav | Indian Institute for Astrophysics, India |
| 31 | Pascoe David | Catholic University of Leuven, Belgium |
| 32 | Prasad Krishna | Queens University Belfast, UK |
| 33 | Reale Fabio | University of Palermo, Italy |
| 34 | Shen Yuandeng | Yunnan Observatories of the Chinese Academy of Sciences, China |
| 35 | Shi Mijie | Shandong University, China |
| 36 | Srivastava Abhishek | Indian Institute of Technology, India |

| No. | Name | Institution |
|-----|----------------------------|---|
| 37 | Su Jiangtao | National Astronomical Observatory of the Chinese Academy of Sciences, China |
| 38 | Tan Baolin | National Astronomical Observatory of the Chinese Academy of Sciences, China |
| 39 | Terradas Jaume (remote) | Universitat de les Illes Balears, Spain |
| 40 | Tian Hui | Peking University, China |
| 41 | Van Doorselaere Tom | Catholic University of Leuven, Belgium |
| 42 | Vasheghani Farahani Soheil | Tafresh University, Iran |
| 43 | Verth Gary (remote) | University of Sheffield, UK |
| 44 | Wang Tongjiang | NASA-Goddard Space Flight Center, USA |
| 45 | Yan Yihua | National Astronomical Observatory of the Chinese Academy of Sciences, China |
| 46 | Yang Liping | National Space Science Center of the Chinese Academy of Sciences, China |
| 47 | Yuan Ding | Harbin Institute of Technology, China |
| 48 | Zhang Qingmin | Purple Mountain Observatory of the Chinese Academy of Sciences |
| 49 | Zhang Yuzong | National Astronomical Observatory of the Chinese Academy of Sciences, China |
| 50 | Zhao Xiaozhou | Purple Mountain Observatory of the Chinese Academy of Sciences, China |
| 51 | Zimovets Ivan | Space Research Institute of the Russian Academy of Sciences (IKI), Russia |

NOTES

Workshop website:

http://www.issibj.ac.cn/Program/Workshops/Oscillatory/201903/t20190314_206856.html



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