INTERNATIONAL
SPACE
SCIENCE
INSTITUTE

2012
2013 Annual Report

Imprint

Publisher
International Space Science Institute
Hallerstrasse 6
CH-3012 Bern
Switzerland
Tel.: +41 31 631 48 96
Fax.: +41 31 631 48 97
E-mail: info@issibern.ch
Internet: www.issibern.ch

Editor/Concept/Layout/Cover Design
Andrea Fischer

Printed by
Länggass Druck AG
Länggassstr. 65
3000 Bern 9
Switzerland

Cover Page

Puzzle composed of six images (from the upper left to the lower right):

1. Envisat Advanced Synthetic Aperture Radar interferogram over the Kenyan section of the Great Rift Valley showing small surface displacements that are not visible to the naked eye of the Longonot Volcano (ESA).

2. LL Ori and the Orion Nebula. Esthetic close-up of cosmic clouds and stellar winds features LL Orionis, interacting with the Orion Nebula flow (NASA, ESA and the Hubble Heritage Team).

3. The massive star factory known as the Trifid Nebula was captured in all its glory with the Wide-Field Imager camera attached to the MPG/ESO 2.2-metre telescope at ESO's La Silla Observatory in northern Chile (ESO).

4. Image of the Carina Nebula, a region of massive star formation in the southern skies (ESO/T. Preibisch).

5. The curiously-shaped dust structure occurs in our neighboring Large Magellanic Cloud, in a star forming region very near the expansive Tarantula Nebula (NASA, ESA, and M. Livio (STScI)).

6. ALOS satellite image showing an area with extensive agricultural use in western Russia, with roads and rivers cutting through the cropland (JAXA, ESA).

Table of Contents

The International Space Science Institute (ISSI) is an Institute of Advanced Studies where scientists from all over the world meet in a multi- and interdisciplinary setting to reach out for new scientific horizons. The main function is to contribute to the achievement of a deeper understanding of the results from different space missions, ground based observations and laboratory experiments, and adding value of those results through multidisciplinary research. The program of ISSI covers a widespread spectrum of disciplines from the physics of the solar system and planetary sciences to astrophysics and cosmology, and from Earth sciences to astrobiology.

From the Chairman of the Board of Trustees

This is my last annual report as Chairman of the Board of Trustees. After 5 years and at age 75, I decided that it is time to make room for some fresh blood. While there is ample opportunity to look back to the business year 2012/2013, I may be permitted to extend that retrospection to the five years during which I had the privilege and the pleasure to serve the international space science community as chairman of the Board of the ISSI foundation.

When the founding Chairman Hanspeter Schneiter passed the symbolic gavel on to me in the June meeting of 2008, the International Space Science Institute was already a mature and well-known institution with a high reputation. Under the able leadership first of Johannes Geiss and then Roger-Maurice Bonnet, the number of visitors that come to Bern every year had grown from nothing to several hundred. The books that had been published as a result of work initiated and done at ISSI filled an impressive shelf. The administration behind the scene worked like clockwork. What could I do? I soon decided not to try to fix something that was not broken. However, the world around the placid city of Bern changed and ISSI had to adapt. Most changes were beneficial for ISSI. At the very beginning of my term, the delegate of the Russian Academy of Sciences, Prof. Lev Zelenyi, surprised us with the request that the Academy becomes a contributing associate of the Institute. Of course, this offer was most welcome and an agreement was signed in due time. A less lucrative, but nevertheless welcome agreement was reached with NASA. In the early years, NASA held a seat on the Board, but rarely sent a delegate. During talks held at the Kennedy Space Center in February 2011 it was agreed that Prof. Len Fisk would be the personal representative of NASA Administrator Charles Bolden. Finally, the director of the Space Science Center of the Chinese Academy of Science, Prof. Wu Ji proposed that the Center organizes an institution similar to ISSI in order to help the Chinese space science community to keep up with the spectacular development of the Chinese space technology. After some discussion the Board agreed and so ISSI now has its first "Franchise" subsidiary. There will be mutual representation in the respective Boards of Trustees and the ISSI Science Committee will cooperate with ISSI Beijing.

During all the time, the relationship with the main contributors, ESA, the Swiss Confederation and the University of Bern has been smooth and cooperative.

At the end of my term, I like to thank all the colleagues and partners who helped to keep ISSI on a successful track. First of all my colleagues on the board, especially my vice chairmen Prof. Hans Balsiger and Prof. Willy Benz. The scientific conscience of ISSI is the Science Committee. Its members and the chairmen Profs. Len Culhane, Johan Bleeker and Tillman Spohn have done an outstanding job in selecting the most promising projects among the many that are being proposed every year. The well-oiled machinery behind the scene, called the administrative personnel, led by the Executive Directors Prof. Roger-Maurice Bonnet and then, after a smooth transition, Prof. Rafael Rodrigo, deserves an especially warm applause. I have watched with amazement how the part-time directors have shown a full-time dedication to the Institute: Profs. André Balogh, Lennart Bengtsson and Len Culhane. In all the comings and goings Prof. Rudolf von Steiger assured continuity with professionalism and I am particularly moved that the founding father of ISSI, Prof. Johannes Geiss is still available as the wise and experienced guide. To all, named and unnamed, thank you for your support, your dedication and – sometimes – your patience with me.

My successor as Chairman of the Board will be Prof. Urs Würgler, former Rector of the University of Bern. I wish him all the luck, support and satisfaction that I had the privilege to enjoy and I thank him for his willingness to assume that task.

Simon Aegerter
Wollerau, July 24, 2013

From the leaving and the new Executive Directors

Eighteen years have passed since the creation of ISSI. Since 1995, three Executive directors have been selected by ISSI's Board of Trustees and be put in charge of leading the Institute and of representing it to the outside scientific world: Prof. Johannes Geiss (the founder of the Institute) between 1995 and 2002, Roger-Maurice Bonnet between 2003 and 2012, and Rafael Rodrigo since February 2013. Such changes could have been traumatic for the users of ISSI and for its staff, but they have not! ISSI provides a unique service to the scientific community and the sense of service is what has characterized the three of us in the course of our respective careers, with the responsible concern of ensuring continuity and constantly improving the quality of our past and present service.

In the first eighteen years of its existence, ISSI has obviously proven its uniqueness as well as its attractiveness as the constant progression of the number of its users testifies. The users are the members of the international space science community, originating from 54 different countries, encompassing all domains of space science, Earth sciences and fundamental physics, including observers, theoreticians, modelists, and experimenters. This international character is the strength of ISSI and it is preserved through the leading role of the Executive Director.

The daily running of ISSI rests on three main elements: the Directorate, the Scientific Committee and the Staff. In the past eighteen years, not less than eleven directors have successively participated in the Directorate, which is responsible for the successful scientific and administrative management of the Institute. All of them have an outstanding international reputation in their own field of research, which also contributes enormously to the attractiveness of ISSI and explains why the Institute has constantly improved its scientific breadth and diversity. In particular, the recent inclusion in an increasing proportion of Earth sciences projects in ISSI's program under the invaluable leadership of Prof. Lennart Bengtsson proves that ISSI has the potential of offering new services and of amplifying its role in areas of space research, which were not there at the onset of the Institute.

The Scientific Committee has seen its importance growing with time, and ISSI is resting fully on the advise of its members. All are first class international scientists. All feel responsible and all offer an invaluable guaranty of quality to ISSI's program. They are all respected by ISSI and by its users, because they have enormously contributed to the success and to the harmonious development of the Institute. It is just remarkable that ISSI never had any difficulty in regularly renewing the membership of the Committee because rotation is of crucial importance, and because being a member is considered to be so important by the scientists. Roger-Maurice Bonnet would like to express his warmest thanks to the successive Chairmen of the Committee: Risto Pellinen, Len Culhane, Johan Bleeker and Tilman Spohn.

The staff of ISSI is small in number but all its members without exception have also understood that they are essential to the proper and smooth running of ISSI. It is their sense of service and professionalism that has contributed -and will certainly continue to contribute- to the success and the reputation of the Institute. The workforce of ISSI totals less than 8 full-time persons, in contrast with the more than 900 users visiting ISSI last year, requiring the amazing number of more than 5,000 nights reserved per year in the city of Bern. To this support staff we should also add the scientific "post-docs" pursuing their own research and helping the directors in pursuing theirs.

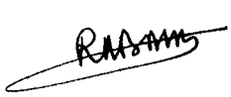
From the leaving and the new Executive Directors

The two of us are joining efforts in ensuring the highest prestige to the Institute while at the same time attracting new partners and associates. In that respect, following the Board approval of creating a "sister" ISSI-type institute in Beijing (China), consequently to the signature on 14 February 2012 of a Memorandum of Understanding between Dr. Simon Aegerter, President of the Board and the Director General of the National Space Science Center in Beijing, Prof. Wu Ji, we are sparing no efforts through a friendly and tight cooperation in ensuring a harmonious implementation of that association in full clarity with the Swiss State Secretariat for Education, Research and Innovation. We do have great hopes that this important development in the life of ISSI will lead to the emergence of a new dimension of the Institute.

The success of ISSI would not have been so great without the constant support of our funding authorities in particular, the Swiss Space Office, the European Space Agency Directors respectively responsible for Science and Robotic Exploration and for Earth Observations and the University of Bern. We also enjoy the yearly contribution of the Russian Academy of Sciences, as well as the support of the Swiss National Science Foundation through the contract granted to our Swiss colleague in the Directorate: Prof. Rudolf von Steiger. Let us thank all of their responsible leaders and managers for their constant and so precious help.

As one of us (R. Bonnet) has left his duties at the time of writing this text, while the second (R. Rodrigo) has just started his functions, it is very appropriate to thank those who have left the Institute in the recent past: Goetz Paschmann, André Balogh, Lennart Bengtsson, and Len Culhane for their invaluable contributions, and to welcome their successors: Anny Cazenave, and John Zarnecki to whom we wish the best of success in their new important function. Roger-Maurice Bonnet would like to convey many warm thanks also to Vittorio Manno, first ISSI Program manager, to Michel Blanc who helped considerably in the running and management of ISSI's participation in the Europlanet Research Initiative of the European Commission, and to Hermann Opgenoorth. He addresses his thanks and recognition to his friends of the Board of Trustees, in particular to the representatives of NASA, the Russian Academy of Sciences and the Swiss Space Office for their support and to the ISSI staff for their unique and constant support and expression of friendship. He would like to address his most sincere and warmest wishes of success to his old friend and nevertheless successor, Rafael Rodrigo.

Rafael Rodrigo wants to address his recognition to Prof. Geiss and Prof. Bonnet for their leading role in creating such an important and unique Advanced Study Institute as ISSI is today. He also acknowledges the excellent co-operation with the Board of Trustees, the Science Committee and their respective Chairmen. Finally, and despite the short time since February, he has realized the outstanding professionalism and availability of the staff of ISSI. They are the main responsible for the smooth transition from one Directorate to other. His gratitude is due to all of them. He will continue working with the staff of ISSI with the same positive spirit and commitment of his predecessor.



Roger-Maurice Bonnet

Rafael Rodrigo

The 18th year of ISSI was a year of transition, as detailed by the two Executive Directors on the previous pages. Such periods are often perceived as difficult, with uncertainties having a negative impact on the spirit and the productivity of an institute. Nothing could be further from the truth in this case: We are happy to report of a year with a very healthy program, thriving with activity, and an unprecedented number of visitors. This in itself demonstrates that ISSI, like a person at age 18, has reached its age of maturity.

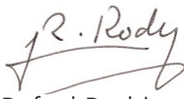
Four Workshops, four Forum meetings, two Working Group meetings, 70 meetings of International Teams, and 16 individual Visiting Scientists brought a record number of 905 visitors to ISSI, among which 115 Young Scientists. The subsequent pages will give more information about all these activities. With this the Institute is running pretty close to its maximum capacity in every respect: availability of rooms, of finances, and of staff support.

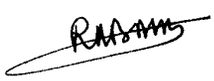
The publication record of ISSI volumes has also reached a new record high: After a somewhat rough start the ISSI Scientific Report Series, which is now also published by Springer, has grown by two more volumes, and even five volumes have appeared in the main Space Sciences Series of ISSI. Not only the number of publications, but also their impact has developed favorably. The two-year impact factor of Space Science Reviews, from which most ISSI volumes are reprinted, has increased by more than 50% to 5.5 in 2012, putting the journal in the top ten astronomy and astrophysics journals ranked by Thompson Scientific; likewise, the impact factor of Surveys in Geophysics, from which the Earth Sciences volumes are reprinted, has increased by a similar factor to 4.1.

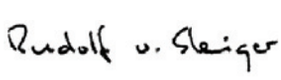
The program will continue in a similar manner: For the upcoming year three Workshops are already firmly planned, and the Science Committee has selected 31 International Teams, from an unprecedented 75 proposals, for implementation over the next couple of years. A new branch of activity is currently under definition: two Forums and a Workshop will be organized in the upcoming year in support of the High-level Science Policy Advisory Committee of ESA (HISPAC). Thus ISSI is fulfilling the mandate defined by the Board of Trustees at its Séance de Réflexion in Rüttihubelbad in September 2011, namely to attain maximum effectiveness within its envelope of "small and beautiful" characteristics.

All this is only possible in a healthy funding environment. The Swiss Confederation has renewed its commitment for the period 2013-2016, based on our request and strategy document submitted last year. ESA has defined a new funding mechanism. In future years, the space science budget will be contributed by the ESA General Budget under supervision of ESA DG and D/CR, and after the recommendation of D/SRE. A newly formed Visiting Committee will review ISSI on a triennial basis and recommend whether ESA should fund ISSI for the following three-years period. The Committee will visit ISSI for the first time in October 2013. In October the three-year funding period of the Swiss National Science Foundation will expire; a proposal for continuation by another three years has been submitted but the decision is outstanding at this time. Meanwhile, the funding agreements with the University of Bern and the Russian Academy of Sciences continue. ISSI exists only thanks to the lasting commitment of all these funding agencies, for which we are deeply grateful.

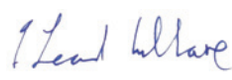
Last but not least ISSI rests on the dedication and professionalism of its staff and postdocs. None of the staff members have left the Institute in this period of transition, but one new member has come on board: We are happy to welcome Mrs. Danielle Zemp, who has joined ISSI for part-time support of the secretariat in February 2013. On the other hand Pia Zacharias will be leaving us in a few months after the end of her postdoc contract and we would like to thank her for her excellent work and team spirit. It is thanks to all of them that ISSI has pulled through this transitional period and emerged stronger than ever before!


Rafael Rodrigo

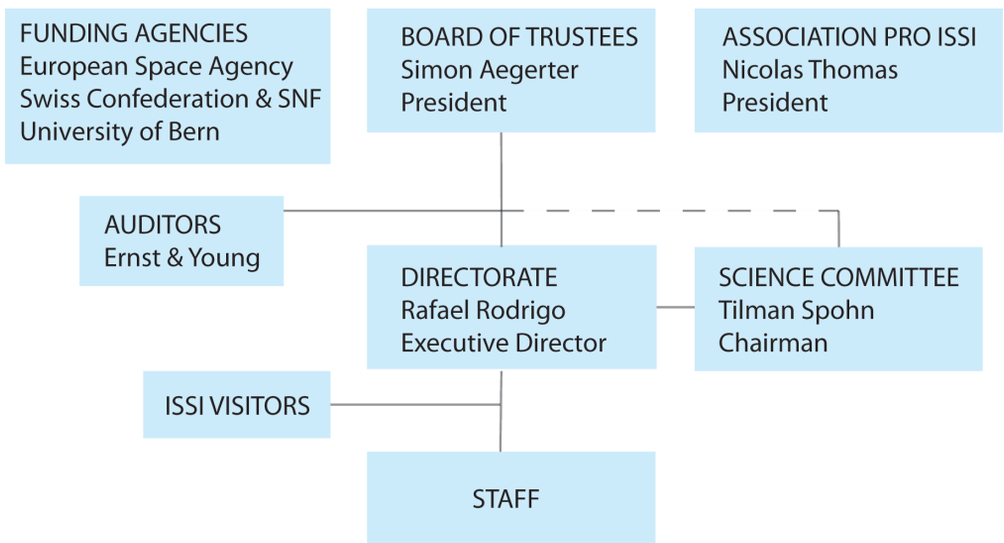

Roger-Maurice Bonnet


Rudolf von Steiger


Lennart Bengtsson


Len Culhane

About the International Space Science Institute



The International Space Science Institute (ISSI) is a nonprofit organization set up in Bern in 1995 as a foundation under Swiss law with an endowment by Contraves Space AG, later renamed Oerlikon Space AG and now part of RUAG. Three statutory bodies govern ISSI: the Board of Trustees, the Directorate, and the Science Committee. A fourth important body, the Association Pro ISSI, promotes the idea of ISSI, especially within Switzerland.

The European Space Agency (ESA), the Swiss Confederation, and the Swiss National Science Foundation (SNF) provide the financial resources for ISSI's operation. The University of Bern contributes through a grant to a Director and in-kind facilities. Since 2010 the Russian Academy of Sciences is supporting ISSI with an annual financial contribution. Details can be found on page 13. ISSI received tax-exempt status from the Canton of Bern in May 1995.

ISSI's Board of Trustees oversees the work accomplished at the Institute, exerts financial control, and appoints the Directors and members of the Science Committee. It consists of representatives of the Founder, and of the funding Institutions. Furthermore the Board of Trustees may nominate up to five personalities representing the national and international science community, space industry and space politics for terms of three years. The Board of Trustees is presided over by Simon Aegerter.

The Science Committee, chaired by Tilman Spohn, is made up of internationally known scientists active in the fields covered by ISSI. The Science Committee advises and supports the Directorate in the establishment of the scientific agenda providing a proper equilibrium among the activities and reviews and grades the Team proposals in response to the annual Call. Science Committee members serve a three year term (with a possible extension of one year).

The Directorate is in charge of the scientific, operational, and administrative management of the Institute. It interacts with the Funding Agencies, the Swiss authorities, the Board of Trustees, the Science Committee and the Association Pro ISSI. The Directorate consists of Rafael Rodrigo (Executive Director), Rudolf von Steiger (University of Bern), Lennart Bengtsson (MPI for Meteorology, Germany) and Len Culhane (University College London, UK).

The Association Pro ISSI, founded in spring 1994, counts about 135 members. Pro ISSI promotes the idea of ISSI by organizing public lectures, where internationally known scientists introduce their results. Summaries of these talks are published in the journal SPATIUM. Member benefits include invitation to lectures and a free subscription to SPATIUM. The Board of the Association Pro ISSI is presided over by Nicolas Thomas.

front row from left to right:
Rosine Lallement, Observatoire de Paris-Meudon, France
Urs Würgler, Bern, Switzerland *(new Chairman as of 1st July 2013)*
Simon Aegerter, the Cogito Foundation, Wollerau, Switzerland *(Chairman)**
Lennard A. Fisk, University of Michigan, Ann Arbor, USA
Hans Balsiger, University of Bern, Switzerland
Daniel Fürst, RUAG, Zurich, Switzerland

back row from left to right:
Nicolas Thomas, President of the Pro ISSI Association, Bern, Switzerland
Sergio Volonté, Former Head of the Planning and Coordination Office in the Science and Robotic Exploration Directorate, ESA, Paris, France (retired)
Kathrin Altwegg, University of Bern, Switzerland *(Secretary of the Board)*
André Maeder, Observatoire de Genève, Sauverny, Switzerland
Willy Benz, University of Bern, Switzerland *(Vice Chairman)*
Daniel Neuenschwander, Swiss Space Office, Bern, Switzerland

missing on the picture:
Alvaro Giménez, ESA, Paris, France
Risto Pellinen, Finnish Meteorological Institute, Helsinki, Finland*
Lev M. Zelenyi, Russian Academy of Sciences, Moscow, Russia

* Membership ended on 30 June 2013

The Science Committee

front row from left to right:
Véronique Dehant, Royal Observatory of Belgium, Brussels, Belgium*
Anny Cazenave, LEGOS, CNES, Toulouse, France*
Richard Marsden, ESTEC ESA, Noordwijk, The Netherlands (ex officio ESA)
Tilman Spohn, German Aerospace Center (DLR), Berlin, Germany (Chairman)
Michael Thompson, University Corporation for Atmospheric Research, Colorado, USA*
Rumi Nakamura, Space Research Institute, Graz, Austria
Luigi Stella, INAF, Rome, Italy

back row from left to right:
Mikhail Pavlinsky, IKI, Russian Academy of Sciences, Moscow, Russia (ex officio RAS)*
Valery L. Shematovich, Institute of Astronomy, RAS, Moscow, Russia
Hugh Hudson, Space Sciences Laboratory, University of California, USA
Masahiro Hoshino, Department of Earth and Planetary Science, University of Tokyo, Japan
Joanna D. Haigh, Imperial College London, United Kingdom
Michael Rast, ESA ESRIN, Frascati, Italy (ex officio ESA)
Götz Paschmann, MPI Garching, Germany (adviser)
Niklaus Kämpfer, Institute of Applied Physics, University of Bern, Switzerland*
Marco Velli, NASA Jet Propulsion Laboratory, Pasadena, USA
Thierry Dudok de Wit, LPCE, CNRS, Orléans, France*

* Membership ended on 30 June 2013

front row from left to the right:
Pia Zacharias, Post Doctoral Scientist
Andrea Fischer, Editorial Assistant
Silvia Wenger, Assistant to the Executive Director
Irmela Schweizer, Librarian
Jennifer Zaugg, Secretary
Danielle Zemp, Secretary

back row from left to the right:
Marco Calisto, Post Doctoral Scientist
Saliba F. Saliba, Computer Engineer and System Administrator
Maurizio Falanga, Science Program Manager
Rafael Rodrigo, Executive Director
Rudolf von Steiger, Director
Len Culhane, Director
Roger-Maurice Bonnet, Discipline Scientist
Johannes Geiss, Honorary Director

missing on the picture:
Lennart Bengtsson, Director
Michel Blanc, Discipline Scientist
Hermann Opgenoorth, Discipline Scientist

All lists show the status at the end of the eighteenth business year on 30 June 2013.

