INTERNATIONAL SPACE SCIENCE INSTITUTE
Hallerstrasse 6 • CH-3012 Bern • Switzerland

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

Magnetic Reconnection: Explosive Energy Conversion in Space Plasmas

3-7 August 2020

Conveners

Rumi Nakamura	Space Research Institute, Austria
James L. Burch	Southwest Research Institute, USA
James F. Drake	University of Maryland, USA
Barbara L. Giles	Goddard Space Flight Center, USA
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Objectives and Content of the Workshop

Among the different plasmas, Geospace is a natural plasma laboratory to study the ground truth of how magnetic reconnection operates in nature, since plasmas and fields in action can be directly measured at high cadence. For such in-situ observations, multi-point measurements, where temporal and spatial variations can be separated, are essential for detecting the complex energy conversion processes. With the recent advances in in-situ measurement capabilities, studying non-ideal MHD and kinetic physics of magnetic reconnection and relevant plasma processes became for the first time possible from spacecraft observations. These new observations from different plasma regions (magnetopause, magnetotail current sheet, magnetosheath, solar wind) will be highlighted in the workshop. Enhanced computational capabilities enable us to survey effects of different plasma regimes and current sheet configuration. Dedicated runs for direct comparison between the theory and the observations became possible also for electron-scale physics. Observational and theoretical studies on those effects of the plasma conditions, current sheet geometries, role of the waves and turbulence, particle acceleration, multi-scale aspect of the reconnection will be discussed. Analysis schemes that have been newly developed for characterizing the temporal/spatial changes of the complex plasma processes will be reviewed.
Sudden release of magnetic energy due to magnetic reconnection has been detected by different wave-length in astrophysical phenomena such as flares and gamma-ray

bursts. Recent advances in theoretical simulations have significantly contributed to understanding magnetic reconnection not only for geospace but for astrophysical plasma to help explain the remote sensing data of reconnection. Magnetic reconnection in these different environments are highlighted and compared with the reconnection in the geospace.

The objectives of the workshop is to review progress in research of magnetic reconnection and relevant processes in space plasma, based on recent in-situ multi-point observations and theoretical simulations, and to discuss its astrophysical context. **The purpose of this is to produce the first ISSI reference work on magnetic reconnection dedicated to in-situ multipoint plasma observations combined with theoretical advancements.** Both micro-scale and multi-scale aspects will be included, to be useful for interpreting and quantifying reconnection in other planetary and astrophysical context. The Workshop will cover observations and modeling and highlight what has been learned and what is still not understood.

The Workshop will cover the following main themes:

- Micro-scale processes of magnetic reconnection
- Role of waves and turbulence
- Multi-scale aspects and large-scale context/consequence
- Advances in data analysis techniques and simulation techniques
- Magnetic reconnection in astrophysics and other environments

Short presentations (20 min talk + 10 min discussion) on the above listed topic(s) by all participants are foreseen. All of those attending will contribute to one or more of the chapters.

Product

Based on the presentations and discussions during the workshop, we will select about 15 sub-topics to be published as review papers and to be the content of a volume in the Space Science Series of ISSI by Springer Nature.

Location

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

Attendance

This will be by invitation only with ~ 47 participants maximum including young scientists.

Young scientists

Under its special programme for supporting young scientists, ISSI will invite several early career scientists, within two years of their PhD, to take 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 fee for the Workshop.

Schedule

Invitations and First Circular:	6th April 2020
Registration deadline:	
Second Circular and final program:	3rd June 2020
Hotel deadline:	6th July 2020
Workshop:	3rd-7th August 2020