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

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

**28 March 2018**

# Auroral Physics

**Convenors:**

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# Date: 6–10 August 2018

**Context:**

The aurora is one of the most extensively observed of all space phenomena, with ground-based optical and magnetic observations dating back centuries, and with measurements from countless in situ probes since the beginning of the space age. Despite this, we lack a complete theoretical description of most types of aurora. For example, the familiar quiet green arcs that fill the evening polar sky are known to be caused by plasma sheet electrons accelerated through electrostatic potentials of tens of kV, but what generates and sustains these structures in the magnetosphere? Similarly, diffuse auroras result from pitch angle scattering of plasma sheet electrons by plasma waves, but their complicated temporal pulsations and spatial patterns remain unexplained. Given that auroras are ubiquitous throughout the solar system and beyond, we are compelled to take advantage of our relatively easy access to direct observations of the auroral system and work towards a proper theoretical explanation.

**Objective of the Workshop:**

The purpose of this workshop is to bring together auroral experimentalists (ground-based and in situ), theorists and simulationists in order to produce a thorough assessment of our current state of understanding of the essential properties of auroras and the mechanisms responsible for them. All relevant literature will be reviewed in order to establish the best characterization possible of auroral properties including morphology and structure, lifetime, particle energies and fluxes, relation to electrical currents, variability, frequency of occurrence, locations, source regions, environmental

factors (solar illumination, solar wind), and any other parameters that can be used to test theories. Candidate theories will be summarized and reviewed critically according to their ability to address observed parameters. The workshop and the book that results from it will document established facts and critical gaps in our current understanding, in support of the long-term goal to identify the physical mechanisms underlying the creation and behavior of the aurora.

**The topics covered in the Workshop:**

1) Quiet, discrete arcs
2) Field-line resonance arcs
3) Diffuse and pulsating aurora
4) Polar cap auroras
5) Small-scale dynamic aurora (breakup-related)
6) Large-scale dynamic auroral phenomena (e.g. PBIs, streamers omega bands)
7) Low-latitude and subauroral phenomena (e.g. proton aurora, SAR arcs, STEVE)
8) Cusp/PFAF/shock auroras

**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 a Topical Collection in Space Science Reviews. It is expected that a total of up to 15 high-quality topical review papers will result, to be submitted to the usual refereeing process and published in the book. The 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, with emphasis on interdisciplinarity.

**Location:** The Workshop will be held at the International Space Science Institute, Hallerstrasse 6, 3012 Bern, Switzerland. More information on: www.issibern.ch.

**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:**

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| Formal invitations and First Circular: | 28 March 2018 |
| Registration deadline: | 15 April 2018 |
| Second Circular and final program: | 30 June 2018 |
| Workshop: | 6–10 August 2018 |