Facilities

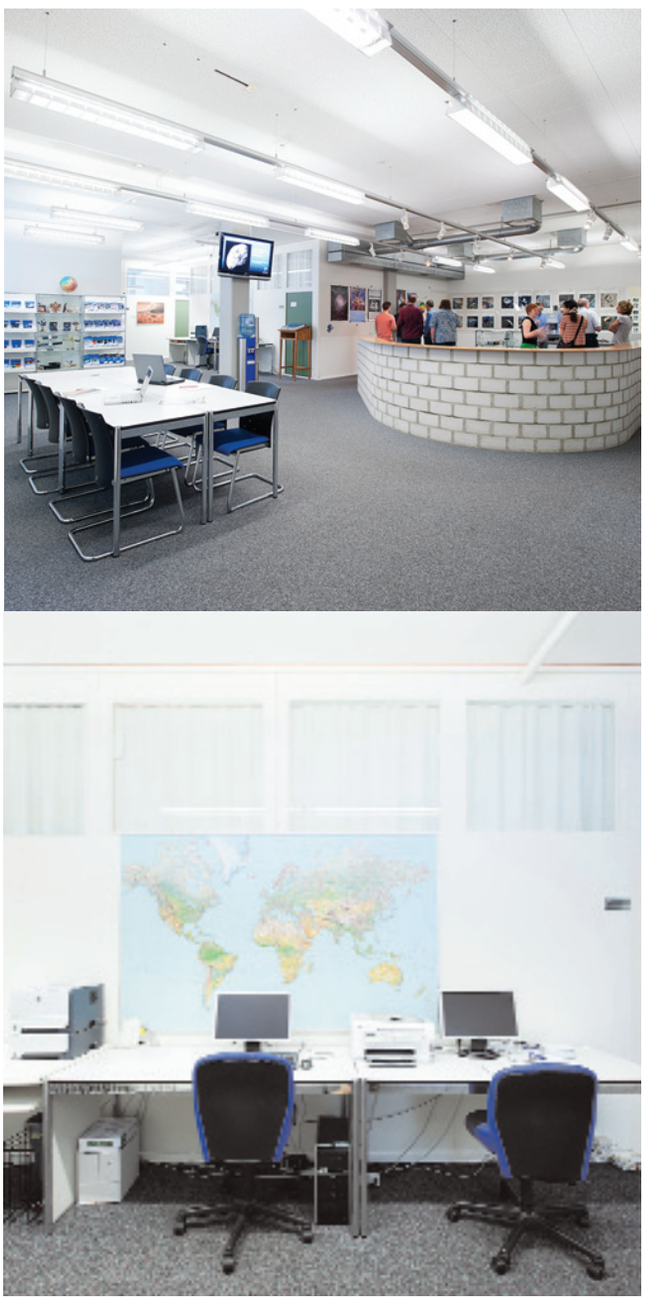
The ISSI facilities offer an area of 700 m^2 on two floors, consisting of office space for staff members, a conference room, two seminar rooms (up to 40 participants each), two smaller rooms for the visiting teams (one room for up to 14 and the other room for up to 10 participants), and two offices for visiting scientists. All rooms are equipped with high speed network connections (wireless included), some of them have printers and projectors for large screen presentation. There is also a big coffee and reading area as a favorite meeting point for the visitors.

During the 18th business year the locking mechanism of ISSI's main doors on the 1st and 3rd floors has been changed. This change allows the locks to automatically stay open during office hours so visitors can simply press on the doorknob to open the doors without first ringing the bell.

Among other items bought during the 18th business year are: new computers (3 Macs, 1 Windows), 3 printers, other computer accessories, a new coffee machine, etc.

ISSI's workgroup domain network is a part of the University's local area network, so that its resources (e.g., Linux cluster server, grid server, license server and special peripherals) are available as well. With the locally installed computer peripherals, the Institute's staff and guest scientists are able to perform most computing tasks and access the Internet.
The network consists of the following:
- Two servers – Mac (10.6 server) and Linux (Ubuntu 12.04 server)
- Six Windows workstations one of which runs Windows 8
- Seven Mac workstations running Mac OS 10.6 - 10.8
- Eleven laptops (four Windows and seven Macs)
- Eight printers, three of which are color
- Five projectors (four fixed on the ceiling and a mobile one)
- Two wireless access points
- One digital video camera, one still camera, two scanners

ISSI's software packages are regularly updated. These software packages provide access to the large scientific packages (such as IDL, Matlab, Grapher, ArcView GIS, ISIS, and Maple) either locally or by connecting to the University's license server. This provides a heterogeneous workstation environment in the Institute.



Pictures above showing ISSI's meeting point and working station.

Please feel free to visit our up to date website www.issibern.ch for more information or follow ISSI on Twitter @ISSIBern or Facebook.

The eighteenth financial year of ISSI ended with a surplus of 79'641.47 CHF, as opposed to a budgeted deficit of 100 kCHF. The deficit had been budgeted in order to partially spend the unex-pected extraordinary income in the previous year from a currency compensation fund established by the Swiss Federal Council. However the result was turned positive primarily due to dissolved ac-cruals made earlier for publications that have now come out less costly than estimated at the time, and to some extent also from earlier International Teams that have completed their activities under budget.

On the revenue side all lines were as as budgeted thanks to the current stability of the exchange rate of the Euro. The contributions from ESA (both Science Directorate and Earth Observation Programme), Switzerland, and Russia were similar to the previous year while the one from EuroPlaNet, the project that formally ended in December 2012, represents the last payment from the EC that was delayed for reasons unrelated to ISSI. On the expense side all lines were very close to the expected values, with the exception of an underspending for Workshops etc. due to the reasons given above. The resulting surplus, together with the one from the previous year, will be used over the forthcoming years primarily for selecting more Workshops, Working Groups, Teams, Visitors than a strictly balanced budget would allow for.

Finally, it is important to note that ISSI also receives indirect contributions that do not appear in the table above. One of the directors is employed directly by the University of Bern. ISSI also benefits from the University through in-kind contributions such as internet connectivity.

Operating Revenues in CHF for the 18th Business Year (1.7.2012-30.6.2013)

ESA Science Directorate		1'494'000.00
ESA Earth Observation Programme		396'000.00
Swiss Confederation		930'000.00
EuroPlaNet		66'983.10
Russian Academy of Sciences		75'000.00
Other income [3]		17'312.43

Operating Expenses in CHF for the 18th Business Year (1.7.2012-30.6.2013)

Salaries and related Costs[1]	1'292'270.73	
Fixed Costs	270'260.85	
Operating Costs [2]	266'970.67	
Investment (depreciated)	24'020.34	
Workshops, Working Groups, Teams, Visiting Scientists (ISSI funded) [4]	1' 046'130.47	
Result of the Year	79'642.47	
Subtotal	2'979'295.53	2'979'295.53

Audited by Ernst & Young, Bern

Swiss National Science Foundation (SNF)

Grant from SNF [5]		195'827.00
Workshops, Working Groups, Teams, Visiting Scientists (SNF funded)	195'827.00	
Total	**3'175'122.53**	**3'175'122.53**

Audited by SNF

Remarks:

[1] **Salaries:** It should be noted that the majority of the ISSI staff members (including directors) are scientists actively conducting research as well as taking care of organizational, editorial, and administrative tasks.

[2] **Operating costs** include repair and maintenance, insurance, supplies, administration, and public relations.

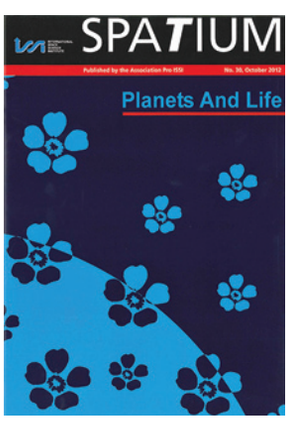
[3] **Other income** includes extraordinary income, interest income, and exchange gain or loss.

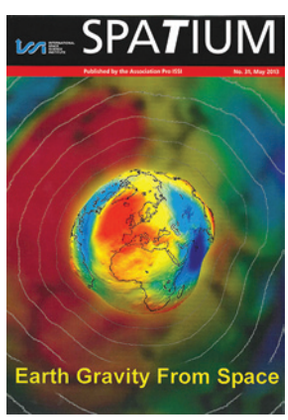
[4] **Workshops, etc.** also include the balance from income and expenses of guest apartments.

[5] **SNF:** Grant from Swiss National Science Foundation to R. von Steiger and related expenses.

The Association Pro ISSI

Hermann Böhnhardt from the Max-Planck-Institut für Sonnensystemforschung talking about "Pluto & Co: Der Asteroidengürtel am Rande des Planetensystems".





Covers of the SPATIUM No. 30 and 31 published in the 18th ISSI Business Year.

The Pro ISSI Association was founded in 1994 under Swiss law with the goals to create a Space Science Institute in Switzerland, and to communicate the fascinating results of space sciences to the Swiss public. With the creation of the foundation International Space Science Institute (ISSI) in 1995 the first objective had been reached. Pro ISSI focuses now on providing a bridge between leading space scientists and its members, representing universities, industry, politics and public administration. The Association offers public lectures on new insights in space science, and publishes 2 to 3 SPATIUM issues per year. The Pro ISSI Association, which consists presently of 135 members, meets once per year for its general assembly.

Pro ISSI Activities and the SPATIUM Series

Pro ISSI organized three public lectures in the period of this report:
The General Assembly was held on 6 November 2012 followed by a lecture given by Helmut Lammer, Österreichische Akademie der Wissenschaften, Institut für Weltraumforschung, Graz, with the title: "Entstehung und Evolution von Planetenatmosphären: Implikationen für die Habitabilität". The speaker addressed the evolution of Solar System atmospheres in the first 500 million years of the Solar System's existence and demonstrated how conditions were probably extremely different from those seen today.
On 20 March 2013, Hermann Böhnhardt, Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau gave a lecture entitled "Pluto & Co: Der Asteroidengürtel am Rande des Planetensystems" which discussed the observations and properties of the Kuiper-Edgeworth Belt and the objects that it contains.

On 15 May 2013 Martin Pätzold, Rheinisches Institut für Umweltforschung an der Universität zu Köln, gave a lecture on "Radiosondierungsexperimente mit Raumsonden: Grundlegende Erkenntnisse über Atmosphären und Schwerefelder der Planeten" which gave an excellent impression of the precision with which radio science experiments measure, for example, masses of solar system objects.

During the reporting period, issue no. 30 was published in October 2012. It reports on Tilman Spohn's lecture "Planets and Life" addressing the complex conditions that made life possible on Earth and - maybe - on other places in the universe as well. The subsequent issue appeared in May 2013 reporting on Reiner Rummel's talk on "Earth Gravity From Space" dealing with the old, but no less intriguing miracle of Earth's gravity field.

These publications together with all previous issues of Spatium can be found on Pro ISSI's homepage www.issibern.ch/publications/spatium.html.

The Board of Pro ISSI constists of Nicolas Thomas (President), Hansjörg Schlaepfer (Editor of Spatium), Frank Rutschmann (Treasurer) and Silvia Wenger (Secretary).

The Program and the Tools

ISSI's mode of operation is generally fivefold: multi- and interdisciplinary Workshops, Working Groups, International Teams, Forum, and Visiting Scientists. In the 18th business year a total of 905 international scientists participated in the scientific activities of ISSI:

Workshops consist of up to 50 invited scientists exchange their views on a scientific theme, typically during a week's duration. Workshops always lead to a volume of the Space Science Series of ISSI and in parallel as issues of Space Science Reviews or Surveys in Geophysics. In the 18th year four Workshops were organized, which summaries can be found on the following pages.

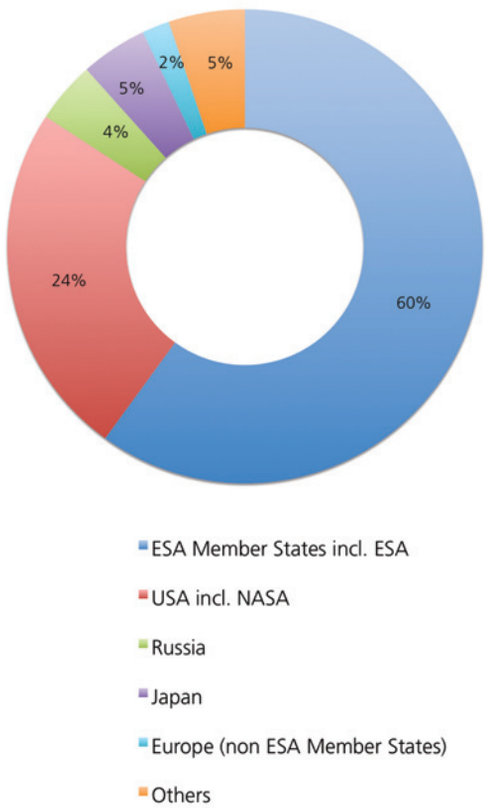
Working Groups have a smaller number of members and meet repeatedly as necessary to achieve the assigned objective. The results of the Working Groups activities are in general published as titles of ISSI Scientific Report Series. In the course of the 18th business year two Working Groups started their work.

International Teams consist of about 15 external scientists, addressing a specific scientific topic in a self-organized fashion. The results of these activities are customarily reported in scientific journals. In total 70 Team meetings took place in the 18th business year. Details can be found from page 26 on.

A **Forum** is an informal and free debate consisting of some 25 high-level participants on questions of political and scientific nature for about two days. A Forum does not necessarily lead to formal recommendations or decisions. In the 18th business year one Forum was held.

Visiting Scientists spend variable periods of scientific activity at ISSI. 16 individual visitors used the ISSI facilities during the year.

The **Young Scientists** Program is designed to bring PhD students and young post docs in contact with the community at work. These young scientists are invited by ISSI to complement the membership of Workshops, Working Groups, International Teams and Forums. 115 young scientists participated in the ISSI activities in the course of the 18th year.



Pie chart showing the ISSI visitors countries of origin. A total of 905 scientists worked during the eighteenth ISSI business year, 372 of them were for the first time at ISSI.

How to use ISSI tools

As a general rule participation in ISSI's activities is by invitation only. The financial support for the invited scientists covers the local accommodation expenses and a per diem while in Bern.

International Teams: A call for proposals is released every year in January. These proposals are evaluated by the ISSI Science Committee and approved by the Directorate.

Workshops, Working Groups, and Forum: There is no annual call. The scientific community may suggest at any time Workshops, Working Groups, and Forums by submitting an idea on one page maximum. The ISSI Science Committee will evaluate these suggestions and the ISSI Directorate will take a final decision.

Forums

Forums are informal and free debates among some twenty-five high-level participants on open questions of scientific nature or science policy matters. Forums do not necessarily lead to formal recommendations or decisions.

Solar Activity and the Solar Cycle

20-21 November 2012

Following a sustained focus on missions to study the Sun and Heliosphere e.g. SOHO, Yohkoh, Hinode, Stereo, SDO, ACE, Ulysses, a Forum was held to assess the state of solar activity knowledge and the potential for future development of the subject. A total of 20 leading workers from 11 countries participated. While the use of space-based assets has enabled a crucial expansion of solar atmosphere studies, it was recognized as important that the Forum should review their present status, assess existing areas of high interest and importance and recognize any new scientific directions in the subject.
Overview talks addressed our current understanding of the Sun's physics including the solar dynamo, solar irradiance, magnetic flux emergence and the lessons learned from observations of other stars. The importance of solar activity and cyclic behavior for related fields e.g. solar wind and heliosphere, was also summarized. Areas related to future solar activity studies including helioseismology – particularly high latitude observations, global imaging, high resolution spectroscopy and future stellar x-ray observations, were also addressed.
Following extensive discussion, the Forum identified several existing subject areas of high interest. These were i. Placing the Sun in a stellar context, ii. Solar irradiance variations, iii. Helioseismology across the cycle, iv. Solar wind origins, v. Solar flares, coronal mass ejections (CMEs) and solar energetic particles (SEPs) and vi. Global coronal structure variations. The discussions also identified several new scientific directions. A broad understanding of the magnetic linkage from the sub-photospheric to the coronal environment is developing rapidly and will be enhanced by the extension of magnetic field measurement to the entire solar atmosphere. Growing understanding of the indices that characterize magnetic activity and of dynamo theory may make it possible to link these areas. Studies of total solar and spectral irradiance could soon allow the separate identification of sources and patterns of variation. The possibly abnormal behavior of cycles 23 and 24 should be examined in the overall context of magnetic activity. Finally, the intriguing possibility that planetary dynamics may affect the solar interior should be pursued further.
The Forum proposed two Workshops and two Working Groups to advance a number of these topics. In addition several suggestions for possible ISSI teams were put forward for community response in the 2013 and later team assessment rounds.

Future Science of Exoplanets and their Systems - EuroPlaNet

5-6 December 2012

The Forum was jointly organized and sponsored by ISSI and the Europlanet Research Infrastructure Network, as well as coordinated with the Center for Space and Habitability of the University of Bern. It gathered about 25 of the world scientific experts of the expanding field of exoplanets. The object of the forum was to establish the status of the field, make a review of the different classes of exoplanets known, and see if there is a dominant model for their formation and the formation of planetary systems in general.
Among the items discussed, were the question of the formation of exoplanets, the minimum models that can be built from the available data, and a review of the different techniques for exoplanets detection. The different present and future, in-planning instruments and satellites dedicated to exoplanets were discussed, including the plan for the first «small mission» CHEOPS of ESA, led by Switzerland, which will be dedicated to exoplanet follow-on search.
Several outcomes were produced: A paper "The Science of Exoplanets and their Systems" by Helmut Lammer et al. accepted in «Astrobiology», and a set of ordered suggestions for future ISSI workshops. Some were:
• The origin, formation and the delivery of water from planetary embryos to protoplanets
• The disk in relation to the formation of planets and their proto-atmospheres by constraining the formation from observations

• Star-planet atmosphere interaction vs. stellar distance and evolutionary consequences (spectral type–M star habitable zone planets-, chemistry, magnetosphere, etc.)
Habitability was clearly one of the key issues of the workshop. The first of these workshop ideas should be implemented in 2014.

Near Earth Electro-Magnetic Environment

3-5 April 2013

Within the Earth Science work plan this Forum was organized to discuss and review new science opportunities offered by the SWARM and CLUSTER observations. It is expected that new ideas will emerge for studying the impact of solar wind and interplanetary magnetic field on the near Earth environment.
The Forum offered 19 expert scientists the opportunity to consolidate and prepare important background information about the SWARM and CLUSTER constellation and bring along some first ideas. Having both SWARM and CLUSTER satellite constellation in simultaneous operation during 2013-2014 offers a unique opportunity to make joint observations to facilitate science that is unobtainable from the missions alone. The experience gained from the combination of the two missions will be useful in proposing future mission concepts for Earth science, space science and potentially future space weather missions.
The Forum was arranged as a sequence of several sessions. The first was thought as an introductory session, the second gave some insight in the dynamics and structure of current flowing between the magnetosphere and ionosphere along the geomagnetic field lines, the third about the appearance of boundary layers between different magnetospheric domains, the fourth session informed about the latest innovations in the modeling of 3D ionospheric electrodynamics and the fifth informed about plasma waves in the magnetosphere and associated pulsations observed by ground-based and satellite measurements.
The Forum concluded with recommendations to ESA to conduct the following actions:
• SWARM orbit information should be provided to planning tools life CEF (JAXA), Tipsod (NASA) and OVT (Orbit Visualization Tool).
• SWARM Quicklook data (L1B and L2) should be available for researchers with a simple browsing service.
• For pulsation studies it would be necessary to get high time resolution SWARM A and B data (16 Hz and 50 Hz) in North-East-Center coordinates.
• During the early phase of the SWARM mission, the gradually apart drifting orbital planes of C and A&B will provide unique opportunities to study local time gradients. Special attention should be paid to the CLUSTER performance during this time period.
A follow-on of the Forum is foreseen in several Working groups and international teams. A detailed summary can be found on ISSI's web site.

