

Second Circular – Workshop of the International Space Science Institute (ISSI)

1 March 2013

Multi-scale structure formation and dynamics in cosmic plasmas

Convenors:

Spiro Antiochos (NASA/GSFC, USA)
André Balogh (Imperial College London, UK)
Andrei Bykov (Ioffe Physical-Technical Institute, St. Petersburg, Russia),
Jonathan Eastwood (Imperial College London, UK),
Jelle Kaastra (SRON, Utrecht, The Netherlands)

Local organisation: Jennifer Zaugg, ISSI, jennifer.zaugg@issibern.ch
Phone: +41 31 631 48 96, Fax: +41 31 631 48 97

Date: 15 - 19 April 2013

Context: The International Space Science Institute (ISSI) is holding a series of three Workshops on physical processes in cosmic plasmas. The initiative is based on discussions held in an ISSI Forum in March 2009 on the future of magnetospheric research and also subsequently. The objective of the workshops is to broaden the review of space plasma physics to all scales in the Universe. The Workshop on "*Particle acceleration in cosmic plasmas*" was the first to be held on 16 to 20 May 2011. It was followed by the Workshop on the "*Microphysics of cosmic plasmas*" on 16 to 20 April 2012. The third Workshop in the series, on "*Multi-scale structure formation and dynamics in cosmic plasmas*" will be held in ISSI on 15 to 19 April 2013.

Workshop website: <http://www.issibern.ch/workshops/cosmicplasma3/>

Objective of the Workshop:

A great challenge of modern astrophysics is understanding the physics of structure formation at very different scales from planetary magnetospheres to the largest scale structures of the universe. Structure formation is always a highly non-linear process involving energy transfers between different constituents of cosmic matter and fields. Nonlinear plasma processes play a key role in many models of cosmic structure formation and their dynamics on a very broad range of scales.

The Workshop will review observations of structure formation and dynamics on all scales: in situ and remotely from space, and also ground-based, from the magnetosphere to cosmological scales. A detailed assessment will be made of the physical processes underlying the formation of structures in these different physical environments. Special attention will be paid to the interaction between scales and similarities in the processes that shape the structures on the different scales. We will cover the theory and modelling of the physical processes that lead to the amazing variety and nontrivial dynamics of structures in cosmic plasmas.

The Workshop will cover the following main themes:

A. The phenomenology and modelling of astrophysical structures

- Cosmological-scale structures relevant to plasmas
- Plasma phenomena in clusters of galaxies
- The environment of Active Galactic Nuclei
- Structures and dynamics of galaxies
- Interstellar structures and dynamics
- Solar structures and dynamics from the photosphere to the corona
- Heliospheric structures and dynamics
- Magnetospheric boundaries and structures

B. Physics of structure formation in cosmic plasma

- Plasma relaxed states and structure formation and the role of the helicity in laboratory and astrophysical plasmas
- Turbulence, intermittency and shocks in cosmic structures
- Overview of astrophysical plasma structures
- Structures in plasmas: from the laboratory to cosmic scales

Product: Following the Workshop, its output will be published as a volume in the Space Science Series of ISSI by Springer, in parallel with the publication of the papers in Space Science Reviews. It is expected that a total of about 15 to 20 review style and quality papers, submitted to the usual refereeing process will be published in the book. Papers will be based on talks presented at the Workshop and will reflect the discussions

that are encouraged to be held among the participants during the Workshop. A realistic schedule for the publication of the contributions will be confirmed at the conclusion of the Workshop, but the deadline is expected to be end of September 2013.

Advice to the speakers

The conveners would like to remind the speakers that ISSI workshops differ in many ways from other, larger gatherings called "workshop". The guiding spirit of the ISSI workshops is interdisciplinarity - contributors are invited from a range of communities to interact during the workshop, so that the broad synthesis of the topics covered can emerge in the published contributions the ISSI volume of the workshop. In your talks we would like you to focus both on the topic we have asked you to speak on (as opposed to the topic it is easiest for you to speak on), and to consider broad implications of your topic for cosmic plasmas. In particular, please emphasize those aspects that may be applicable to other environments and parameter spaces - please show awareness of the ubiquity of plasma phenomena in the Universe. While many of the attendees will not be entirely familiar with your own work, all the attendees are able plasma physicists and will have views on how your work can relate to other problems. Take a bit of time to outline what we don't know, and how this lack of knowledge may be resolved.

Location: The Workshop will be held at the International Space Science Institute, Hallerstrasse 6, 3012 Bern, Switzerland.

Attendance: by invitation only. The Draft Program attached to this Second Circular only names confirmed participants in the Workshop.

Funding: ISSI will provide the subsistence costs (hotel and a per diem to cover meals) to all participants, but not the travel costs. There will be no registration charge for the Workshop.

Young scientist program of ISSI

Up to six young scientists will be invited to participate in the Workshop. The definition in this context is that they should be within 2 years of their PhD (plus or minus). ISSI will cover the subsistence costs (hotel and meals) to the invited young scientists.

Travelling to Bern

Bern can be reached easily from two international airports: [Zurich \(ZRH\)](#) and [Geneva \(GVA\)](#). Direct intercity trains to Bern depart every half hour from inside the airport buildings; see www.rail.ch for detailed departure times. The travel time is ~1.5 hours from Zurich airport and ~2 hours from Geneva airport.

There is also a local airport (Bern, BRN <http://www.flughafenbern.ch/>), located a 20 minute shuttle ride from the city centre, with direct connections to Munich, Berlin

Schönefeld, London, Hamburg, Amsterdam, London City, Vienna and Paris Orly and other cities.

Bern is connected to many European cities by fast intercity trains (e.g. TGV Paris-Bern in 4.5 hours, or Frankfurt-Bern 5 hours). Up-to-date timetable information of trains within and around Switzerland can be found at www.rail.ch. Also check out our website www.issibern.ch/ for a few more travel tips such as links to city maps of Bern, weather forecasts, tourist information etc...

Hotel reservations

A block booking has been made in city centre hotels for the Workshop. All participants at the workshop are requested to contact the workshop secretary, Jennifer Zaugg (Tel. +41-31-631-4896, Fax: +41-31-631-4897, email: Jennifer.Zaugg@issibern.ch), to indicate their arrival and departure dates and times, as well as any special requests they may have (e.g. double room). Please note that all hotel reservations have to be done by the ISSI Secretariat.

A confirmation will be returned within a few days. Block bookings have been made in nearby hotels; please see <http://www.issibern.ch/localguide/location.html> for maps that indicate the location of ISSI and of the hotels (go to “hotels”, and near the bottom of the page “map of hotels”).

Schedule:

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| Invitations and First Circular: | 20 September 2012 |
| Registration deadline: | 30 November 2012 |
| Second Circular and final program: | 1 March 2013 |
| Workshop: | 15 – 19 April 2013 |