

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

15 September 2013

The solar activity cycle: physical causes and consequences

Convenors:

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Date: 11 - 15 November 2013

Context: At a Forum on "*Solar activity and the solar cycle: future developments and applications*" held on 20-21 November last year, the International Space Science Institute (ISSI) considered how it can contribute to a better understanding of the physics of the solar activity cycle. Proposals have been formulated for possible future ISSI activities arising from the discussions at this Forum. Two proposals for Workshops were presented to the Forum and recommended for implementation to the Directorate of ISSI: "*The solar activity cycle: physical causes and consequences*" and "*Solar activity and solar magnetic fields*." These suggestions were accepted in principle by the Directorate of ISSI and, following the consultation of ISSI's Science Committee, the first of these was given the go-ahead. It will be held on 11 to 15 November 2013. Detailed proposals for the second of these workshops will be presented to the Science Committee later in 2013 and it is expected to be held in the second half of 2014.

Objectives of the Workshop:

- to review systematically, from a physical viewpoint, all the indicators of solar activity (focussing on the Schwabe and Hale cycles) and to elaborate possible/likely/proven causal chains from the solar interior to the corona,
- to formulate the most likely physically based causal time sequence(s) from one solar cycle to the next (as a physical basis of predictive models)
- to outline the likely causes/mechanisms of longer term memory - how solar conditions and activity parameters map from one cycle to feed through the next cycle(s)

- to include the topic of stellar activity cycles for a comparative study with the solar activity cycle
- to conclude about the state of knowledge/ignorance about the physics of solar activity

The structure of the Workshop has the following main themes:

- Solar activity indices and their interdependences - a detailed review
 - *11 talks scheduled, on sunspots and sunspot numbers; radio flux; irradiance; plage index, facular areas; flares, CMEs, coronal and heliospheric manifestations*
- Physical inferences from the activity indices (5 talks scheduled)
 - *5 talks scheduled on the Waldmeier effect (inferences from SS time series); inferences from the butterfly diagram; hemispheric asymmetries; the Gnevyshev gap; and forecasting models*
- The interior drivers of solar activity (5 talks scheduled)
 - *5 talks scheduled on helioseismology, the solar cycle and flow fields in the convection zone; magnetic field dynamics in the convection zone; aspects of flux emergence*
- Magnetic feedback and magnetic flux dynamics related to solar activity
 - *8 talks scheduled on meridional flows and flux transport; torsional oscillations; Joy's law; helicity observations, theory and implications; polar magnetic fields, the solar dipole and multipoles.*
- Solar cycles, stellar cycles - a comparative view of solar/stellar activity
 - *4 talks scheduled on what do we know about cyclic variations in solar-like stars? - Asteroseismology and stellar activity; stellar spots and differential rotation; and implications for solar activity.*
- Drawing conclusions: the physical foundation of the solar cycle
 - *5 talks scheduled on parameters that lead to 11-year cyclic behaviour of the solar magnetic field; dynamo theories of the solar cycle; physical basis of flux emergence from the tachocline; oscillator models of the solar cycle; and solar cycle variability: stochastic or chaotic?*

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, with emphasis on interdisciplinarity. During the Workshop, the Convenors will encourage the participants to formulate proposals for the review papers and to suggest a list of authors. There will be time for informal get-togethers of collaborators. By the conclusion of the Workshop, it is expected that a list of papers, with provisional titles and authors will be agreed by the participants. 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 April 2014.

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 the cyclic nature of solar activity, with special emphasis on the 11- and 22 year cycles. Longer term variability is also of interest, but primarily in shedding light on the cyclic activity. While many of the attendees will not be entirely familiar with your own work, all the attendees are solar 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. Please make sure that your talk is NO LONGER than 25 minutes, so that at least three or four immediate questions can be asked. The Workshop's environment is suitable for off-line discussions.

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.

Equipment available at ISSI

The ISSI Seminar Room, where the Workshop will be held, is equipped with a computer, a projector for electronic presentations with a big screen, a video/DVD player, an overhead projector and a whiteboard. The seminar room has high-speed wireless connection (either using EDUROAM or ISSI's own credentials) and the standard Ethernet connection using RJ45 cables. The institute provides a heterogeneous

workstation environment with several computers available to be used by our visitors (Windows, Macintosh and Linux). A photocopy machine, two scanners, two printers and TV are also available as well as a range of electrical adapters for the Swiss system.

Participants who wish to bring their own notebook computers will be able to connect with the Internet using one of the options mentioned above. You will also be able to connect with the projector from your own notebook. If you have any questions or need help in computer related matters, please contact Saliba F. Saliba saliba@issibern.ch.

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 at a 20 minute shuttle ride from the city centre, with direct connections to Munich, Berlin Schönefeld, Hamburg, Amsterdam, London City, Vienna and Paris Orly and others.

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). 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:

Formal invitations and First Circular:	1 May 2013
Registration deadline:	31 May 2013
Second Circular and final program:	15 September 2013
Workshop:	11 - 15 November 2013