SCOSTEP (Scientific Committee on Solar-Terrestrial Physics)

6-8 May 2013

The charter of the Forum was to define the next scientific program of SCOSTEP for the period 2014-2018. SCOSTEP is tasked by the International Council for Science (ICSU) with running a long-term scientific program in solar terrestrial physics (STP). The 27 participants of the forum defined the scientific program based on (i) the nine white papers submitted in 2012, (ii) participants' expertise in STP science, (iii) current issues in STP, and (iv) community input.
The outcome of the Forum assessed the new scientific program called VARSITI: VARiabliltiy of the Sun and Its Terrestrial Impact, which will start in 2014. Variability involves from the lifetime of the sun to day-to-day solar events (Space Weather and Climate).
The new SCOSTEP VARSITI program will attempt to
• Understand the terrestrial effects of the weak solar activity
• Contrast with historical activity level using natural archives such as ice cores and tree rings
• Continuously monitor the sun via MiniMax24 and study the events using the ISEST program
• Understand how the particle populations in the Earth's magnetosphere evolve

Workshops

Helioseismology and Dynamics of the Solar Interior

24-28 September 2012

Helioseismology – the study of the Sun's interior using observations of acoustic pressure wave propagation, has been significantly advanced following in particular the availability of the SOHO spacecraft at the Lagrange L1 point which has permitted continuous solar observations. The Workshop was designed to review in depth what has been achieved in solar interior observations, to discuss the techniques employed and to chart a course for the future. Workshop Conveners were Michael Thompson, Sacha Brun, Len Culhane, Laurent Gizon, Markus Roth and Takashi Sekii. Following a brief outline of the available information on internal dynamics, several presentations were given on interior abundances, structure and dynamics. These were followed by two sessions on understanding solar magnetism where the importance of long-term synoptic observations was emphasized. Some seven talks then addressed the solar interior to atmosphere connection with a focus on flows, the dynamo, emerging magnetic flux and the role of waves in the atmosphere. Attention then turned to data analysis, assimilation and computation techniques. This was followed by an extensive discussion of new observational techniques with particular attention being given to future space missions including the ESA/NASA Solar Orbiter. There was also a significant discussion of the Solar-Stellar connection which included a total of seven talks. The themes addressed in a total of some 28 talks were then structured into a set of fourteen multi-author chapters in which all of the participants will be involved. The Workshop ended with a concluding summary that addressed future perspectives and challenges in the field of Helioseismology.

Thirty-six leading international practitioners participated in the Workshop along with five young scientists who were also supported by the ISSI program. A book, entitled "Helioseismology and Dynamics of the Solar Interior" will be published as a volume in the ISSI Space Science Series. The fourteen multi-author chapters will include all of the themes from the Workshop and will provide a review of current status along with expectations for the future of this important discipline.

Workshops are selected by the Directorate in consultation with the Science Committee. Proposals or suggestions for Workshops may originate from the external community. The program and speakers are defined by a group of experts serving as conveners. The Workshops can be attended by up to 50 invited scientists. Workshops always lead to a volume of the Space Sciences Series of ISSI (SSSI) published by Springer and in parallel as issues of Space Science Reviews or Surveys in Geophysics.

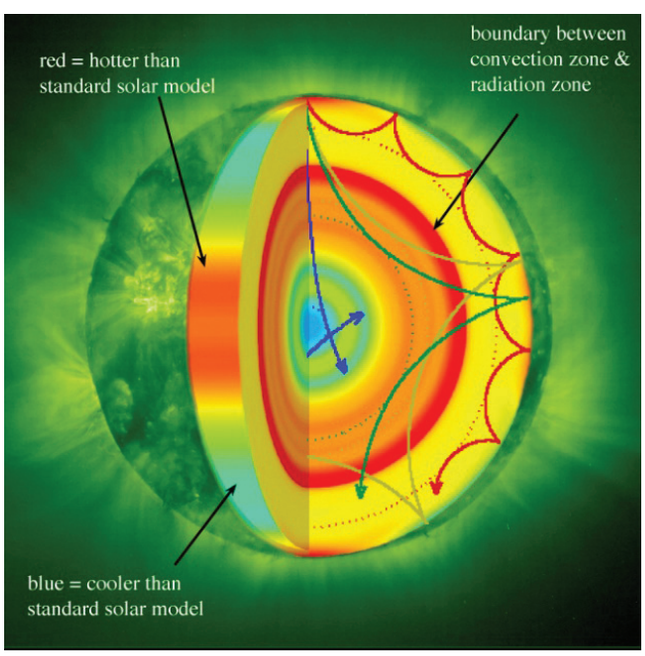


Diagram of the solar interior showing the principal structural features – core, radiation zone and convection zone. Internal sound waves are detected by high precision Doppler velocity measurements at the surface. Sample wave propagation paths through the interior are schematically illustrated. Careful frequency measurements allow estimation of physical property – temperature, composition, flow velocity, values and their comparison with models of the Sun's interior. (Image Credit: HMI Team, Stanford)

The Physics of Accretion onto Black Holes

8-12 October 2012

This was the first Workshops organized by ISSI on the theme of black holes. The Workshop addressed the range of physical processes that underlie the observed large-scale properties, physical models for the accretion flow around black holes of all masses, accretion on black holes from stellar mass to supermassive, black hole fundamental parameters, as well as accretion jets outflows. The Workshop was convened by Tomaso Belloni, Piergiorgio Casella, Maurizio Falanga, Marat Gilfanov, Peter Jonker, and Andrew King. The invited experts in the Workshop reviewed the status of understanding what has been achieved in the research on accretion on all mass scales, from galactic binaries to intermediate mass black holes to super-massive AGN, and discuss possible future directions. As a new departure for multi-wavelength and high performance fast-timing research has been presented, however, the Workshop also considered the lessons that can be learned from the extensive existing knowledge of past missions. The Workshop's sessions covered general overview of current accretion theory and simulations, the various ways of feeding the black holes, black hole merging and the last parsec problem, interaction with the environment, (jets, outflows), spin and masses of black holes etc. The theory has been discussed and compared with the observations. The Workshop concluded by overview and outlook summaries, given by world-leading authorities, of the different topics of the Workshop.

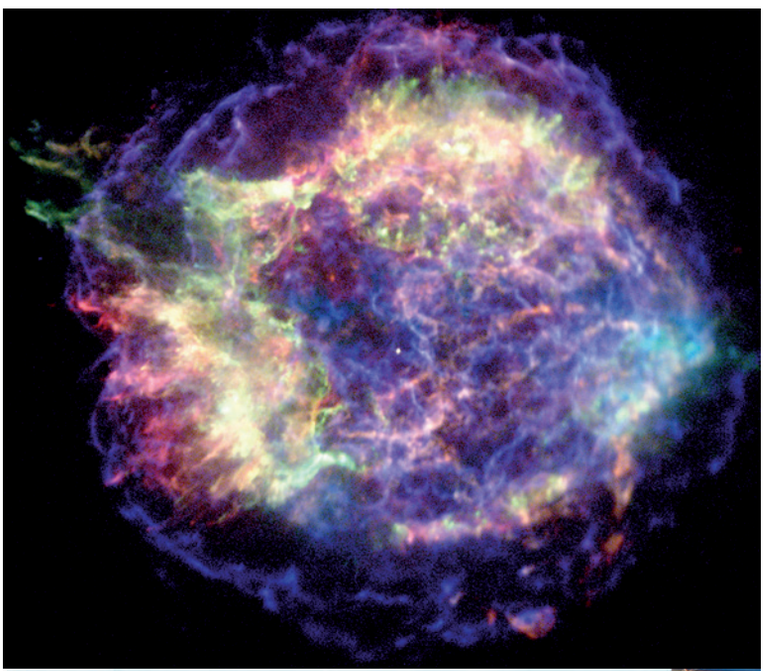
There were 36 participants in the Workshop including seven young scientists supported within the framework of ISSI's special program. The book on the "The Physics of Accretion onto Black Holes" that will be published in the Space Science Series of ISSI, as a tangible outcome of the lively presentations and discussions during the Workshop, is planned to have 23 substantial, multi-authored reviews of the topics covered in the Workshop.

Giant Planet Magnetodiscs and Aurorae – EUROPLANET Workshop

26-30 November 2012

Magnetodiscs are large current sheets surrounding Jupiter and Saturn that are filled with plasma principally originating in the natural satellites. They are also Solar System analogues for astrophysical discs. Magnetodiscs are special features of the fast rotating giant planets, a special feature of rotationally driven magnetospheres. Auroral signatures in the optical and radio spectrum allow diagnostic of these dynamical processes and enable the visualization of the large plasma and field structures in the magnetospheres.
The objectives of this workshop - which was attended by 31 participants - was to address outstanding issues in the structure and dynamics of magnetodiscs using a comparative approach:
- Review current understanding of magnetodiscs and auroral responses to magnetodisc dynamics.
- Characterize and understand radial plasma transport in magnetodiscs.
- Determine how magnetic reconnection works in magnetodiscs, what are the effects on plasma transport, and what are the associated auroral responses to magnetic reconnection.
- Characterize how the solar wind influences magnetodiscs and the auroral responses to solar wind-driven dynamics.
- Characterize the spectral and spatial properties of auroral emissions produced by magnetodisc dynamics, investigate whether there are significant differences between solar wind- and internally-driven dynamics.
- Determine the sources of local-time asymmetries in magnetodiscs.
The workshop results will be published in Space Science Review, and reprinted as a hardcover book in the Space Sciences Series of ISSI. This Workshop was the fourth held at ISSI in the framework of the Europlanet RI. The Europlanet Research Infrastructure is the four-year follow-on project to EuroPlaNet, a four-year Coordination Action supported by the European Union.

Workshops



Upper picture showing the youngest supernova remnant in the Milky Way (Cas-A) illustrating the complexity of structures formed dynamically, following the explosion of the supernova. (Image Credit: NASA/CXC/MIT/UMass Amherst/M.D.Stage et al.)
The photo below showing the participants of the ISSI Workshop "Multiscale Structure Formation and Dynamics in Cosmic Plasmas" held at the International Space Science Institute in April 2013.

Multi-scale Structure Formation and Dynamics in Cosmic Plasmas

15-19 April 2013

The Workshop was the third and concluding workshop in the series on cosmic plasmas organized by ISSI, as recommended by a Forum held in 2009 that debated the question "Is There a Future for Magnetospheric Research?". The study of space plasma physics developed through the decades of magnetospheric research was taken as a starting point for extending the knowledge of space plasmas to astrophysical scales. The first two Workshops in this series, held respectively in 2011 and 2012 dealt with the acceleration of particles and the microphysics of cosmic plasmas on all scales. The third Workshop confronted a great challenge of modern astrophysics: the physics of structure formation at very different scales from planetary magnetospheres to the largest scale structures of the universe. Structure formation is always a highly non-linear process involving energy transfers between different constituents of cosmic matter and fields. Nonlinear plasma processes play a key role in many models of cosmic structure formation and their dynamics on a very broad range of scales. The Workshop covered the phenomenology and modeling of astrophysical structures, from the scale of clusters of galaxies to single galaxies; from interstellar space to the heliosphere; from the rich spectrum of structures in the solar corona to those formed in the dynamic magnetospheres of the Earth and the planets. Contributions were made by all the 36 participating scientists, a truly multi-disciplinary group of astrophysicists, solar physicists and space plasma physicists. No such gathering has ever been held before, with the explicit objective of exploring, by leading experts in their fields, the common ground of the formation of often similar structures, on vastly different scales, in astrophysical plasmas. The forthcoming volume in the Space Science Series of ISSI, based on the Workshop, promises to be a milestone in cosmic plasma research.

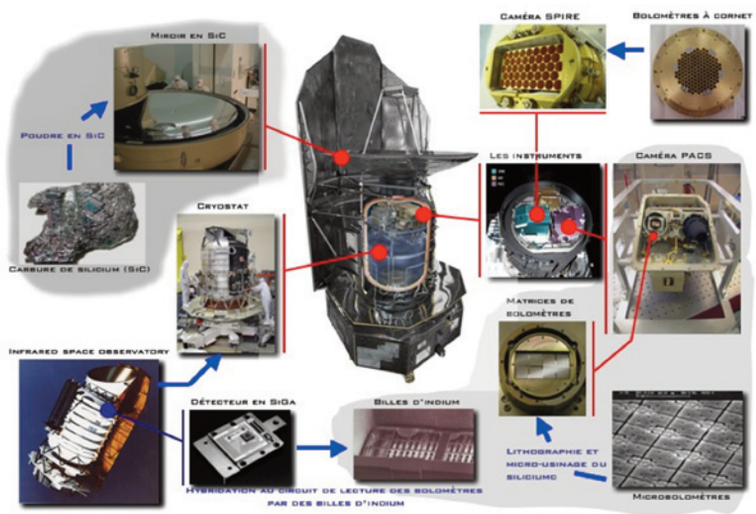
EXPLORNOVA – Space Science Missions: Innovation History and Knowledge Management

Working Groups are set up for specific tasks, also of technical nature. The results of the Working Groups activities are published as volumes of ISSI Scientific Report Series (SR) or in the scientific literature.

The EXPLORNOVA Working Group project was accepted by the ISSI Science Committee at its Fall 2012 meeting. It is led by Vincent Minier (CEA France), and the membership consists of Roger-Maurice Bonnet, Vincent Bontems, Roy Booth, Thijs de Graauw, Olivier Grasset, Matt Griffin, Tom Phillips, Göran Pilbratt, Stéphane Tirard, and Sergio Volonté.
It aims at capturing and analyzing the process of innovation in space technologies based on the history, the design and the realization of "key space science instruments". The study, will address the following issues:
- How do new technologies emerge and diffuse in space science?
- How do science goals, technology and management interact in the design of space mission and act on innovation?
- Is there any common pattern in the innovation processes that once identified could be used for future space instruments?

For the sake of simplicity the project will focus on the photo-detection systems, cryogenic devices and energy power supply that are at the heart of the ESA Herschel space observatory.
Herschel will serve as a gateway to follow technical lineages of interest backward in time until identifying the starting point of innovation and how they paved the way to new technological developments. For instance, the Herschel cryostat is based on that of the Infrared Space Observatory. We can define a technical lineage of the cryostat, with Herschel and ISO providing two data points on the lineage curve. A similar study will be performed on bolometers and deployable space mirrors. Examples of various technical lineages that converged in the development of Herschel are shown on the picture. Synergies between industry, military and scientific research institutes will be part of the proposed study. Once completed, its results will be tested and possibly applied to other space missions.

The Working Group will hold two meetings a year at ISSI in the time frame 2013-2015, consisting of study meetings dedicated to the data analysis and to book writing. In addition, special guests who have been engaged in the past in the design of a space mission will be invited to attend. In parallel, interviews will be conducted with key historical players from Space Agencies, Research laboratories and Industry.



Examples of various technical lineages that converge to the Herschel space observatory: SiC mirror, Helium-liquid cryostat, and micro-bolometers. (Image Credit: V. Minier (2010))

A first kick-off meeting was held on 24-25 May 2013 and a second meeting is planned for 17-18 December 2013. The meetings in 2015 at the completion of the Working Group will be devoted to the writing and the editing of the ISSI book to be published in the ISSI Scientific Report Series. The project will be presented to the Herschel community during the Herschel conference planned for October 2013 at ESTEC.

Working Groups

Earth Explorers focus on the atmosphere, biosphere, hydrosphere, cryosphere and Earth's interior, with the overall emphasis on learning more about the interactions between these components and the influence human activity is having on natural Earth processes. (Image Credit: ESA)

Carbon Cycle Data Assimilation: How to Consistently Assimilate Multiple Data

The idea for this Working Group originated from a ISSI Forum on "Assessing Requirements for a Carbon Model Reference Validation Framework" held in January 2012.

Data Assimilation (DA) objectively combines information from observations with information contained in a model of the evolving system taking into account errors in both observations and model. DA has evolved from Numerical Weather Prediction (NWP) where it is now routinely used to improve weather forecasts by improving the models' initial conditions for the next forecast. DA is now evolving to play a key role in various other fields of Earth System Science to initialise model simulations or to estimate model process parameters. Data assimilation methods are also becoming an important tool to assess and prepare for future Earth Observation (EO) Missions. It is only over the recent past (~10 years) that in carbon cycle research substantial progress has been achieved in the availability of observations (including EO) as well as in the use of these observational data to constrain models, and here in particular on the development of carbon cycle data assimilation systems to optimally estimate model process parameters given these observations. These observations cover the whole range of characteristics of the carbon cycle: from very local (plant leaf level data) to large-scale (ground-based flask samples of background atmospheric CO_2 concentrations) in the spatial domain and instantaneous (eddy-covariance CO_2 fluxes) to multi-annual (ground-based carbon inventories) in the temporal domain.

The above mentioned range of observations together with the advent of additional EO products rellevant to the carbon cycle (total column CO_2, chlorophyll fluorescence) raises new open questions on the use of multiple data streams in assimilation systems in carbon cycle research:

How can we combine several data streams with different temporal/spatial characteristics into a data assimilation system? How do we weight the different data sets in a data assimilation system? How can we make optimal use of the different types of observations in carbon cycle DA systems? How do we handle biases and observational data dependencies in DA systems?

The intention is to further develop existing data assimilation techniques for application in carbon cycle research and to find solutions to the above raised questions. The scientists will concentrate on establishing a suite of generic case studies addressing the following issues: Weighting of different data sets in a DA system, i.e. how to weight a few very accurate observations (for instance of O_2/N_2 separating the land from the ocean CO_2 sink) against 106 less accurate satellite observations of vegetation activity?

Different assimilation methodologies for different purposes, i.e. do we need to distinguish between solving for initial condition and parameter estimation? Treatment of data biases and correlated observational errors.

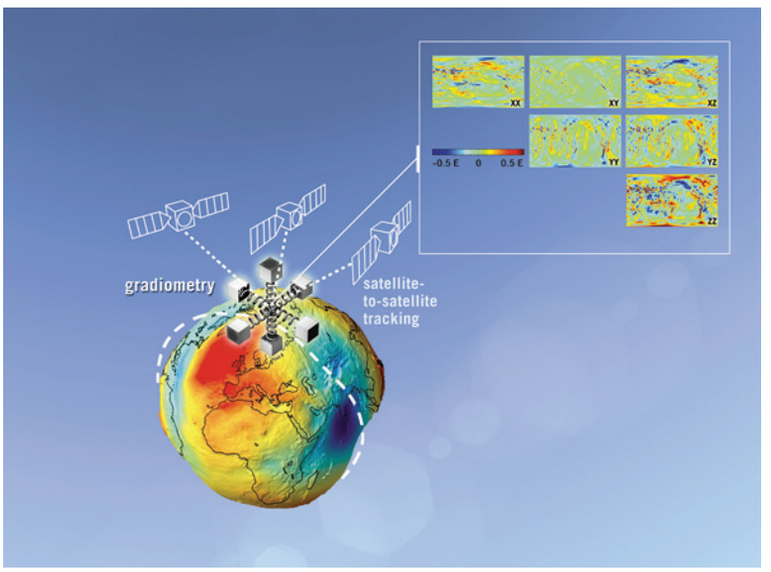
The Working Group is led by Marko Scholze (Lund University, Sweden) and Martin Heimann (MPI-BGC, Jena, Germany) and includes further 9 group members. The first meeting was held from 15 to 17 May 2013, 3 more meetings are planned. The outcome of the Working Group will be published in a volume in the ISSI Scientific Report Series.

Understanding Gravity

Gravity is a fundamental force that, in addition to its physical importance underpins many human activities – particularly those undertaken in Space. In spite of its crucial role, it is one of the least well-understood forces. Thus it is both a key concept in Physics while having application in a range of important practical areas including time measurement, navigation and the properties of Earth and other planets.

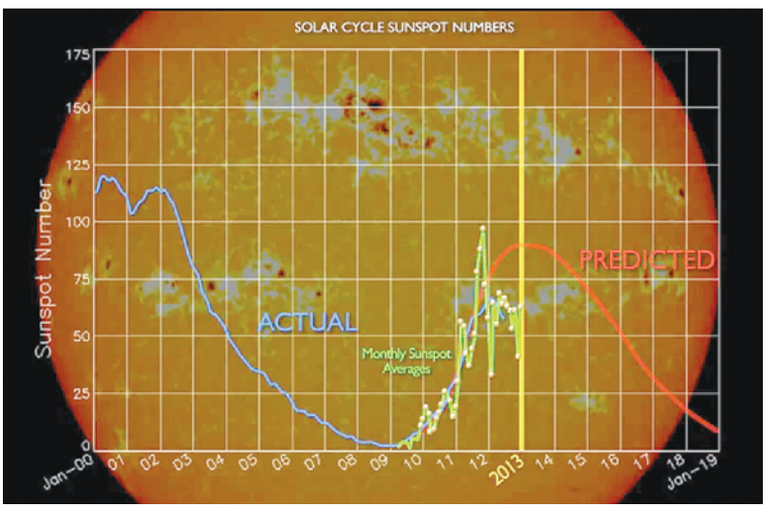
The ESA High-level Science Policy Advisory Committee (HISPAC), an advisory body that reports to the Director-General, has defined a number of Grand Science Themes and Cross-cutting Enabling Technologies. Understanding Gravity is one of four science themes and the Committee has suggested that this Forum should be held to enable a wide-ranging discussion of this topic. The remit of HISPAC is to engage in broad reflection on interdisciplinary themes and ideas. The topic of gravitation is well suited to this approach given that it involves four ESA Directorates namely Science and Robotic Exploration, Earth Observation, Navigation and Human Spaceflight and Operations.

Following summary presentations of the relevant areas for both the fundamental aspects and their potential applications, a wide-ranging discussion will take place that will seek to identify cross-cutting synergies and to examine potential impacts on the future programs of the Agency. In addition it is anticipated that a community discussion of a broad but interconnected range of topics will lead to the suggestion of one or more linked themes for future ISSI workshops. This Forum will be held on 3 and 4 December 2013.



