

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

29 April 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 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.

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:

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