

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

**31 August 2012**

### **Helioseismology and Dynamics of the Solar Interior**

#### **Convenors**

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**Date: 24 - 28 September 2012**

#### **Background**

Helioseismology, the study of the Sun's interior from observations of the vibrations of its surface, has since 1970 become a highly productive technique given the ongoing excitation of the interior vibration modes, probably by turbulence in the convection zone. Long observing times are essential to measure the oscillation frequencies with the precision required, and to extract the lowest mode frequencies involved. Earth-based observations have been undertaken with widely spread networks. In addition, the enormous value of long-term space-based observations has been demonstrated by the three helioseismology instruments aboard the Solar and Heliospheric Observatory (SOHO) located in space at the Sun-Earth L1 point. The Solar Dynamics Observatory's Helioseismic Magnetic Imager (SDO-HMI) is now adding further high quality observations to the large volume of space data already available.

#### **Objectives of the Workshop:**

The Workshop is designed to review in depth what has been achieved in helioseismology, to examine the techniques employed and, in particular, to chart a course for the future development of this important discipline particularly in relation to advancing understanding of the dynamics of the solar interior. Application of these techniques to stellar interiors is growing in importance and so the helioseismology/asteroseismology relationship will be examined. However the principal aim of the Workshop is to comprehensively review the current and future status of solar studies.

Following discussion by the Convenors, it is proposed that the Workshop will cover the following main themes:

1. Historical overview of helioseismology
  - techniques, instruments and results
  - space missions and their output
2. Understanding solar abundances and the structure and microphysics of the solar interior
3. Understanding solar dynamics, rotation, convection and overshoot
4. Understanding solar magnetism and the 11-yr cycle
5. The importance of long-term synoptic observations and datasets
6. Sub-photosphere to solar atmosphere connection
  - Irradiance as a function of solar latitude and longitude
7. Computational helioseismology: forward and inverse problems
8. New data analysis techniques and data assimilation
9. New observational techniques
10. Helioseismology with Solar Orbiter
11. Future mission concepts for helioseismology
12. The solar-stellar connection
  - Temporal and wavelength variation of solar irradiance
  - Asteroseismology of solar-like stars
13. Summary

Short presentations by those attending will be structured around the above headings. This list could, subject to discussion and assessment at the Workshop, become the set of chapter headings for the ISSI book. All of those attending will be expected to contribute to one or more of the chapters.

## **Product**

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 12 to 15 review style and quality chapters, submitted to the usual refereeing process will be published in the book. Chapters will be based on talks presented at the Workshop and will reflect the

discussions that will be held among the participants during the Workshop. A realistic schedule for the publication of the contributions will be agreed and confirmed at the end of the Workshop but the deadline is expected to be end of January, 2013.

### **Advice to 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 interaction between the attendees who are representing, in this case, all aspects of helioseismology. The resulting multi-author chapters should provide a broad view of the current status of this important discipline but, above all, the Workshop should focus on the future directions of the subject – what we are seeking to achieve in the future and what we need to do to get there. This latter aspect includes new missions, new instrumentation and observing methodologies, new analysis techniques and the development of theory. With this in mind, *presenters are encouraged to spend a significant fraction of their talks in addressing future directions and challenges and the barriers that need to be overcome*. We anticipate that the extended discussion sessions on Monday, Tuesday and Thursday will seek to emphasise these aspects.

### **Location**

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

### **Attendance**

This will be by invitation only. The final version of the Workshop programme is attached to this circular.

### **Young scientists**

Under its special programme for supporting young scientists, ISSI will invite five early career scientists, within two years of their PhD, to take a full part in the Workshop. ISSI will cover the subsistence costs (hotel and meals) to the invited young scientists.

### **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.

### **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](http://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 a 20 minute shuttle ride from the city centre, with direct connections to Munich, Berlin Schönefeld, Hamburg, Amsterdam, London City, Vienna and Paris Orly.

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](http://www.rail.ch). Also check out our website [www.issibern.ch/](http://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 have already been requested to contact the workshop secretary, Jennifer Zaugg (Tel. +41-31-631-4896, Fax: +41-31-631-4897, email: [Jennifer.Zaugg@issibern.ch](mailto: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 made 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**

Invitations and First Circular:	4 April 2012
Registration deadline:	11 May 2012
Second Circular and final program:	31 August 2012
Workshop:	24–28 September 2012