The GOCE gradiometer contains three pairs of proof masses positioned at the outer ends of three 50 cm long orthogonal arms. Because of their different position in the gravitational field they all experience the gravitational acceleration of Earth slightly differently. The three axes of the gradiometer allow the simultaneous measurement of six independent but complementary components of the gravity field. (Image Credit: ESA, AOES Medialab)

Forthcoming Workshops



2013 is supposed to be the year of Solar Max, the peak of the 11-year sunspot cycle. Yet 2013 has arrived and solar activity is relatively low. Sunspot numbers are well below their values in 2011, and strong solar flares have been infrequent for many months. Astronomers have been counting sunspots for centuries, and they have seen that the solar cycle is not perfectly regular. For one thing, the back-and-forth swing in sunspot counts can take anywhere from 10 to 13 years to complete; also, the amplitude of the cycle varies. (Image Credit: NASA)

Plasma Sources for Solar System Magnetospheres

The Workshop is designed to review in depth our present state of knowledge concerning the major source processes for the plasma populations, which we find in the magnetospheres of planets with intrinsic dynamo fields throughout the solar system, from Mercury to Earth and further out to the giant planets. The main goal of this Workshop is to discuss for each planet the primary plasma sources, like planetary ionospheres (surface in case of Mercury), moons and rings, plus plasma entry from the solar wind. Further discussions will deal with major acceleration processes and sinks, which are relevant to explain the final magnetospheric plasma populations in terms of composition and energy distribution. Finally the Workshop will try to address common processes, which may be universal to solar system magnetospheres.
The Workshop will cover the following main themes: Historical perspective of plasma populations at Earth 1. Mercury, 2. Earth, 3. Jupiter, 4. Saturn, 5. Uranus and Neptune, 6. Universal processes in solar system magnetospheres. Invited presentations by those attending will be structured around the above headings. The Workshop will be held from 23 to 27 September 2013.

The Solar Activity Cycle: Physical Causes And Consequences

At a Forum on "Solar Activity and the Solar Cycle: Future Developments and Applications" held in November 2012, 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 Forum and were recommended for implementation to the Directorate of ISSI. Two Workshops were proposed, one on "The Solar Activity Cycle: Physical Causes and Consequences" and one on "Solar Activity and Solar Magnetic Fields". The proposals were agreed 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, to be held on 11 to 15 November 2013.
The objectives are 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, and to conclude about the state of knowledge/ignorance about the physics of solar activity. The Workshop will be structured into six sessions with presentations of some 45 invited participants including several young scientists:

- Solar activity indices and their interdependences - a detailed review
- Physical inferences from the activity indices
- The interior drivers of solar activity
- Magnetic feedback and magnetic flux dynamics related to solar activity
- Solar cycles, stellar cycles - a comparative view of solar/stellar activity

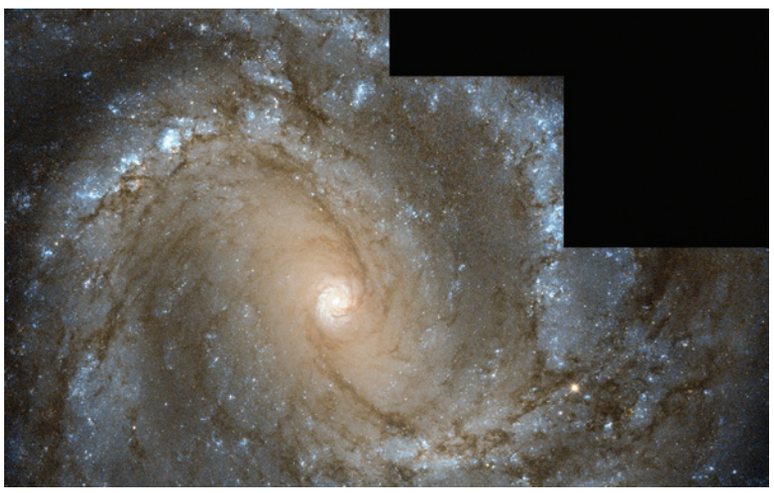
• Drawing conclusions: the physical foundation of the solar cycle

The resulting 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, thus giving a comprehensive overview of the status of the field.

The Strongest Magnetic Fields in the Universe

The International Space Science Institute has been holding a series of three Workshops on Cosmic Magnetic Fields so far comprising the Solar-interplanetary, Terrestrial and Planetary magnetic fields. In addition, in order to also cover our knowledge about astrophysical magnetic fields, a fourth Workshop on Large-scale Magnetic fields in the Universe took place at ISSI in March 2010. This latter Workshop also included our contemporary knowledge about the primordial magnetic fields and the origin of the weak-field large-scale cosmological magnetic structure. The series, so far, leaves open the question of the generation and effects of the very strong magnetic field found near the most compact objects in the Universe, as there are Magnetic Stars, White Dwarfs, Neutron Stars and AGNs, their interaction with matter and observational phenomena, among them shock waves and all kinds of radiation. The upcoming Workshop intends to fill this gap.

One great challenge of modern astrophysics is the understanding of the origin of magnetic fields at different scales from planetary to the largest scale structures of the universe. This Workshop, which is the last in a series of Workshops organized at ISSI on Cosmic Magnetic Fields, intends to deal with the compact magnetized objects encountered in the universe, understanding how the observed very strong magnetic fields that are sometimes found in the environment of these objects are generated and what effects they produce on their environment as well as the generation of the radiation emitted from them which is the only carrier of the remote information. Among these effects the generation of Jets and their complex physics, the occurrence of Gamma Ray Bursts, the formation and properties of Relativistic Shocks, and the production of High-Energy Particles by the Cosmic Engines are of tantalizing interest.



The NASA/ESA Hubble Space Telescope has captured this image of nearby spiral galaxy Messier 61, also known as NGC 4303. The galaxy, located only 55 million light-years away from Earth, is roughly the size of the Milky Way, with a diameter of around 100 000 light-years. The galaxy is notable for one particular reason - six supernovae have been observed within Messier 61, a total that places it in the top handful of galaxies alongside Messier 83, also with six, and NGC 6946, with a grand total of nine observed supernovae. (Image Credit: ESA/Hubble & NASA Acknowledgements: G. Chapdelaine, L. Limatola, and R. Gendler)

The Workshop will review observations and theory of the magnetic field production at the observed strengths as well as their effects on the objects and the environment.

Following main themes will be covered: Magnetic Stars, White Dwarfs, Neutron Stars, Magnetars, Pulsar Wind Nebulae, AGNs/GRBs, Jet Acceleration and Collimation as well as Reconnection and Particle Acceleration. The Workshop will take place from 3 to 7 February 2014.

International Teams

Listed are Teams that had a meeting at ISSI in the period of the 18th business year. A rationale is given only for the selected teams in 2012 for the others see the previous Annual Reports.

International Teams consist of about 4-15 external scientists, addressing a specific scientific topic in a self-organized fashion, under the responsibility of a Leader in a series of two to three one-week meetings over a period of 18 to 24 months. The results of these activities are customarily reported in scientific journals. The selection of Teams results from an annual Call for International Teams issued in January and from the subsequent review and prioritization done by the Science Committee.

Teams selected in 2009

Comparative Study of Induced Magnetospheres

Team leader: Cesar Bertucci, Institute for Astronomy and Space Physics - IAFE, Ciudad Universitaria, Buenos Aires, Argentina
Session: 29 October - 2 November 2012

Exploiting the Multi-Wavelength Lensing Survey

Team leader: Daniel Schaerer, University of Geneva, Switzerland
Session: 3-5 June 2013

Teams selected in 2010

Extracting Information from Spectropolarimetric Observations: Comparison of Inversion Codes

Team leader: Juan Manuel Borrero, Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany
Session: 17-21 December 2012

The Astero Fitting at Low Angular Degree Group (asteroFLAG)

Team leader: William Chaplin, University of Birmingham, United Kingdom
Session: 27-31 August 2012

The Earth's Radiation Belts: Physical Processes and Dynamic Modeling

Team leader: Norma B. Crosby, , BISA, Belgium and Richard Horne, British Antarctic Survey, United Kingdom
Session: 18-22 March 2013

The Substorm Current Wedge

Team leader: Larry Kepko, Research Astrophysicist, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA
Session: 28-30 January 2013

Critical Assessment and Standardized Reporting of Vertical Filtering and Error Propagation in the Data Processing Algorithms of the NDACC Lidars

Team leader: Thierry Leblanc, JPL-Table Mountain Facility, Wrightwood, USA
Session: 10-14 September 2012

Collisionless Shock Physics: From Non-Relativistic to Relativistic Shocks

Team leader: Alexandre Marcowith, University of Montpellier II, France
Session: 17-21 December 2012

Plasma Coupling in the Auroral Magnetosphere–Ionosphere System (POLARIS)

Team leaders: Octav Marghitu, Institute for Space Sciences, Bucharest, Romania and Joachim Vogt, Jacobs University Bremen, Germany
Session: 12-16 November 2012

Remote Observation of Aerosol Cloud-Precipitation Climate Interactions

Team leader: Anni Reissell, University of Helsinki, Finland and Danny Rosenfeld, The Hebrew University of Jerusalem, Jerusalem, Israel
Session: 13-15 February 2013

Teams selected in 2011

Coronal Heating – Using Observables (flows and emission measure) to Settle the Question of Steady vs. Impulsive Heating
Team leaders: Stephen Bradshaw, Department of Physics and Astronomy, Rice University, USA, and Helen E. Mason, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, United Kingdom
Session: 26 February - 1 March 2013

Multi-point Studies of the Auroral Acceleration Region using Cluster
Team leader: Colin Forsyth, UCL Mullard Space Science Laboratory, United Kingdom
Session: 7-11 January 2013

Flow-driven Instabilities of the Sun-Earth System
Team leader: Claire Foullon, University of Warwick, United Kingdom
Session: 2-5 April 2013

Zonal Jets and Eddies – Planetary Science and Satellite Oceanography at the Crossroads
Team leader: Boris Galperin, University of South Florida, USA
Session: 2-5 April 2013

Present and Past Activity of the Galactic Center Super-massive Black Hole and its Impact on the Central Molecular Zone of the Galaxy
Team leader: Andrea Goldwurm, Service d'Astrophysique / IRFU / DSM / CEA - Saclay, France
Session: 27-31 May 2013

Atmosphere-Ionosphere Coupling during Stratospheric Sudden Warmings
Team leader: Larisa Goncharenko, MIT Haystack Observatory, USA
Session: 29 October - 2 November 2012

The Formation of Star Clusters
Team leader: Simon Goodwin, Department of Physics and Astronomy, University of Sheffield, United Kingdom
Sessions: 1-5 October 2012 and 18-22 March 2013

The Physics of the Heliopause
Team leaders: Randy Jokipii, University of Arizona, USA and Edward C. Stone, California Institute of Technology, USA
Sessions: 6-9 November 2012 and 21-24 May 2013

Characterizing Super-Earths and Life Advance through Linking 1D/3D Atm. Models and their Resulting Observables
Team leader: Lisa Kaltenegger, Harvard Smithsonian Center for Astrophysics, USA
Sessions: 10-12 September and 10-12 December 2012

Aerosol Remote Sensing from Space
Team leader: Alexander Kokhanovsky, Bremen University, Germany
Session: 16-20 July 2012

An Assessment of the Accuracies and Uncertainties in the Total Solar Irradiance Climate Data Record
Team leader: Greg Kopp, University of Colorado, USA
Session: 14-16 May 2013

Spatial and Temporal Studies of the Heliospheric Interaction with the Local Interstellar Medium from SOHO/SWAN UV, IBEX Neutral Atom, and ACE and STEREO Pickup Ion Observations
Team leaders: Dimitra Koutroumpa, Service d'Aeronomie du CNRS, France and Vlad Izmodenov, Space Research Institute (IKI), Moscow, Russia
Session: 21-25 January 2013

Characterizing Stellar and Exoplanetary Environments via Observations and Advanced Modeling Techniques
Team leader: Helmut Lammer, Austrian Academy of Sciences, Graz, Austria
Session: 9-12 April 2013

Resolving Current Systems in Geospace
Team leaders: Mike Liemohn, University of Michigan, USA and Natalia Ganushkina, Finnish Meteorological Institute, Finland
Session: 17-21 September 2012

International Teams

Interaction of Satellites with their Space Environment
Team leader: Richard Marchand, University of Alberta, Canada
Session: 3-7 June 2013

Generation of Climate Data Records of Sea-Surface Temperature from Current and Future Satellite Radiometers
Team leader: Peter J. Minnett, University of Miami, USA
Sessions: 1-5 October 2012 and 8-12 April 2013

Lunar Volatiles
Team leaders: Igor Mitrofanov, Space Research Institute (IKI), Moscow, Russia and William Boynton, University of Arizona, USA
Session: 21-24 May 2013

Advancing Our Understanding of Solar Wind Fractionation
Team leader: Dan Reisenfeld, University of Montana, USA
Session: 18-21 June 2013

Deriving Physical Parameters of Atmosphere-less Bodies in the Solar System by Modeling their Thermal Emission
Team leader: Hans Rickman, University of Uppsala, Sweden
Session: 13-15 March 2013

Extreme Solar Flares as Drivers of Space Weather: From Science towards Reliable Statistics
Team leaders: Karel Schrijver, Lockheed Martin Advanced Technology Center, USA and Jürg Beer, EAWAG, Switzerland
Sessions: 23-26 April 2013

Comparative Jovian Aeronomy
Team leader: Tom Stallard, University of Leicester, United Kingdom
Session: 10-14 September 2012

Long-term Reconstruction of Solar and Solar Wind Parameters
Team leader: Leif Svalgaard, Stanford University, USA
Session: 30 April - 3 May 2013

Teams selected in 2012

Atmospheric Gravity Waves in Global Climate Prediction and Weather Forecasting Applications
Team leader: Joan Alexander , Colorado Research Associates (CoRA) Division, USA
Session: 8-12 April 2013
Scientific Rationale: Improving the accuracy of global weather-to-climate prediction models is a crucial activity for Earth scientists in the 21st century because of the profound social impacts of climate change. In particular, the role of stratospheric processes have been highlighted in many recent studies. These include effects of stratospheric dynamical processes on seasonal forecasts at extratropical latitudes and decadal-scale ozone changes on Southern Hemisphere circulation, ocean currents, and carbon uptake. Two key needs for climate modeling in the present era are reducing model wind biases with improved estimates of gravity wave forces, and improving methods for specifying gravity wave sources that are physically justifiable. The modern era of satellite data observations wedded with modern data assimilation system tools are leading to exciting new methods for estimating gravity wave forces in the middle atmosphere. The team's work aims to define next generation approaches to the problem of gravity wave effects in global models.

Planetary Population Synthesis: Interpreting Present and Future Space Data
Team leaders: Yann Alibert, University of Bern, Switzerland and Douglas Lin, University of California Santa Cruz, USA
Session: 3-7 December 2012
Scientific Rationale: The quest to understand planet formation has entered an explosive growth phase in the past few years, primarily thanks to the wealth of data influx provided by space missions. These data must therefore be treated as a statistical ensemble, whose properties must be understood. Population synthesis is a method to take advantage of statistical properties emerging from observations, to understand underlying processes shaping a population, in this case extrasolar planets. The team brings together theorists and observers from different institutes worldwide in order to interpret and predict observational data coming from the above-mentioned missions. For this, the team merges the efforts

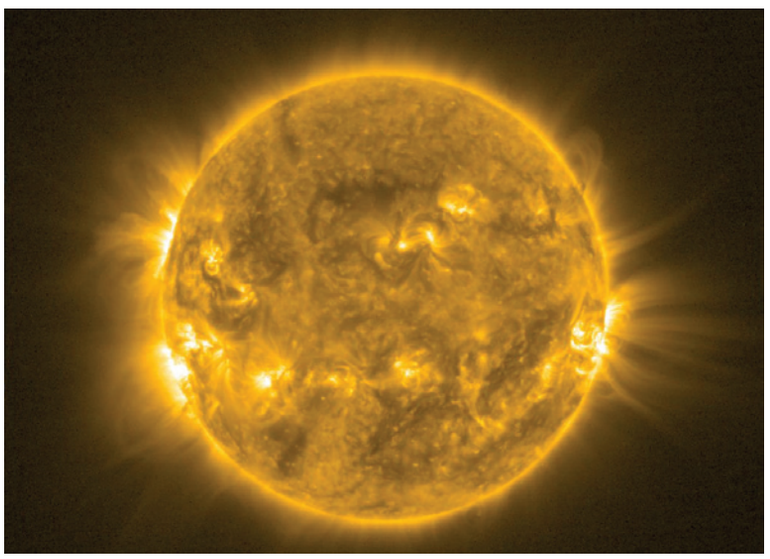
of the two leading groups of population synthesis worldwide, as well as expertises in astrometry, microlensing, direct imaging, planetary formation and evolution, and dynamics (planet-planet, planet-star, and disk-planet interactions).

Self-Organized Criticality and Turbulence

Team leader: Markus Aschwanden, Lockheed Martin Solar and Astrophysics Laboratory, USA
Session: 15-19 October 2012
Scientific Rationale: Nonlinear systems that apparently exhibit self-organized criticality (SOC) are frequently observed in astrophysics, magnetospheric physics, geophysics, human activities (stock market, city sizes), and in natural hazards (earthquakes, avalanches, forest fires). The theoretical concept of SOC has been pioneered since Bak in 1987 and simulated with cellular automaton models, but a comprehensive universal theory is still lacking. It is timely now to take advantage of comprehensive new databases of space observations and geophysics records over the last half century. The aims are to cross-compare observations (from space physics and other databases), to discuss SOC, SOC-related (such as turbulence), and non-SOC theoretical models, and to establish a diagnostic metrics between observations and theoretical models that yield new physical insights into SOC phenomena and complexity in nature.

Thermonuclear Bursts: Probing Neutron Stars and their Accretion Environment

Team leader: Andrew Cumming, McGill University, Montreal, Canada
Session: 10-14 December 2012
Scientific Rationale: Thermonuclear flashes on accreting neutron stars, observed as Type I X-ray bursts, offer a powerful probe of both how accreted material arrives and spreads over the surface of the neutron star and of the conditions inside the dense interior. The team combines observational and theoretical effort on two major outstanding issues in the physics of thermonuclear burning on neutron stars: photospheric radius expansion X-ray bursts and X-ray burst oscillations. Both of these phenomena have tremendous potential to measure neutron star masses and radii and thereby determine the equation of state of dense matter. The goal is to enable this potential with new theoretical models aimed at understanding the basic physical processes of fuel accumulation and burning and the systematic uncertainties in deriving neutron star parameters.

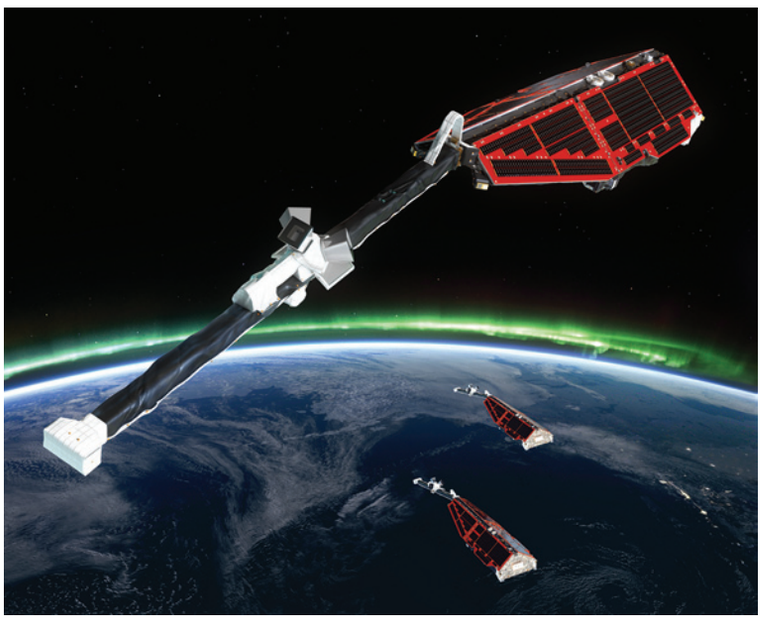


The SWAP instrument on board ESA's Proba-2 sees the Sun, 30 July 2013, at 9:28:57.258 CEST. SWAP (Sun Watcher using Active Pixel System detector and Image Processing) is a small telescope that captures the solar corona at wavelengths corresponding to temperatures of about a million degrees (around 17.1 nanometers). (Image Credit: ESA/SWAP PROBA2 science centre)

Nonlinear Force-Free Modeling of the Solar Corona: Towards a New Generation of Methods

Team leaders: Marc DeRosa, Lockheed Martin Solar and Astrophysics Laboratory, USA and Michael S. Wheatland, The University of Sydney, Australia
Session: 29 January - 1 February 2013
Scientific Rationale: Knowledge of the structure and evolution of the magnetic field of the solar corona is important for investigating and understanding the origins of space weather. One class of models assumes that the corona, due to its low plasma beta, is free of Lorentz forces. Such nonlinear force-free field (NLFFF) models, when they can be computed, provide insight into coronal energetics without having to solve the full magnetohydrodynamic equations. However, past research has established that NLFFF models are beset by limitations (in both the data and the methods) that preclude their use on a regular basis. In recent years, advances in modeling techniques as well as new instrumentation have enabled many of these issues to be addressed. The aim of the team is to develop, test, and assess the next generation of NLFFF models to meet twice in the next two years.

International Teams



Swarm is ESA's first constellation of Earth observation satellites designed to measure the magnetic signals from Earth's core, mantle, crust, oceans, ionosphere and magnetosphere, providing data that will allow scientists to study the complexities of our protective magnetic field. (Image Credit: ESA/AOES Medialab)

Polar Cap Arcs: Understanding Magnetosphere-Ionosphere Coupling and Magnetospheric Topology during Periods of Northward IMF

Team leaders: Robert Fear, University of Leicester, United Kingdom and Romain Maggiolo, Belgian Institute for Space Aeronomy, Belgium
Session: 11-15 February 2013
Scientific Rationale: The coupling between the magnetosphere and the ionosphere is a key issue in solar-terrestrial physics. The magnetosphere-ionosphere system is often thought to be inactive when the IMF is northward; however, observations over several decades have shown that under these conditions, optical emissions are detected within the polar cap. Polar cap arcs are the signature of poorly understood processes that couple the magnetosphere to the ionosphere when the IMF is northward; consequently observations of polar cap arcs are capable of revealing profound information about the topology of the magnetosphere during intervals of northward IMF, and they are useful tools to study auroral conjugacy. The team includes scientists with diverse expertise in models and observations of polar cap arcs to identify and investigate key issues linked to polar cap arcs in order to give a better picture of magnetosphere-ionosphere interactions during periods of northward IMF.

