

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

21 June 2012

Multi-scale structure formation and dynamics in cosmic plasmas

Convenors:

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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, 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.

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 of the Workshop

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.

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

Attendance: by invitation only, ~ 40 participants maximum.

Young scientists: Under its special programme of supporting young scientists, ISSI will invite (in addition) 4 to 6 early career scientists, within 2 years of their PhD, to take a full part 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.

Schedule:

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