Kinetic Plasma Processes at Airless Bodies

Team leader: Matthew O. Fillingim, University of California, Berkeley, USA
Session: 12-16 November 2012
Scientific Rationale: The team studies kinetic plasma processes occurring at airless bodies in the Solar System. The goal is to characterize and compare the kinetic plasma processes occurring around airless bodies including the Moon, asteroids, and the airless satellites of Mars, Jupiter, and Saturn. The scientists focus on non-equilibrium plasma distributions produced by the interaction of solar wind and/or magnetospheric plasma with airless bodies (and the localized electric and magnetic fields associated with such bodies) and the plasma processes that generate these distributions. The team also studies the plasma wave environment around airless bodies and determine how the observed wave activity is related to the observed non-equilibrium plasma distributions. These objectives are achieved through a combination of analysis of observational data and simulation results. These activities seek to advance our understanding of basic plasma processes occurring in the Solar System.

Rapid Dynamics in the Earth's Core: Assimilation of Satellite Observations into MHD models

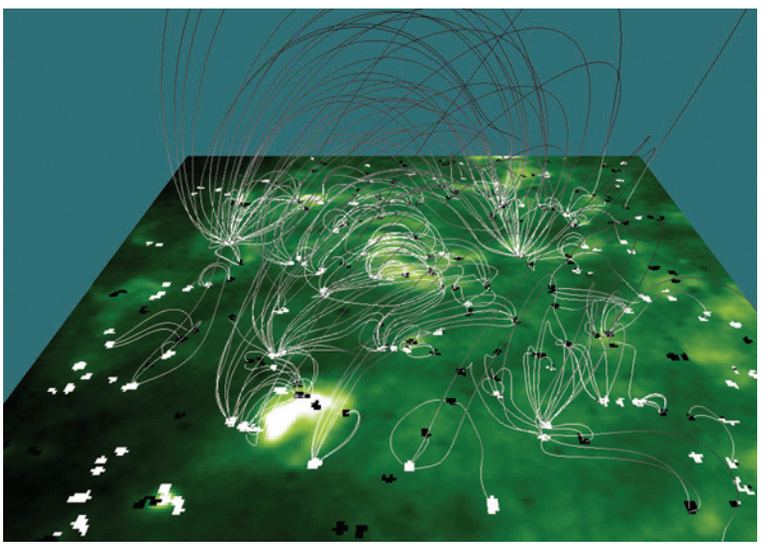
Team leader: Christopher Finlay, Technical University of Denmark, Copenhagen, Denmark
Session: 11-15 February 2013
Scientific Rationale: Satellite magnetic observations from the Oersted and CHAMP missions have in the past decade revealed rapid changes in the Earth's core. The origin of these events is not yet understood, but they seem to involve a reorganization of flows and magnetic fields within the outer core. Integration of magnetic field observations from satellites, in particular from the upcoming ESA Swarm constellation, with specially tailored MHD models of core dynamics is now required in order to make progress. There is now an urgent need for an improved characterization of the correlated errors inherent in satellite magnetic observations and in derived global field models. There is also a need for numerical models capable of describing rapid outer core dynamics, such as quasi-geostrophic MHD models. The team, comprising both observational and theoretical expertise, works on algorithms to combine satellite observations and new numerical models of core dynamics.

Observations and Modeling of Flare Chromospheres

Team leader: Lyndsay Fletcher, University of Glasgow, United Kingdom
Session: 14-17 January 2013
Scientific Rationale: Solar flares are the most energetic energy release events in the Solar System. The majority of energy radiated from a flare originates in the solar chromosphere, the dynamic interface between the Sun's photosphere and corona, and it is only by thoroughly probing the flare chromosphere that we can understand the way in which flare energy is transmitted and dissipated. Over the last few years, observations have become available which provide new constraints on energy deposition, and new tests for the flare models. Advanced numerical simulations can be run which, together with the observations, can constrain the energy input and dissipation during the flare. Within the year 2013, a new satellite observing in the UV is launched (IRIS) which allows the team the first look at flare radiation in three UV spectral bands not accessible for flare observations since the Solar Maximum Mission three decades ago.

First Principles Physics for Charged Particle Transport in Strong Space and Astrophysical Magnetic Turbulence

Team leader: Federico Fraschetti, University of Arizona, USA
Session: 13-17 May 2013
Scientific Rationale: The properties of transport of energetic particles in a strong magnetic turbulence have been investigated in the last few years mostly through numerical simulations, due to the technical difficulties of pursuing an analytical investigation. The members of the team discuss the main assumptions made in the current theoretical treatments and how go beyond them, for instance, fluctuation computed along unperturbed particle orbit, validity to first order in magnetic turbulence, small ratio of particle gyroradius to turbulence correlation length, uncoupled wavenumbers of particle power spectrum, with the aim of extending the original theories and investigate the strong turbulence regime. The team also broaches those numerical simulations which can help to address these points. This work will be relevant for the propagation of energetic particles in interplanetary medium, at supernova remnant shocks, in the intergalactic medium.

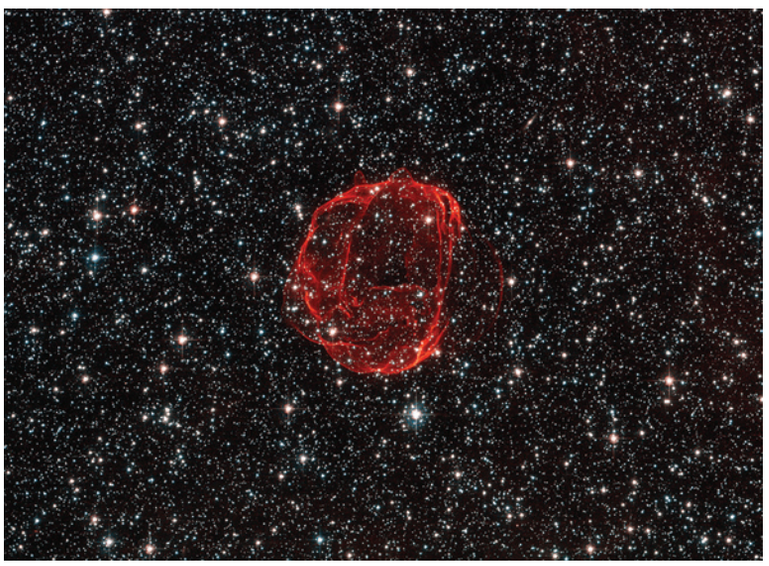


This image provides a model of magnetic fields at the Sun's surface using SOHO data, showing irregular magnetic fields (the 'magnetic carpet') in the solar corona (top layer of the Sun's atmosphere). Small-scale current sheets are likely to form in such turbulent environment and reconnection may occur in similar fashion as in Earth's magnetosheath. This can be relevant to a better understanding of the heating of solar corona. (Image Credit: Stanford-Lockheed Inst. for Space / NASA GSFC)

Coronal Magnetometry: Building Tools for Discovery

Team leader: Sarah E. Gibson, National Center for Atmospheric Research, USA
Session: 25 February - 1 March 2013
Scientific Rationale: Magnetism defines the complex and dynamic solar corona, lying at the heart of any understanding of the origins of space weather at the Earth. It is now at a watershed moment: telescopes using infrared, visible, and radio magnetometry are obtaining unprecedented observations, and future large telescopes are under development that will revolutionize the understanding of coronal magnetism. The team brings together observers from the various wavelength regimes and modelers to help interpret these novel observations. A major goal is to expand the FORWARD solarsoft IDL tree, which currently enables reproduction of infrared polarimetric observables from MHD models, to incorporate observables at other wavelengths. The scientists develop methods for combining such observations to diagnose the 3D coronal magnetic field, and consider implications for the development of multi-frequency, next-generation coronal magnetometric telescopes.

International Teams



These delicate wisps of gas make up an object known as SNR B0519-69.0, or SNR 0519 for short. The thin, blood-red shells are actually the remnants from when an unstable progenitor star exploded violently as a supernova around 600 years ago. There are several types of supernova, but for SNR 0519 the star that exploded is known to have been a white dwarf star – a Sun-like star in the final stages of its life. (Image Credit: ESA/Hubble & NASA. Acknowledgement: Claude Cornen)

Towards an Integrated Retrieval of Antarctic Sea Ice Volume

Team leaders: Petra Heil, University of Tasmania, Australia and Stefan Kern, University of Hamburg, Germany

Session: *22-26 July 2013 (BY 19)*

Scientific Rationale: Sea ice is found at the interface of ocean and atmosphere of Earth's polar regions, and has been described as one of the climate canaries. It also provides refuge to numerous ecosystems. While the science hold a good understanding of fundamental sea ice processes, its complex interactions within the polar climate system require further research. Because of its expanse, remote sensing provides the only (sustainable) method for observing and monitoring sea ice. However, satellite-derived sea ice products require further validation and systematic assessment, if they are to be used for climate observations. Much attention has been paid to the Arctic sea ice cover, presumably because of the more dramatic changes observed and projected. The Antarctic sea ice cover has received less attention. However, since Antarctic sea ice is much thinner than Arctic sea ice, any change in sea ice thickness might have more severe consequences for the health of the Antarctic sea ice cover than it has for the Arctic. Therefore, a part of the research will focus on the Southern Ocean sea ice cover.

Characterizing Diurnal Variations of Ozone for Improving Ozone Trend Estimates

Team leader: Klemens Hocke, Institute of Applied Physics and Oeschger Centre for Climate Change Research, University of Bern, Switzerland

Session: 10-14 December 2012

Scientific Rationale: Stratospheric ozone profiles from satellite and ground-based instruments are collected at different local times. To create a homogeneous long-term record of O_3 from these sensors one needs to remove possible biases between instruments caused by diurnal effects. Several ground-based microwave radiometer instruments that are part of the Network for the Detection of Atmospheric Composition Change (NDACC), including instruments at two Swiss stations located at Payerne and Bern, have been measuring diurnal variations of O_3 for more than 20-30 years. Recent analyses of these data indicate that there is significant local time variation of ozone in the upper stratosphere, perhaps down to the mid stratosphere (20 hPa). The variations are particularly large (10-15%) around 1 hPa, and appear to have significant seasonal and latitudinal dependence. Satellite data and model results show similar variations. However, the differences between models and measurements, and between measurements themselves can sometimes be quite large. It is necessary to resolve these differences in order to develop a scientific consensus on the diurnal variations of O_3 at different altitudes. The aim of this proposed effort is to bring together a representative group of scientists from the measurement and modeling community to develop such a consensus.

The Evolution of the First Stars in Dwarf Galaxies

Team leader: Pascale Jablonka, École Polytechnique de Lausanne EPFL, Lausanne, Switzerland

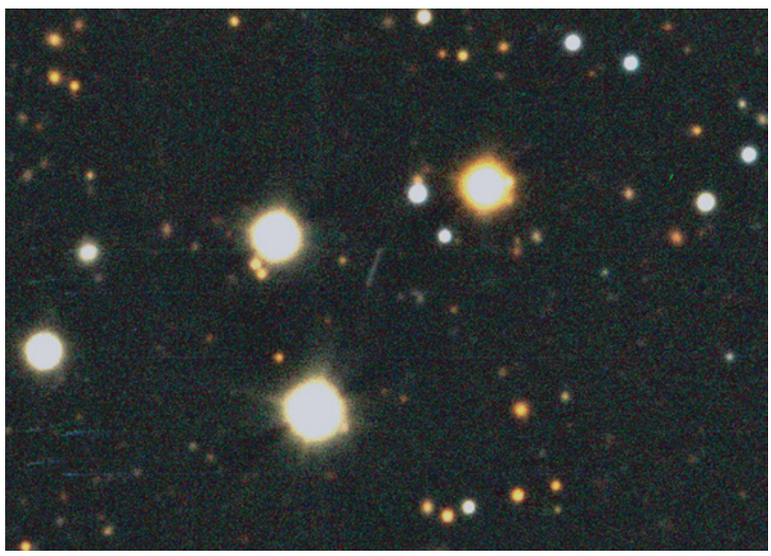
Session: 17-19 December 2012

Scientific Rationale: The question of the origins of cosmic systems at all scales is at the heart of modern astrophysics. In the ΛCDM galaxy formation paradigm, the first galaxies to form are the smallest, and the dwarf galaxies we observe today are their closest

surviving relics. These faint objects are the most ancient and metal-poor Galactic systems known. A potentially much larger population, including streams from recently disrupted systems, is revealed and characterized by new optical and near-infrared surveys and the upcoming Gaia space mission. To exploit these advances, it requires a range of cross-disciplinary expertise: from numerical simulations, via survey data analysis, through to detailed chemical modeling. This allows the team to enhance the derivation of accurate chemical abundances in the extremely low stellar metallicity and low gravity regime found in dwarf galaxies and to optimize the next target selection strategies. These are key requirements to understanding the nucleosynthesis and the nature of the first stars in dwarf spheroidal galaxies.

Modeling Cometary Environments in the Context of the Heritage of the Giotto Mission to Comet Halley and of Forthcoming New Observations at Comet 67P/Churyumov-Gerasimenko

Team leader: Monio Kartalev, Bulgarian Academy of Sciences, Sofia, Bulgaria
Session: 19-23 November 2012
Scientific Rationale: The project is dedicated to finding better insights on the problem of modeling the solar wind – ionized coma interaction. The emphasis will be made on the fluid model approaches. The problem of the importance of the applied specific numerical techniques will be also addressed. The basic aims of the project's activities are:
- Advance the understanding of the basic processes governing the interaction of solar wind plasma with the cometary ionized coma.
- Comparing many different models of the global plasma interaction at comet environment.
- Reconsideration and possible reinterpretation of some experimentally observed but not uniquely explained phenomena in the comet Halley environment.
- Providing additional tools for possible interpretation of oncoming observation of the comet 67P/CG environment during the concluding stage of the Rosetta mission.



Composite image of the nucleus of Comet 67P/Churyumov-Gerasimenko (the trail of light at the centre), recorded in 2004 with the SUSI-2 camera on the 3.5-m New Technology Telescope. It is based on fifteen series of exposures seen in three different wavebands. Because the comet is moving with respect to the background stars, it appears as a trail. (Image Credit: ESO)

X-ray and Radio Diagnostics of Energetic Electrons in Solar Flares

Team leader: Eduard P. Kontar, University of Glasgow, Glasgow, United Kingdom
Session: 4-8 February 2013
Scientific Rationale: During periods of sporadic solar activity, the Sun effectively converts magnetic energy into kinetic energy of accelerated particles in solar flares. Radio and hard X-ray emissions both originate from non-thermal electrons; hence a closer comparison could lead to a unified scenario. However, the new observational results are surprising and demonstrate that we are still far from even a general scenario for flares. The combination of radio and X-ray data makes tests of the current models and the new ideas with fewer possible degrees of freedom. In the view of the high quality X-ray (RHESSI) and ground-based broadband radio observatories, we plan to use the combined X-ray and radio observations to gain a new level of understanding of electron acceleration and transport building on numerical simulations as an essential link between radio and X-ray data. This is a particularly timely activity which can help to better plan the future observations with FASR, LOFAR, Solar Orbiter, and Solar Probe Plus.

International Teams

Impression of the team meeting on "Heavy Ions: Their Dynamical Impact on the Magnetosphere" led by Elena Kronberg held in February 2013.

Heavy Ions: Their Dynamical Impact on the Magnetosphere

Team leader: Elena Kronberg, Max-Planck-Institute for Solar System Research, Katlenburg-Lindau, Germany
Session: 4-8 February 2013
Scientific Rationale: Ions from the ionosphere modify the density, temperature and composition of the plasma sheet, the main reservoir of magnetospheric plasma. It is, however, challenging to include these ions in numerical studies of the magnetotail, ring current and radiation belt. Information about the ion abundances and their dependence on the solar wind and magnetospheric conditions is essential for defining the boundaries in simulations. The improvement of numerical models via verification against data will refine our understanding of the near-Earth space weather. The team brings observers and modeling specialists together, with the objective to combine the best databases (Cluster) and models for investigating the role of the heavy ion contribution on the dynamics of the near-Earth magnetosphere.

The Induced Magnetosphere of Mars: Physical Processes and Consequences

Team leader: Mark Lester, University of Leicester, Leicester, United Kingdom
Session: 12-16 November 2012
Scientific Rationale: Planets and other solar system bodies, including satellites of the gas giant planets, which possess a conducting ionized upper atmosphere but no intrinsic dynamo magnetic field, are typically engulfed in draped magnetic field lines stemming from the surrounding field of the host star or planet. These so-called 'induced magnetospheres' modulate the interaction between the upper atmosphere of the planet or moon and the impinging solar wind or host-planetary plasma. Such an induced magnetosphere has been observed at Mars, and many of the features of ion outflow from the planet, plasma heating in the upper atmosphere etc., are intricately coupled to the intensity and geometry of the draped field within the induced magnetosphere in response to solar wind variations. The team focus on the analysis of data from Mars Express during two campaign periods when Mars was located behind Earth on the so-called Parker spiral of heliospheric magnetic field, allowing the use of data from near-Earth satellites, e.g. ACE, to relate any observed dynamics in the upper atmosphere at Mars to solar wind disturbances previously passing Earth. The work is also supported by numerical simulations.

Quantifying Hemispheric Differences in Particle Forcing Effects on Stratospheric Ozone

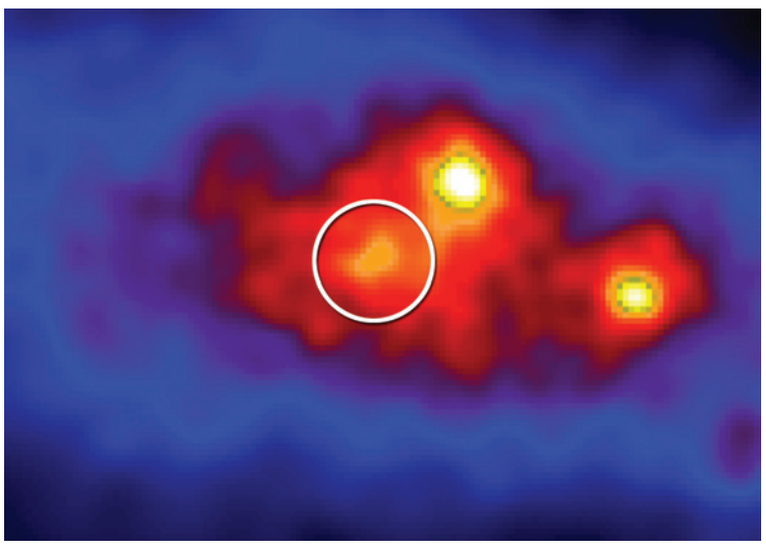
Team leader: Daniel Marsh, National Center for Atmospheric Research, Boulder, USA
Session: 18-22 March 2013
Scientific Rationale: Energetic particle precipitation (EPP) significantly affects the composition of the middle and upper atmosphere. Model simulations and observations have shown that EPP produces odd-nitrogen species (NOx) that subsequently destroy ozone. It is becoming clear that the variable dynamics of the winter polar stratosphere in the Northern Hemisphere play a vital role in transport of NOx. Major stratospheric sudden warmings, appear to either enhance or reduce NOx downward transport. In contrast, the lack of variability in the Southern Hemisphere winter results in a consistent conduit of upper atmospheric NOx into the stratosphere. The team uses satellite data and model simulations to quantify hemispheric differences in wintertime EPP NOx and its effects on stratospheric ozone. It aims to assess which hemisphere responds more directly to EPP forcing on timescales up to the 11-year solar cycle, and how that varies with meteorology. This is a necessary first step in understanding the role of stratospheric EPP-induced ozone loss in driving tropospheric climate variability.

Unified View of Stellar Winds in Massive X-ray Binaries

Team leader: Silvia Martinez Nunez, University of Alicante, Spain
Session: 18-22 February 2013
Scientific Rationale: The aim is to bring together specialists in winds from massive stars and also observers of High-Mass X-ray Binary (HMXB) systems in order to review the state-of-the-art in observations and modeling and to develop a unified view on the physics of the stellar winds in these systems. Massive stars are among the most important cosmic engines: they trigger the star formation and, together with low-mass stars, enrich the interstellar medium with the heavy elements but on short time scales, ultimately leading to formation of Earth-like planets and development of life. Among the bright X-ray sources in the sky a significant number consists of a compact object accreting from the wind of such massive stars. These winds are fast, dense, with mass-loss rates M >10–7 M⊙/yr, and driven by line scattering of the star's intense continuum radiation field. While the basic picture has been established for decades, many details are still debated.

MHD Oscillations in the Solar Corona and Earth's Magnetosphere: Towards Consolidated Understanding

Team leaders: Valery Nakariakov, University of Warwick, Coventry, United Kingdom and Viacheslav Pilipenko, Space Research Institute, Russia
Session: 25 February - 1 March 2013
Scientific Rationale: The team aims to develop consolidated models of magnetohydrodynamic (MHD) oscillatory processes observed in solar system plasmas, especially in the solar corona and the Earth's magnetosphere. The interest in the understanding of the mechanisms for the oscillations and of their linkage with the physical conditions in the plasmas is connected with the new powerful remote diagnostics. The oscillatory processes in different plasma systems show interesting similarities and differences, which so far received little attention and remain under-exploited. In addition, the launch within the past three years of SDO, Hinode, STEREO, THEMIS and CORONAS-PHOTON, in combination with matured analysis of data from earlier spacecraft makes it very timely to survey the breadth of observations giving evidence for MHD oscillatory processes in solar and space plasmas.



Brighter colors indicate greater numbers of gamma rays detected in this Fermi LAT view of a region centered on the position of Cygnus X-3 (circled). The brightest sources are pulsars. (Image Credit: NASA/DOE/Fermi LAT Collaboration)

Study of Gamma-ray Loud Binary Systems

Team leader: Andrii Neronov, University of Geneva, Switzerland
Session: 19-22 February 2013
Scientific Rationale: Over the last several years the amount of information on the Gamma-ray Loud Binary Systems (GRLBs) has dramatically increased due to the operation of Fermi telescope which provides an all-sky survey in the GeV band. Several new types of binary systems were discovered by Fermi. The diversity of the GRLBs reveals a variety of physical conditions in which efficient particle acceleration could operate. At the same time, non-detection of some large amount of X-ray binaries which were conjectured to be efficient particle accelerators before the launch of Fermi shows that particle accelerators could operate only in binaries with very specific physical conditions. The understanding of the conditions for particle acceleration in the binary systems is far from being satisfactory. Improvement of such understanding is the main goal of the team work. The work of the team is centered around three main types of activities: Radio, Optical, X-ray and gamma-ray observations of selected GRLBs; Mining of archival multiwavelength data on the known GRLB systems and on the new GRLB candidates; and theoretical modeling toward a self-consistent picture of particle acceleration and gamma-ray emission in GRLBs.

International Teams

Large-scale Vortices and Zonal Winds in Planetary Atmospheres/Ionospheres: Theory versus Observations

Team leader: Oleg Pokhotelov, Institute of Physics of the Earth, Russian Academy of Sciences, Russia
Sessions: 17-21 September 2012 and 27-31 May 2013
Scientific Rationale: The scientific activity is associated with a theoretical description of the generation of zonal winds and large-scale vortices in turbulent planetary atmospheres. These structures mainly determine the dynamics and transport processes in these regions. The role of nonlinear effects in the formation of mesoscale vortical structures (cyclones and anticyclones) is examined. A new mechanism for zonal wind generation in planetary atmospheres is developed. It is based on the parametric generation of convective cells by finite-amplitude Rossby waves. Weakly turbulent spectra of these and similar waves are analyzed. Furthermore, nonlinear dynamics of the planetary electromagnetic waves propagating through the weakly ionized ionosphere will be investigated. The theoretical results will be compared with the results of satellite microwave monitoring of the Earth's atmosphere and will be applied to the interpretation of the wave phenomena in Venus and Jupiter atmospheres.

Dusty Plasma Effects in the System Earth–Moon

Team leader: Sergey Popel, Institute of Physics of the Earth, Russian Academy of Sciences, Russia
Session: 18-22 February 2013
Scientific Rationale: The overall goal consists in providing essential synergy for achieving major progress in the area of dusty plasma processes occurring in the system Earth–Moon and in the incorporation of this field into modern space and planetary sciences. To achieve the progress in an understanding of dusty plasma processes occurring in the system Earth–Moon, the focus is on the scientific objectives which include: systematization of the knowledge on dusts in the system Earth-Moon, description of dust parameters; theoretical and computational models describing dust grain charging, dynamics, and transport of dust grains in the lunar exosphere and Earth's magnetosphere; theoretical and computational models of wave and collective phenomena in the dusty plasma system Earth–Moon, recommendations on development of experimental methods on observation (in the polar regions) and analysis of dusty plasmas existing in the near-surface layer of the Moon, etc.

Understanding Solar Jets and their Role in Atmospheric Structure and Dynamics

Team leader: Nour-Eddine Raouafi, The Johns Hopkins University, USA
Session: 4-8 March 2013
Scientific Rationale: Chromospheric and coronal jets represent important manifestations of ubiquitous solar transients, which may be the source of significant mass and energy input to the upper solar atmosphere and the solar wind. While the energy involved in a jet-like event is smaller than that of "nominal" solar flares and Coronal Mass Ejections (CMEs), jets share many common properties with these major phenomena, in particular, the explosive magnetically driven dynamics. Studies of jets, therefore, can provide critical insight for understanding the larger, more complex drivers of the solar activity. On the other side of the size-spectrum, the study of jets could also supply important clues on the physics of transients close or at the limit of the current spatial resolution such as spicules. Furthermore, the jet phenomenon may be a basic process for heating the corona and accelerating the solar wind; consequently their study gives us the opportunity to attack a broad range of solar-heliospheric problems.
Over the last decade, observations from space (Yohkoh, SOHO, STEREO, Hinode, and SDO) and from groundbased observatories have inspired an ever-growing interest in transients like jets. However, many aspects of these jets remain elusive: discrepancies between observations and models remain unresolved; driving mechanisms have not been clarified; some of their physical properties are at best known for limited samples, etc.
Recent discoveries suggest also that different types of small-scale active events (e.g., spicules, EUV- and X-ray jets, bright points, and plumes) may be closely related. However, the exact nature of these inter-relationship(s), the plasma properties, the magnetic structure, and the magnetic topology of these features, as well as their formation process and evolution still remain unclear. The aim is to consolidate and enhance the knowledge on the properties of chromospheric and coronal jets from both observational and modeling points of view.
The objectives include:

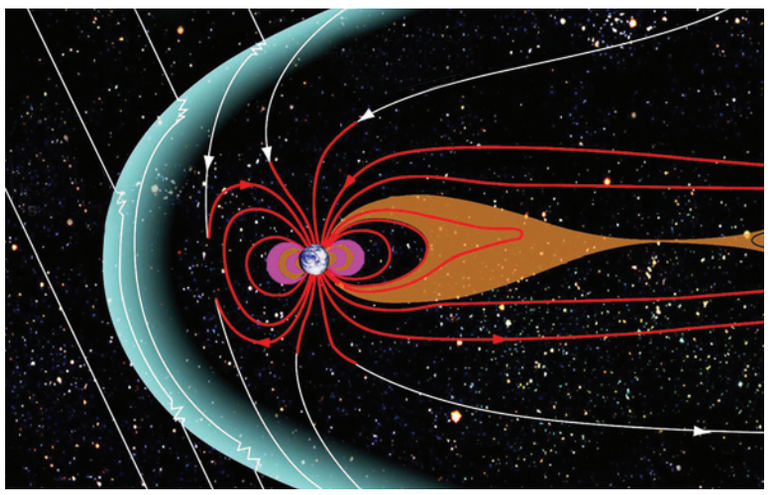
1. Advance our understanding of the triggering and driving mechanisms of solar jets;
2. Determine the physical properties and the magnetic set-ups of jets through statistical studies using data from SDO, Hinode, STEREO, IRIS, ...;
3. Compare, constrain, and drive numerical models using observational measurements;
4. Study the nature of inter-relationship between jets and other solar structures such as plumes and bright points;
5. Determine their net role in producing and maintaining the observed upper solar atmosphere and solar wind.

Particle Acceleration at Plasma Jet Fronts in the Earth's Magnetosphere

Team leader: Alessandro Retino, Laboratoire de Physique des Plasmas - CNRS, France
Session: 21-25 January 2013
Scientific Rationale: The team studies particle acceleration at plasma jet fronts in the Earth's magnetosphere. The main goal is to identify the different ion and electron acceleration mechanisms at/around fronts and to establish which the most efficient ones are. Plasma jets and associated particle acceleration are very important in many astrophysical environments but can be studied in detail only in the magnetosphere, where highresolution measurements of particle distribution functions and electromagnetic fields are available in situ. To achieve the goal, the team combines multi-spacecraft ESA/Cluster and NASA/Themis in situ observations with models and numerical simulations (MHD, kinetic).

Solar Wind Charge Exchange Soft X ray Imaging in the Solar System

Team leaders: David Sibeck and Michael R. Collier, NASA Goddard Space Flight Center, USA
Session: 14-18 January 2013
Scientific Rationale: X-ray emission from Solar Wind Charge Exchange (SWCX) recombination is ubiquitous. It occurs in planetary atmospheres, comets, interplanetary space, and in the Earth's exosphere, while evidence for extrasolar charge exchange emission has been observed in supernova remnants, galaxies and galaxy clusters. Consequently, the heliophysics, planetary science, and astrophysics communities all have an interest in SWCX. The cross-disciplinary nature of the subject requires an unusually high degree of cooperation and coordination across these disciplines. The team brings together experts from across Europe, the United States, and Japan from the fields of heliophysics, astrophysics, and planetary science to (1) assess the current state of SWCX soft X-ray research including relevant laboratory and theoretical atomic collision processes, (2) tackle outstanding problems in theory, observation, and modeling, and (3) define the direction of future research.

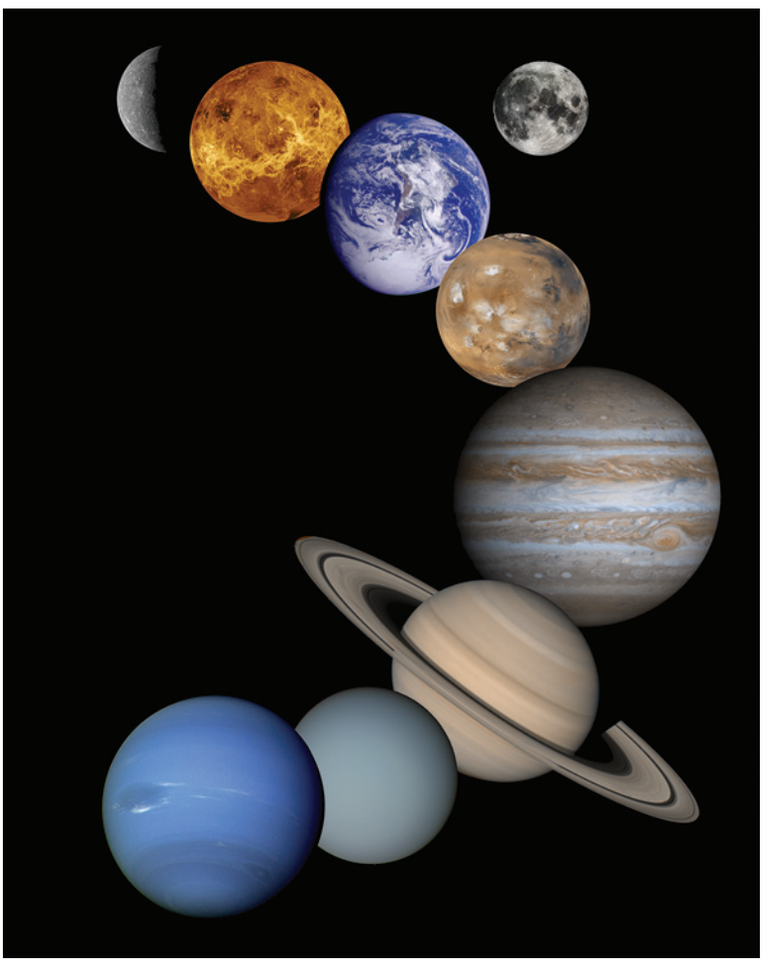


A magnetosphere is that area of space, around a planet, that is controlled by the planet's magnetic field. The Earth's magnetosphere is a highly dynamic structure that responds dramatically to solar variations. The shape of the Earth's magnetosphere is the direct result of being blasted by solar wind. The solar wind compresses its sunward side to a distance of only 6 to 10 times the radius of the Earth. A supersonic shock wave is created sunward of Earth called the Bow Shock. (Image Credit: NASA/Goddard/Aaron Kaase)

Stratospheric Sulfur and its Role in Climate (SSiRC) Workshops

Team leader: Larry W. Thomason, NASA Langley Research Center, USA
Session: 31 October - 2 November 2012
Scientific Rationale: The team addresses timely questions regarding the stratospheric sulfur budget with a primary objective of facilitating significant strides in the understanding of the processes that govern stratospheric sulfate aerosols and to improve the representation of these processes in global climate models. The project is timely because it will contribute to the fundamental scientific understanding of the natural state of the stratospheric aerosol layer and its

International Teams



This is a montage of planetary images taken by spacecraft managed by the Jet Propulsion Laboratory in Pasadena, CA. Included are (from top to bottom) images of Mercury, Venus, Earth (and Moon), Mars, Jupiter, Saturn, Uranus and Neptune. (Image Credit: NASA/JPL)

lifecycle. This knowledge is an indispensable prerequisite to the evaluation of any aerosol-based geoengineering schemes proposed to counterbalance global warming. The knowledge gained forms the scientific basis to develop tools to include an interactive stratospheric aerosol layer in climate models and to improve climate-relevant aerosol data products obtained from different measurement techniques. To achieve the main goals, the team is bringing together key scientists associated with measurements of aerosol and their precursors and from the climate modeling community.

Vesta, the Key to the Origins of the Solar System

Team leader: Diego Turrini, Italian National Astrophysics Institute (INAF), Rome, Italy
Session: 28 January - 1 February 2013
Scientific Rationale: One of the less understood phases in the history of the Solar System is that of the Solar Nebula, when the giant planets were forming together with the primordial asteroids. According to recent results on the Howardite-Eucrite-Diogenite meteorites, the asteroid 4 Vesta formed and differentiated in the Solar Nebula before the formation of Jupiter. The formation of Jupiter triggered a phase of primordial bombardment in the inner Solar System due to the appearance of orbital resonances in the asteroid belt and the scattering of planetesimals from the outer Solar System. This Jovian Early Bombardment (JEB) could have caused either the partial or the complete erosion of the basaltic crust of Vesta, which the Dawn mission confirmed to have survived until now. This project assembles a team of experts on dynamics, impact physics, meteorites, geophysics and thermal evolution of asteroids to assess the timescale of the geophysical evolution of Vesta and the possible signatures (e.g maria or cryptomaria, surface erosion) left by the JEB on its surface. The team works in strict collaboration with the Dawn mission to use Vesta as a probe into the origins of the Solar System.

Towards a Full Integration of Earth Observation Products and Concepts in Land Surface Models

Team leader: Peter M. van Bodegom, VU University Amsterdam, The Netherlands
Session: 25-27 June 2013
Scientific Rationale: Land surface models increasingly make use of Earth Observation (EO)–products. However, a full exploitation of EO–products is currently hampered by the different definitions, assumptions and algorithms applied by the scientific communities involved. Moreover, it seems that the radiative transfer schemes applied in land surface models are frequently internally inconsistent, while concepts on consistent radiative transfer schemes are available. There is thus a strong need for improved communication and integration of the scientific communities involved. The first meeting aims to evaluate the need for consistent radiative transfer schemes in land surface models and available approaches to achieve

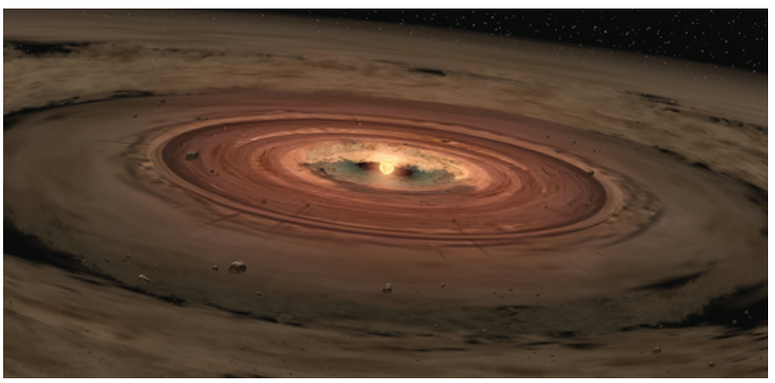
this. The second team meeting aims to discuss integrative approaches to apply EO–products to model land surface processes by the use of data assimilation tools and ecological constraints.Through these timely topics, the team intends to achieve a better understanding and appreciation of each others products.

Dawn-Dusk Asymmetries in the Coupled Solar Wind-Magnetosphere-Ionosphere System

Team leaders: Andrew Walsh, ESTEC, The Netherlands and Stein Haaland, University of Bergen, Norway
Session: 22-26 April 2013
Scientific Rationale: Dawn-Dusk asymmetries have been observed in the Earth's magnetotail current systems and particle fluxes, in the ring current, and in polar cap patches and in global convection pattern in the ionosphere. There is also evidence that the proton and electron auroral ovals are offset in the Dawn-Dusk direction. Various authors have related these asymmetries to differences in solar illumination, ionospheric conductivity and processes internal to the magnetosphere. Significant Dawn-Dusk asymmetries have also been observed in the terrestrial magnetosheath, and there is evidence that plasma entry mechanism to the magnetotail, for example, operate differently in the pre- and post-midnight sectors. The goal is to examine all of these asymmetries and investigate their causes, with the ultimate aim of providing a theoretical and conceptual framework into which they can be placed.

Magnetic Activity of M-type Dwarf Stars and the Influence on Habitable Extra-Solar Planets

Team leader: Sven Wedemeyer-Böhm, University of Oslo, Norway
Session: 28 January - 1 February 2013
Scientific Rationale: As of today, more than 900 exoplanets are known. Many of them orbit cool dwarf stars of spectral type M, which constitute 75% of all stars in our galaxy. M-dwarfs might thus be the most common planet host stars by far. While many properties of the atmospheres of these stars are poorly known, M-dwarfs are known to exhibit high levels of magnetic activity. It includes the emission of intense bursts of radiation in the form of flares, which can be a thousand times stronger than their solar analogues. These violent mega-flares are likely to have a potentially hazardous influence on accompanying nearby planets and might therefore severely affect the habitability of a planet. The interdisciplinary team is investigating the activity of M-type dwarf stars and the resulting influence on the atmospheres of nearby planets, which is crucial for understanding under which conditions life may evolve.



This artist's concept shows a brown dwarf surrounded by a swirling disk of planet-building dust. NASA's Spitzer Space Telescope spotted such a disk around a surprisingly low-mass brown dwarf, or "failed star." Astronomers believe that this unusual system will eventually spawn planets. If so, they speculate the disk has enough mass to make one small gas giant and a few Earth-sized rocky planets. (Image Credit: NASA/JPL)

Magnetosphere and Ionosphere as a Coupled System: Theory and Observations

Team leader: Andrew Wright, University of St. Andrews, United Kingdom
Session: 21-25 January 2013
Scientific Rationale: The coupling of the terrestrial magnetosphere and ionosphere is fundamental to understanding the behavior of each region. Strong coupling is often associated with the closure of intense electrical currents flowing along magnetic fields lines. The Alfvén wave is a natural agent for carrying these currents, and is known to modify signatures of coupling such as optical auroral emissions when magnetospheric electrons are precipitated in the ionosphere (in so-called 'upward' current regions). In 'downward' current regions, cold ionospheric electrons are removed and flow into the magnetosphere. The redistribution of plasma by currents and associated changes in conductivity modify the Alfvén wave reflected back into the magnetosphere, and hence the total field-aligned current coupling the two regions. The self-consistent coupling is nonlinear and can lead to the formation of small scales through steepening, which can bring new physics into play. Our investigations will exploit both theory and observations.

International Teams approved in 2013

The Teams below have been selected for implementation from the proposals received in response to the 2013 Call for International Teams:

Slow Solar Wind Sources and Acceleration Mechanisms in the Corona
Team leaders: Lucia Abbo (I) and Leon Ofman (US)

Partially Ionized Plasmas in Astrophysics (PIPA)
Team leader: José Luis Ballester (ES)

Mapping the Northern Plains of Mars: Origins, Evolution and Response to Climate Change
Team leader: Matthew Balme (UK)

Deciphering AGN out Ows: Multi-Wavelength Monitoring of NGC5548
Team leader: Massimo Cappi (I)

Massive Star Clusters Across the Hubble Time
Team leader: Corinne Charbonnel (CH)

Early Universe: Research On Plasma Astrochemistry
Team leader: Carla M. Coppola (I)

Unveiling Multiple AGN Activity in Galaxy Mergers
Team leader: Alessandra DeRosa (I)

Integrating Earth Observation Data the Description of Land Management Practices into Global Carbon Cycle Models
Team leader: Han Dolman (NL)

Exploration of the inner Heliosphere - what we have learned from Helios and what we want to study with Solar Orbiter
Team leader: Wolfgang Droege (DE)

Non-Equilibrium Processes in the Solar Corona and their Connection to the Solar Wind
Team leaders: Elena Dzifcakova (CZ) and Helen E. Mason (UK)

Multidisciplinary Search for Preservation Windows of Biomolecules in Modern and Ancient Terrestrial Analogs as a Proxy for Ancient Deposits of Mars
Team leader: David C. Fernandez Remolar (ES)

Effects of Interplanetary Disturbances on the Earth's Atmosphere and Climate
Team leader: Katya Georgieva (BU)

Understanding Intrinsic Galaxy Alignments
Team leader: Benjamin Joachimi (UK)

From 2D Mesoscale Surface Expressions to 3D Upper Ocean Dynamics
Team leader: Johnny A. Johannessen (NO)

The Science of Near-Sun Comets
Team leader: Geraint H. Jones G. (UK)

Sub-arcsecond Observations and Interpretation of the Solar Chromosphere
Team leaders: Lucia Kleint (US) and Alberto Sainz (US)

Energy Transformation in Solar and stellar flares
Team leader: Louise Harra (UK)

Towards a Self Consistent Model of the Thermal Structure of the Venus Atmosphere
Team leader: Sanjay S. Limaye (US)

The Nature of Coronal Bright Fronts
Team leaders: David G. Long (UK) and Shaun Bloomfield (IE)

Study Group on the Added-value of Chemical Data Assimilation in the Stratosphere and Upper-troposphere
Team leaders: Richard Ménard R. (CA) and Quentin Errera (B)

Specification of Ionization Sources Affecting Atmospheric Processes
Team leader: Irina A. Mironova (RU)

Probing Deep into the Neutron Star Crust with Transient Neutron-Star Low-Mass X-Ray Binaries
Team leader: Dany Pierre Page (MX)

Modes of Radial Plasma Motion in Planetary Systems
Team leaders: Christopher Paranicas (US) and Caitriona Jackman C. (UK)

Ion and Electron Bulk Heating by Magnetic Reconnection
Team leader: Tai Phan (US)

Heliosheath Processes and Structure of the Heliopause: Modeling Energetic Particles, Cosmic Rays, and Magnetic Fields
Team leaders: Nikolai V. Pogorelov (US) and Horst Fichtner (DE)

Kinetic Turbulence and Heating in the Solar Wind
Team leaders: Fouad Sahraoui (FR) and David Sundkvist (US)

Sulfur Dioxide Variability in the Venus Atmosphere
Team leaders: Anne Carine Vandaele (B) and Oleg Korablev (RU)

Improved Understanding of Venus Clouds
Team leaders: Colin Wilson (UK) and Emmanuel Marcq (FR)

Determination of the Global Conductance Pattern and its Influence on the Dynamics of Geospace
Team leader: Michael Wiltberger (US)

Physics of the Injection of Particle Acceleration at Astrophysical, Heliospheric, and Laboratory Collisionless Shocks
Team leaders: Ryo Yamazaki and Shuichi Matsukiyo (JP)

Superdiffusive Transport in Space Plasmas and its Influence on Energetic Particle Acceleration and Propagation
Team leaders: Gaetano Zimbardo (I) and Horst Fichtner (DE)

WR 25 and Tr16-244, at the bottom of the image, are located within the open cluster Trumpler 16. This cluster is embedded within the Carina Nebula, an immense cauldron of gas and dust that lies approximately 7500 light-years from Earth in the constellation of Carina, the Keel. At the top of the image, a peculiar nebula with the shape of a "defiant" finger points towards WR25 and Tr16-244. (Image Credit: NASA, ESA and Jesús Maíz Apellániz (Instituto de Astrofísica de Andalucía, Spain))

Visiting Scientists

Taking a break while being creative: Rudolf von Steiger and Olaf Amm playing chess in ISSI's cafeteria.

Individual Scientists are invited for extended periods to work on scientific subjects at the forefront in areas of interest to ISSI. The results of this research are to be published as books or in major scientific journals, with appropriate acknowledgement to ISSI.

Olaf Amm, usually working at the Finnish Meteorological Institute in Helsinki, spent a few weeks at ISSI as a Visiting Scientist. Olaf Amm answered a few question about his work and the collaboration with ISSI:

You worked 3 months at ISSI, why have you chosen ISSI for your research sabbatical?
O. Amm: As I know ISSI for more than 10 years, have been leading two teams, participating in numerous of them, attending one workshop, and presently co-organizing a forum, I know that ISSI is a friendly and efficient place to work at. It provides an excellent working environment in terms of practical assistance for its guests (which is especially important having a family with three small kids joining part of the visiting term), computing facilities, and library services. Moreover, ISSI is a central meeting point for high-level scientists of my own and neighboring disciplines from all over the world. This gave me the unique opportunity for many personal discussions with old and new acquaintances which always result in new ideas and input for my work.

Can you quickly describe your projects on which you worked during your stay in Bern?
My main project was related to a mathematical tool called "Spherical Elementary Current (Vector) Systems" (SECS) which I introduced back in 1997. It allows to model any continuously differentiable vector field on a sphere, with a number of advantages as compared to traditional methods (like those based on Spherical Harmonic Analysis or Spherical Cap Harmonic Analysis), and is now used for many different purposes in the Solar-Terrestrial Physics discipline. During my stay, I collected material for an upcoming larger review paper or small book on this topic, and also ideas how to possibly apply this technique to neighboring science disciplines. I wrote one main-authored journal paper applying SECS to the calculation of polarization electric fields in the ionosphere.
Apart from that main project, I took part in one ISSI team during my stay, helped in the preparations of an upcoming ISSI forum, proceeded with a number of other studies partly related to ISSI teams (a total of 4 papers with my participation got submitted during my stay), and supervised one of my students for a week at ISSI. In addition to that, some issues concerning my home institution could not fully be avoided to sneak on my desk.

From your point of view, what are the key words for the International Space Science Institute?
Internationality, multi-disciplinarity, hospitality, communicativity

Following scientists worked at ISSI in the course of the eighteenth business year:

Olaf Amm, Finnish Meteorological Institute, Helsinki, Finland, working period: 9.9.-7.12.2012.

André Balogh, Space and Atmospheric Physics, Imperial College London, UK, working period: 6.-23.11.2012.

Andrei Bykov, Institute of Physics and Technology, Russian Academy of Sciences, St. Petersburg, Russia, working period: 9.-20.4.2013.

Sebastien Falkner, Friedrich-Alexander University Erlangen-Nuernberg, Germany, working period: 17.6.-28.6.2013.

Len Fisk, Department of Atmospheric, Oceanic and Space Sciences College of Engineering, University of Michigan, Ann Arbor, USA, working period: 15.-30.6.2013.

Claus Fröhlich, PMOD WRC, Davos, Switzerland, working period: 18.3.-7.4.2013.

Urs Mall, MPI for Solar System Research, Katlenburg-Lindau, Germany, working period: 13.-17.5.2013.

Ken McCracken, IPST, University of Maryland, College Park, USA, working period: 22.4.-15.5.2013.

Fulvio Melia, Department of Physics and Astronomy, University of Arizona, USA, working period: 9.5.-15.6.2013.

Götz Paschmann, Max-Planck-Institute for Extraterrestrial Physics, Garching, Germany, working periods: 14.-28.10.2012 and 19.5.-1.6.2013.

Risto Pellinen, Finnish Meteorological Institute, Helsinki, Finland, working period: 9.-20.4.2013.

Mario J. Pinheiro, Department of Physics, Instituto Superior Tecnico, Lisboa, Portugal, working period: 3.-13.7.2012.

Alessandro Ridolfi, Department of Physics, University of Rome "La Sapienza", Italy, working period: 7.1.-1.2.2013.

Jean-Pierre Rozelot, OCA-LAGRANGE-CNRS, University of Nice, France, working period: 15.-26.4.2013.

Bengt Sonnerup, Thayer School of Engineering, Dartmouth College, Hanover, USA, working period: 14.-28.10.2012.

Thomas Zurbuchen, Department of Atmospheric, Oceanic & Space Sciences College of Engineering, University of Michigan, Ann Arbor, USA, working periods: 22.7.-5.8.2012 and 13.-20.4.2013.

Events and ISSI in the media at a glance

Events

6 November 2012: Pro ISSI talk "Entstehung und Evolution von Planetenatmosphären: Implikationen für die Habilität" by Helmut Lammer.

7 November 2012: Farewell Symposium for Roger-Maurice Bonnet.

7-8 November 2012: Meeting of the Science Committee.

9 November 2012: Meeting of the Board of Trustees and the ISSI Board Dinner.

15 March 2013: The Influence of Energetic Particles on Atmospheric Composition and Dynamics, Seminar Talk by Marco Calisto.

20 March 2013: Pro ISSI talk "Pluto & Co: Der Asteroidengürtel am Rande des Planetensystems" by Hermann Böhnhardt.

15 May 2013: Pro ISSI talk "Radiosondierungsexperimente mit Raumsonden: Grundlegende Erkenntnisse über Atmosphären und Schwerefelder der Planeten" by Martin Pätzold.

31 May 2013: System Approach to Solar–Terrestrial Physics: Advance in Physical Understanding and Space Weather Forecast, Seminar by Michael Balikhin.

5-7 June 2013: Meeting of the Science Committee.

28 June 2013: Meeting of the Board of Trustees.

ISSI in the media

Article "Apollos Schweizer Denkmalpfleger" by Alois Feusi, Neue Zürcher Zeitung, 20 September 2012.

Interview "International Space Science Institute" with Rudolf von Steiger, International Innovation, Disseminating science, research and technology: Swiss Pioneers, October 2012.

Screenshoot of the Live Interview with Rudolf von Steiger in the Swiss News Broadcast "10 vor 10" on the occasion of meteor incidents in Russia and the Asteroid flyby in February 2013.

Article "A scientific global gathering", International Innovation, Disseminating science, research and technology: Swiss Pioneers, October 2012.

Interview with R.-M. Bonnet by Ciel-et-Espace on the ExoMars Program, 29 November 2012.

Interview with R.-M. Bonnet for the Association "Histoire de l'Espace", 21 December 2012.

Portrait of R.-M. Bonnet in "Signatures" by D. Groupy, 28 January 2013.

TV-Interview with Rudolf von Steiger in the Swiss News Broadcast "10 vor 10" on the occasion of meteor incidents and the Asteorid flyby, "Meteorit explodiert über Russland – 1000 Verletzte" (http://www.srf.ch/player/tv/10vor10/video/meteorit-explodiert-ueber-russland---1000-verletzte?id=ba310f80-a0c2-478f-88a7-a374c20cee5d) and "Asteroid schrammt an Erde vorbei" (http://www.srf.ch/player/tv/10vor10/video/asteroid-schrammt-an-erde-vorbei?id=d1cd2511-2abe-4496-9961-6282915e6b89), 15 February 2013.

Article "Sonnenwind eingefangen" by Mirjam Comtesse, Berner Zeitung, 11 March 2013.

Interview with R.-M. Bonnet by French TV Channel Antenne-2 at the occasion of the first public presentation of the results of the ESA Planck mission, ESA Head Quarters, Paris, 21 March 2013.

Interview "Vielleicht kommt der nächste Larry Page aus Bern" with Thomas Zurbuchen, Berner Zeitung, 28 June 2013.

Alpbach Summer School students and mentors. (Image Credit: FFG/M.A. Jakob)

ISSI and the Alpbach Summer School 2012

The topic of the 36th Summer School, with ISSI as a partner of FFG and ESA, was "Exploration of the Giant Planets and their Systems". 59 students from European countries gathered for two weeks, from 24 July to 3 August 2012, to have a unique educational experience for promising scientists and engineers.

As usual, the program was divided into two sections. The first part of the summer school was taken up with a series of introductory lectures. Some of these summarized current scientific understanding of the giant planets; others looked at spacecraft engineering, mission analysis and design.

The lectures provided a foundation for the workshops, the other key element of the program. During these sessions, the students were divided into four teams and were then asked to design their own innovative space mission, supported and assisted by the lecturers and tutors. The topics of the four teams were: USE – Uranus System Exploration (Team Green), NeTE – The Neptune Triton Explorer (Team Red), Poseidon-Trident: Mission to the Neptunian System (Team Blue), and iTOUR: Investigative Tour Of Uranus (Team Orange). On the last day of the Summer School, each group presented its mission concept to a panel of experts, chaired by Roger-Maurice Bonnet. The jury complimented the students on their dedication and hard work, as well as the excellence of their proposals. Beside the chairman the jury was composed with following members: Willi Benz, Jean-Pierre Lebreton, Harald Posch, Helmut O. Rucker, Karoly Szego, Monica Talevi, Peter Falkner, and André Balogh. On behalf of ISSI, Silvia Wenger provided administrative assistance to the Alpbach Summer School organizer.

Staff Activities

Impression of the Seminar on "The Influence of Energetic Particles on Atmospheric Composition and Dynamics" presented by Marco Calisto.

Presentations

Listed are activities in which ISSI staff scientists participated between 1 July 2012 and 30 June 2013. This includes presentations given, meetings attended, honors received, and chairmanships held.

18 July 2012 – R. von Steiger: The Ulysses Legacy, Invited talk at Cospar 39th Scientific Assembly and Bureau meetings, Mysore, India.

15 August 2012 – P. Zacharias: Ejection of cool plasma into the corona - comparison of 1D and 3D coronal loop models, Hinode-6, St. Andrews, Scotland.

30 August 2012 – R. von Steiger: Ulysses-SWICS, Invited talk at the Symposium in Celebration of the 75th Birthday of George Gloeckler, Ypsilanti MI, USA.

9-12 September 2012 – R.-M. Bonnet: State of the Art of the Space Exploration of the Solar System at The Golden Age of Solar System Exploration, in Honor of M. Fulchignoni, Rome, Italy.

10 September 2012 – P. Zacharias: Ejection of cool plasma into the corona - comparison of 1D and 3D coronal loop models, Fifth Solar Orbiter Workshop, Brugge, Belgium.

17 September - 19 December 2012 – M. Falanga: Teaching Astronomy & Astrophysics class on "Astrophysical Explosions in Binary Stellar Systems", University of Basel, Switzerland.

1-5 October 2012 – R.-M. Bonnet: The New Faces of the Sun, International Astronautical Congress 2012, Naples, Italy.

10 October 2012 – R.-M. Bonnet: De la Fusion Nucléaire au Changement Climatique, Société Astronomique de France, Paris, France.

10 October 2012 – R.-M. Bonnet: Opening speech, INEGRAL Ten Years after Launch, Bibliothèque F. Mitterrand, Paris, France.

15 October 2012 – M. Falanga: Accreting millisecond X-ray pulsars: 10 years of INTEGRAL observations, Conference on "An INTEGRAL view of the high-energy sky, the first 10 years", Paris, France.

25 October 2012 – M. Calisto: Modeling the Carrington event with the 3D CCM SOCOL, 8th MIPAS-IMK/IAA data user meeting, Karlsruhe Institute of Technology, Germany.

27 October 2012 – P. Zacharias: Cool plasma ejections into the solar corona, Physikerinnentagung Deutsche Physikalische Gesellschaft, Freiburg i.Br., Germany.

1 November 2012 – R.-M. Bonnet: Spaceship Earth- L'Humanité entre Terre et Espace, Rencontres du Ciel et de l'Espace, Universcience, Paris, France.

7 November 2012 – R. von Steiger: Introduction, Presentation at the Farewell Symposium for Roger-Maurice Bonnet, ISSI, Bern, Switzerland.

9 November 2012 – P. Zacharias: Mass and energy flows in the outer solar atmosphere in a numerical model approach, ISSI BoT Meeting, Bern, Switzerland.

30 November 2012 – P. Zacharias: Mass flows between the chromosphere and corona in a numerical model approach, Solar in Sonoma Workshop, Petaluma, USA.

5 December 2012 – P. Zacharias: Ejection of cool plasma into the corona: Comparison of 1D and 3D coronal loop models (poster presentation), Fall Meeting AGU, San Francisco, USA.

7 December 2012 – J.L. Culhane: Tracking Solar Active Region Outflow Plasma from its Source to the near-Earth Environment, Fall Meeting AGU, San Francisco, USA.

7 December 2012 – R. von Steiger: Origin of the most strongly FIP-fractionated solar wind: Ulysses SWICS results, Fall Meeting AGU, San Francisco, USA.

12 December 2012 – R.-M. Bonnet: Spaceship Earth-The Future of Humanity, Universidad Metropolitana Student Research Development Center Arecibo Observatory, Puerto Rico.

18 December 2012 – P. Zacharias: Ejection of cool plasma into the solar corona, ESTEC, Noordwijk, The Netherlands.

14 January 2013 – R. von Steiger: Solar Wind Composition and its Variability, Presentation to the ISSI Team of D. Sibeck and M. Collier on Solar Wind Charge Exchange Soft X-ray Imaging in the Solar System, Bern, Switzerland.

20 January 2013 – R. von Steiger: Presentation with "HUGO in the sky" at Rigi-Workshop 2013, (with Daniel Schümperli and Lukas Frey), Switzerland.

24 January 2013 – R.-M. Bonnet: The Legacy of Roald Sagdeev, Symposium for the 80th Birthday of Prof R. Sagdeev, IKI, Moscow, Russia.

6 February 2013 – P. Zacharias: Studies of the dynamics and energetics of plasma ejections into the solar corona, St. Andrews Solar MHD Group seminar talk, University of St. Andrews, Scotland.

14 February 2013 – R.-M. Bonnet: "Keynote Speech" prepared in Video format (available) for the 16th Anniversary of the International Living With a Star program, Vienna, Austria.

24 February 2013 – R.-M. Bonnet: Video Message (available) sent to Prof. A. Nishida at the occasion of his distinction as "Person of Cultural Merit of Japan", Tokyo, Japan.

4 March 2013 – P. Zacharias: Studies of the dynamics and energetics of cool plasma ejections into the corona (poster presentation), LWS SDO Science Workshop, Cambridge MD, USA.

15 March 2013 – M. Calisto: The Influence of Energetic Particles on Atmospheric Composition and Dynamics, Physikalisches Institut, University of Bern, Switzerland.

22 March 2013 – M. Falanga: Millisecond pulsars as Particle Accelerators, Workshop on Positrons in Astrophysics, Mürren, Switzerland.

11 April 2013 – R.-M. Bonnet: 50 years of Space Science, Jean-Dominique Cassini Medal Lecture, European Geosciences Union, Vienna, Austria.

29 April 2013 – M. Falanga: General Introduction and Aims of the School, Cargese International school on "Cosmic Accelerators", Corsica, France.

7 May 2013 – R.-M. Bonnet: Understanding Venus, Comparative Climatology Symposium, NASA Head-Quarters, Washington DC, USA.

20 June 2013 – R. von Steiger: Origin of the most strongly FIP-fractionated solar wind, Presentation to the ISSI Team of D. Reisenfeld on Advancing Our Understanding Of Solar Wind Fractionation, Bern, Switzerland.

Roger-Maurice Bonnet having a speech on his Farewell Symposium in November 2012.

Meetings

12 July 2012 – R.-M. Bonnet: Comité de Vision Stratégique du Centre Spatial de Liège, Liège, Belgium.

14-22 July 2012 – R.-M. Bonnet, R. von Steiger, S. Wenger: Cospar 39th Scientific Assembly and Bureau meetings, Mysore, India.

July 2012 – R. Rodrigo: Rosetta Mission: Asteroids exploration, Arecibo Observatory, Puerto Rico.

24 July- 3 August 2012 – R.-M. Bonnet, S. Wenger: "Exploration of the giant planets and their systems", Alpbach Summer School, Alpbach, Austria.

13-17 August 2012 – J.L. Culhane: Sixth Hinode Science Meeting, St. Andrews, UK.

14-17 August 2012 – P. Zacharias: Hinode-6, St. Andrews, Scotland.

30 August 2012 – R. von Steiger: Symposium in Celebration of the 75th Birthday of George Gloeckler, Ypsilanti MI, USA.

9-12 September 2012 – R.-M. Bonnet: The Golden Age of Solar System Exploration, in Honor of M. Fulchignoni, Rome, Italy.

Staff Activities

10-14 September 2012 – P. Zacharias: Fifth Solar Orbiter Workshop, Brugge, Belgium.

24-27 September 2012 – J.L. Culhane: ISSI Helioseismology Workshop, Bern, Switzerland.

25 September 2012 – M. Falanga: Europlanet Annual General Assembly and Board meeting, Madrid, Spain.

September 2012 – R. Rodrigo: Missions to Mars: an historical perspective and present research, AGMUS 2012 Research Symposium, San Juan, Puerto Rico.

1-5 October 2012 – R.-M. Bonnet: International Astronautical Congress, Naples, Italy.

5 October 2012 – M. Falanga: ESO 50 years, University of Bern, Switzerland.

15-17 October 2012 – J.L. Culhane: Solar-C EUV Imaging Spectrometer Team Meeting, MPI-Lindau, Goettingen, Germany.

15-19 October 2012 – M. Falanga: Conference on "An INTEGRAL view of the high-energy sky, the first 10 years", Paris, France.

17-20 October 2012 – R.-M. Bonnet: Association of Universities Inc. Board of Trustees, Charlottesville, Virginia, USA.

24-26 October 2012 – M. Calisto: 8th MIPAS-IMK/IAA data user meeting, Karlsruhe Institute of Technology, Germany.

25 October 2012 – R.-M. Bonnet: ESA Solar Contamination Review of the Solar Orbiter Mission, ESTEC, The Netherlands.

25-28 October 2012 – P. Zacharias: Physikerinnentagung, Freiburg i.Br., Germany.

26 October 2012 – R.-M. Bonnet: Integral launch tenth Anniversary, ESTEC, The Netherlands.

20-21 November, 2012 – J.L. Culhane: ISSI Solar Activity Forum, Bern, Switzerland.

27 November - 2 December 2012 – P. Zacharias: Solar in Sonoma Workshop, Petaluma, USA.

30 November 2012 – R.-M. Bonnet: Alpbach Summer School 2013 Program Committee, Vienna, Austria.

December 2012 – R. Rodrigo: Mission Cassini-Huygens: Towards a new dimension of space research, NASA Educational Workshop on remote Sensing, Robotics and Space Exploration, University of Puerto Rico, Mayagüez, Puerto Rico.

3-7 December 2012 – J.L. Culhane, R. von Steiger, and P. Zacharias: Fall Meeting of the American Geophysical Union, San Francisco, USA.

10-13 December 2012 – R.-M. Bonnet: Visit Arecibo Observatory, San Juan de Porto Rico.

18 January 2013 – R.-M. Bonnet: Alpbach Summer School 2013 Program Committee, Vienna, Austria.

20-22 January 2013 – R. von Steiger: Thinking Big in a Small World: Creativity in the Molecular Sciences, Rigi-Workshop 2013, Switzerland.

23-26 January 2013 – R.-M. Bonnet: International Symposium for the 80th Birthday of Prof. Roald Sagdeev, IKI, Moscow, Russia.

14-15 February 2013 – R.-M. Bonnet: Association of Universities Inc. Board of Trustees, Washington DC, USA.

28 February - 7 March 2013 – R.-M. Bonnet: Visit to the NSSC, Beijing, China.

4-8 March 2013 – P. Zacharias: LWS SDO Science Workshop, Cambridge MD, USA.

5 April 2013 – R.-M. Bonnet: Celebrations of Prof. Reimar Lüst 90th Birthday, Planetarium Hamburg, Germany.

12 April 2013 – R. von Steiger: Editorial Committee of Space Science Reviews, Vienna, Austria.

7-12 April 2013 – R.-M. Bonnet, H. Opgenoorth: EGU General Assembly 2013, Vienna, Switzerland.

12 April 2013 – J.L. Culhane: "Flares in the Lower Solar Atmosphere", Royal Astronomical Society Discussion Meeting, London, UK.

25-26 April 2013 – H. Opgenoorth: 5th Mars Upper Atmosphere Network Meeting, Boston, USA.

6-8 May 2013 – R. von Steiger: SCOSTEP Forum, ISSI, Bern, Switzerland.

7 May 2013 – R.-M. Bonnet: Comparative Climatology Symposium, NASA Head Quarters, Washington DC, USA.

29 April - 8 May 2013 – M. Falanga: Cargese International school on "Cosmic Accelerators", main organizer, Corsica, France.

20 – 24 May 2013 – J. L. Culhane: Leverhulme Workshop, Solar Interior to Atmosphere Connection, Mullard Space Science Laboratory, Holmbury St Mary, UK.

20-21 June 2013 – R.-M. Bonnet: Association of Universities Inc. Board of Trustees, Morgantown, West Virginia, USA.

26 June 2013 – M. Falanga: Chair of a session on "The Physics at the Magnetospheric Boundary", International Conference, University of Geneva, Switzerland.

29 June 2013 – R.-M. Bonnet: Symposium celebrating the 40th Anniversary of the 1973 Eclipse Observation with Concorde, Paris, France.

Chairman- and Memberships

R.-M. Bonnet:
Comité de Vision Stratégique du Centre Spatial de Liège (Member).
Administrateur de l'Association Française d'Astronomie.
Vice-President of Institut Français d'Histoire de l'Espace.
President of the Alpbach Jury 2013.
International Advisory Committee, Space Part-12 Conference (CERN, 5-7 November 2013, Geneva, CH).
Scientific Organizing Committee of "The Golden Age of Solar System Exploration" in honor of Prof. Marcello Fulchignoni, 9-12 September 2012, Rome, Italy.
Expert and Consultant to the ESA Director General and the Director of Science and Robotic Exploration for the ESA ExoMars Misssion and the Contamination control of the ESA Solar Orbiter.
Co-President of the ESA Solar Contamination Review of the Solar Orbiter Mission.
ESA ExoMars Mission System Requirements Review Board Member.
Senior Advisor to the NSSC Director General for ISSI-BJ matters.

J.L. Culhane:
Fellow of the UK Royal Society.
Chairman of the UK Space Action Network.
Member of the UK Space Agency Science Programme Advisory Committee.
Member of the Editorial Board of Space Policy.

M. Falanga:
Member of the Astronomy & Astrophysics Journal Board of Directors, Swiss representative from 2011-2013.
Member of INTEGRAL Users Group (IUG) from 2010-2012, ESA.
Member of the Editorial Board for Advances in Astronomy Journal.
Member of the LOFT Science Working Groups.
Member of the science organizing Committee conference on "The Physics at the Magnetospheric Boundary", Geneva, Switzerland, 26 June 2013.

H. Opgenoorth:
Subgroup chair for Agency activities for the COSPAR Space Weather Roadmap Committee.
Chair Mars Upper Atmosphere Network, MUAN.
Chair Europlanet Users and Associates Advisory Board.
Member European Space Science Committee, ESSC, of the ESF.

R. Rodrigo:
Distinguished Visiting Professor at Universidad Metropolitana de Puerto Rico in Arecibo Observatory (February - December 2012).
Member of the Board of Trustees of the International Academy of Astronautics.
Professor of the Summer Course "Exploration of the Space", Universidad Politécnica de Madrid (July 2012).

R.von Steiger:
Expert of the FP7 SPACE call of the EC, Brussels, Belgium, February 4-8, 2013.
External Assessor, Faculty of Mathematics and Natural Sciences, University of Turku.
Jury member for the "Habilitation à Diriger des Recherches" of K. Issautier, Obs. de Paris, Meudon.
Specialty Chief Editor, Frontiers in Space Physics, a new, online-only, full open access journal.
Elected Steering Committee Member, IAU Division E.

Honors

11 April 2013 – R.-M. Bonnet: Jean-Dominique Cassini Medal of the EGU.

Miscellaneous

J. Geiss: Mission Apollo 16, Panel Discussion with Charles Duke, Johannes Geiss, Claude Nicollier and Lukas Viglietti on the occasion of the special exihibition «L'odyssée spatiale» (28 September - 7 October 2012), Foire du Valais, Martigny, Switzerland, 29 September 2012.

Staff Publications

Listed are all papers written or co-authored by ISSI staff that were submitted or that appeared between 1 July 2012 and 30 June 2013.

Bengtsson, L., K. Hodges, S. Koumoutsaris, et al., The Changing Energy Balance of the Polar Regions in a Warmer Climate, J. of Climate, 26, 10, 3112-3129, 2013.

Bengtsson, L., What is the climate system able to do 'on its own'?, Tellus Series B - Chemical and Physical Meteorology, 65, 20189, 2013.

Bertini, I. et al. (incl. R. Rodrigo), Search for satellites near 21 Lutetia using OSIRIS Rosetta images, Planet. Space Sci., 66, 64-70, 2012.

Bonnet, R.-M., Neil Armstrong, L'Astronomie, October 2012.

Bonnet, R.-M., Foreword, in: Huber, M., A. Pauluhn, J.L. Culhane, J.G. Timothy, K. Wilhelm, A. Zehnder (eds.), Observing Photons in Space - A guide to Experimental Space Astronomy, 2nd Ed., ISSI Scientific Report 9, ISBN 978-1-4614-7803-4, 2013.

Bonnet, R.-M., Preface, Optique Spatiale, Otrio G. and Cerutti-Maori G., Hermes Publ., in press, 2013.

Bozzo, E., P. Romano, C. Ferrigno, S. Campana, M. Falanga, G. Israel, R. Walter, and L. Stella, XMM-Newton observations of four high mass X-ray binaries and IGR J17348-2045, Astron. Astrophys., 556, 30, 2013.

Bozzo, E., C. Ferrigno, M. Türler, A. Manousakis, M. Falanga, IGR J18179-1621: an obscured X-ray pulsar discovered by INTEGRAL, Astronom. Astrophys., 545, 3, 2012.

Carry, B. et al. (including: R. Rodrigo). Shape modeling technique KOALA validated by ESA Rosetta at (21) Lutetia, Planet. Space Sci., 66, 200-212, 2012.

Cremonese, G. et al. (incl. R. Rodrigo), Hydrocode simulations of largest crater on the asteroid Lutetia, Planet. Space Sci., 66, 147-154, 2012.

Dauser, T., J. Garcia, J. Wilms, M. Böck, L.W. Brenneman, M. Falanga, K. Fukumura, C.S. Reynolds, Irradiation of an accretion disc by a jet: general properties and implications for spin measurements of black holes, MNRAS, 430, 1694, 2013.

De Martino D., T. Belloni, M. Falanga et al., X-ray follow-ups of XSSJ12270-4859: a low-mass X-ray binary with gamma ray FERMI-LAT association, Astron. Astrophys., 550, A89, 2013.

Geiss, J., A.P. Rossi, On the Chronology of Lunar Origin and Evolution, Implications for Earth, Mars and the Solar System as a whole, Astron. Astrophys. Rev., submitted, 2013.

Falanga, M., L. Kuiper, J. Poutanen, D.K. Galloway, E.W. Bonning, E. Bozzo, A. Goldwurm, W. Hermsen, L. Stella, Spectral and timing properties of the accreting X-ray millisecond pulsar IGR J17498-2921, Astron. Astrophys., 545, 26A, 2012.

Falanga, M., L. Kuiper, J. Poutanen, D.K. Galloway, E. Bozzo, A. Goldwurm, W. Hermsen, L. Stella, Accreting millisecond X-ray pulsars: 10 years of INTEGRAL observations, Proc. of Science "An INTEGRAL view of the high-energy sky (the first 10 years)", in press, 2013.

Feroci, M., L. Stella, M. van der Klis, T.J.-L. Courvoisier, M. Falanga, et al., The Large Observatory for X-ray Timing (LOFT), Experimental Astronomy, 34, 2, 415-444, 2012.

Feroci, M., J.W. den Herder, E. Bozzo, et al., LOFT: the Large Observatory For X-ray Timing, Space Telescopes and Instrumentation 2012: Ultraviolet to Gamma Ray, Proc. of the SPIE, 8443, 84432D, 2012.

Gilbert, J.A., D.J. Gershman, G. Gloeckler, R.A. Lundgren, T.H. Zurbuchen, T.M. Orlando, J. McLain, and R. von Steiger, Background Noise in Space-Based Time-of-Flight Sensors, Rev. Sci. Instr., submitted, 2013.

Koumoutsaris, S., What can we learn about climate feedbacks from short-term climate variations?, Tellus A, 65, 18887, 2013.

Küppers, M. et al. (incl. R. Rodrigo), Boulders on Lutetia, Planet. Space Sci., 66, 71-78, 2012.

Lammer, H., M. Blanc, W. Benz, M. Fridlund, V. Coudé du Foresto, M. Güdel, H. Rauer, S. Udry, R.-M. Bonnet, M. Falanga, D. Charbonneau, R. Helled, W. Kley, J. Linsky, L.T. Elkins-Tanton, Y. Alibert, E. Chassefière, T. Encrenaz, A.P. Hatzes, D. Lin, R. Liseau, W. Lorenzen, S.N. Raymond, The Science of Exoplanets and their Systems, Astrobiology, in press, 2013.

Lepri, S.T., J.M. Laming, C.E. Rakowski, and R. von Steiger, Spatially dependent heating and ionization in an ICME observed by both Ulysses and ACE, Astrophys. J., 760, Article #105, doi: 10.1088/0004-637X/760/2/105, 2012.

Magrin, S. et al. (incl. R. Rodrigo), 21 Lutetia spectrophotometry from Rosetta-OSIRIS images and comparison to ground-based observations, Planet. Space Sci., 66, 45-53, 2012.

Massironi, M., S. Marchi, M. Pajola, C. Snodgrass, N. Thomas, C. Tubiana, J. Baptiste Vincent, G. Cremonese, V. Da Deppo, F. Ferri, S. Magrin, H. Sierks, C. Barbieri, P. Lamy, H. Rickman, R. Rodrigo, D. Koschny, The OSIRIS team f1, Geological map and stratigraphy of asteroid 21 Lutetia, Planet. Space Sci., 66, 125-136, 2012.

Papitto, A., C. Ferrigno, E. Bozzo, N. Rea, L. Pavan, S. Campana, P. Romano, L. Burderi, T. Di Salvo, A. Riggio, D.F. Torres, M. Falanga et al., Swinging between rotation and accretion power in a millisecond binary pulsar, Nature, in press, 2013.

Pavan, L., E. Bozzo, C. Ferrigno, M. Falanga, S. Campana, S. Paltani, L. Stella, R. Walter, Soft X-ray follow-up of five hard X-ray emitters, Proc. of Science "An INTEGRAL view of the high-energy sky (the first 10 years)", submitted, 2013.

Rodrigo, R., Exploración Planetaria, Colección: ¿Qué sabemos de? Ed. Catarata, Vol. 37, ISBN 978-84-00-09607-6, Dec. 2012.

Rozanov, E., M. Calisto, T. Egorova, T. Peter, W. Schmutz, Influence of the Precipitating Energetic Particles on Atmospheric Chemistry and Climate, Surv. in Geophys., 33, 3, 483-501, 2012.

Rycroft, M.J., K.A. Nicoll, K.L. Aplin, R.G. Harrison, Recent advances in global electric circuit coupling between the space environment and the troposphere, J. of Atmospheric and Solar-Terrestrial Physics, 90-91, 198-211, 2012.

Schmelz, J.T., D.V. Reames, R. von Steiger, and S. Basu, The composition of the solar corona, solar wind, and solar energetic particles, Astrophys. J., 755, 33, doi:10.1088/0004-637X/755/1/33, 2012.

Teriaca, L., V. Andretta, F. Auchère, C.M. Brown, E. Buchlin, G. Cauzzi, J.L. Culhane, J. Len, Curdt, Werner and 34 co-authors, LEMUR: Large European module for Solar Ultraviolet Research, Experimental Astronomy, 34, 273-309, 2012.

Thomas, N., C. Barbieri, H.U. Keller, P. Lamy, H. Rickman, R. Rodrigo et al. The geomorphology of 21 Lutetia: Results from the OSIRIS imaging system onboard ESA's Rosetta spacecraft, Planet. Space Sci., 66, 96-124, 2012.

Van Driel-Gesztelyi, L., J.L. Culhane, D. Baker, P. Démoulin, C.H. Mandrini, M. DeRosa, A.P. Rouillard, A. Opitz, G. Stenborg, A. Vourlidas, D. Brooks, Magnetic topology of Active Regions and Coronal Holes: Implications for Coronal Outflows and the Solar Wind, Sol. Phys., 281, 237-262, 2012.

Vincent, J.-B. et al. (incl. R. Rodrigo), Physical properties of craters on asteroid (21) Lutetia, Planet. Space Sci., 66, 79-86, 2012.

von Steiger, R., Space Physics – Grand Challenges for the 21st Century, Frontiers in Space Physics, in press, 2013.

Zacharias, P., An independent and critical review of existing Total Solar Irradiance records, Surv. Geophys., submitted, 2013.

Visitor Publications

Listed are all papers written or co-authored by ISSI visitors, with acknowledgement to ISSI, that appeared or were accepted for publication in refereed journals between 1 July 2012 and 30 June 2013.

Alm, L., G.T. Marklund, T. Karlsson, and A. Masson, Pseudo altitude: A new perspective on the auroral density cavity, J. of Geophys. Res.: Space Phys., 118, 1-11, 2013.

Amm, O., R. Fujii, H. Vanhamäki, A. Yoshikawa, and A. Ieda, General solution for calculating polarization electric fields in the auroral ionosphere and application examples, J. Geophys. Res.: Space Physics, 118, 1–10, 2013.

Antonov, V.M., E.L. Boyarinsev, A.A. Boyko, Y.P. Zakharov, A.V. Melekhov, A.G. Ponomarenko, V.G. Posukh, I.F. Shaikhislamov, M.L. Khodachenko, H. Lammer: Inflation of a dipole field in laboratory experiments: toward an understanding of magnetodisk formation in the magnetosphere of a hot Jupiter, Astrophys. J., 769, 28, 10, 2013.

Appourchaux, T., W.J. Chaplin, R.A. Garcia et al., Oscillation mode frequencies of 61 main sequence and subgiant stars observed by Kepler, Astron. Astrophys., 543, 54, 2012.

Bazilevskaya, G.A., Y.I. Stozhkov, A.K. Svirzhevskaya and N.S. Svirzhevsky, Cosmic rays and radioactivity in the near-ground level of the atmosphere, Journal of Physics: Conference Series, 409, 012213, 2013.

Becker, P.A., D. Klochkov, G. Schönherr et al., Spectral formation in accreting X-ray pulsars: bimodal variation of the cyclotron energy with luminosity, Astron. Astrophys., 544, A123, 2012.

Bertucci, C., et al., Temporal variability of waves at the proton cyclotron frequency upstream from Mars: Implications for Mars distant hydrogen exosphere, Geophys. Res. Lett., 40, doi:10.1002/grl.50709, 2013.

Bisikalo, D., P. Kaygorodov, D. Ionov, V. Shematovich, H. Lammer, and L. Fossati, Three-Dimensional Gas Dynamic Simulation of Interaction Between the Exoplanet WASP-12b and its host star, Astrophys. J., 764, 19, 2013.

Bradshaw, S.J., J. A. Klimchuk, J.W. Reep, Diagnosing the time-dependence of active region core heating from the emission measure: I. Low-frequency nanoflares, Astrophys. J., 758, 53, 2012.

Bykov, A.M., M.A. Malkov, J.C. Raymond, A.M. Krassilchtchikov, A.E. Vladimirov, Collisionless Shocks in Partly Ionized Plasma with Cosmic Rays: Microphysics of Non-thermal Components, Space Sci. Rev., doi: 10.1007/s 11214-013-9984-7, 2013.

Bykov, A.M., A. Brandenburg, M.A. Malkov, S.M. Osipov, Microphysics of Cosmic Ray Driven Plasma Instabilities, Space Sci. Rev., doi: 10.1007/s11214-013-9988-3, 2013.

Caballero, I., K. Pottschmidt, D.M. Marcu, L. Barragan, C. Ferrigno, D. Klochkov, J.A. Zurita Heras, S. Suchy, J. Wilms, P. Kretschmar, A. Santangelo, I. Kreykenbohm, F. Fürst, R. Rothschild, R. Staubert, M.H. Finger, A. Camero-Arranz, K. Makishima, T. Enoto, W. Iwakiri, Y. Terada, A double-peaked outburst of A 0535+26 observed with INTEGRAL, RXTE, and Suzaku, Astrophys. J., 764, L23, 2013.

Cargill, P.J., S.J. Bradshaw, J.A. Klimchuk, Enthalpy-based Thermal Evolution of Loops: II. Improvements to the Model, Astrophys. J., 752, 161, 2012.

Cargill, P.J., S.J. Bradshaw, and J.A. Klimchuk, Enthalpy-Based Thermal Evolution of Loops. III. Comparison of Zero-Dimensional Models, Astrophys. J., 758, 5, 2012.

Cheung, M.C.M., M.L. De Rosa, A Method For Data-Driven Simulations Of Evolving Solar Active Regions, Astrophys. J., 757, 147, 2012.

Cargill, P.J., From Flares to Nanoflares: Magnetic Reconnection on the Sun, A&G, 54, 3.16, 2013.

Cargill, P.J., S.J. Bradshaw, The Cooling of Coronal Plasmas. IV. Catastrophic Cooling of Loops, Astrophys. J., in press, 2013.

Chaplin, W.J., R. Sanchis-Ojeda, T.L. Campante et al., Asteroseismic Determination of Obliquities of the Exoplanet Systems Kepler-50 and Kepler-65, Astrophys. J., 766, 101, 2013.

Chalov, S.V. , H.J. Fahr, The role of solar wind electrons at the solar wind termination shock, MNRAS, 433 (1), L40-L43, 2013.

Chau, J.L., L.P. Goncharenko, B.G. Fejer, H. Liu, Equatorial and Low Latitude Ionospheric Effects During Sudden Stratospheric Warming Events, Space Sci. Rev., 168, 1-4, 385-417, 2012.

Clavel, M., R. Terrier, A. Goldwurm, M.R. Morris, G. Ponti, S. Soldi, G. Trap, Echoes of multiple outbursts of Sagittarius A⋆ revealed by Chandra, Astron. Astrophys., in press, 2013.

Consolini, G., On the Passive Nature of Proton Temperature in Solar Wind Turbulence, in Multi-scale Dynamical Processes in Space and Astrophysical Plasmas, ed. by M.P. Leubner and Z. Vörös, Astrophys. Space Sci. Proc., 33, 187-193, 2012.

Combes, F., M. Rex, T.D. Rawle, E. Egami, F. Boone, I. Smail, J. Richard, R.J. Ivison, M. Gurwell, C.M. Casey, A. Omont, A. Berciano Alba, M. Dessauges-Zavadsky, A.C. Edge, G.G. Fazio, J.-P. Kneib, N. Okabe, R. Pelló, P.G. Pérez-González, D. Schaerer, G.P. Smith, A.M. Swinbank and P. van der Werf, A bright z = 5.2 lensed submillimeter galaxy in the field of Abell 773 - HLSJ091828.6+514223, Astron. Astrophys., 538, L4, 2012.

Criscuoli, S., D. Del Moro, F. Giannattasio, B. Viticchié, F. Giorgi, I. Ermolli, F. Zuccarello, F. Berrilli, High cadence spectropolarimetry of moving magnetic features observed around a pore, Astron. Astrophys., 546, A26, 2012.

de la Cruz Rodríguez, J., B. De Pontieu, M. Carlsson, and L.H.M. Rouppe van der Voort, Heating of the Magnetic Chromosphere: Observational Constraints from Ca II λ8542 Spectra, Astrophys. J., 764, L11, 2013.

De Rosnay, P., G. Balsamo, C. Albergel, J. Muñoz-Sabater, L. Isaksen, Initialisation of Land Surface Variables for Numerical Weather Prediction, Surv. Geophys., 2012.

Delcourt, D.C., K. Seki, N. Terada, and T.E. Moore, Centrifugally stimulated exospheric ion escape at Mercury, Geophys. Res. Lett., 39, L22105, 2012.

Dubinin, E., M. Fraenz, J. Woch, T.L. Zhang, Y. Wei, A. Fedorov, S. Barabash, R. Lundin, Toroidal and poloi-dal magnetic fields at Venus. Venus Express observations, Planet. Space Sci., in press, 2013.

Dubyagin, S., N. Ganushkina, S. Apatenkov, M. Kubyshkina, H. Singer, and M. Liemohn, Geometry of duskside equatorial current during magnetic storm main phase as deduced from magnetospheric low-latitude observations, Ann. Geophys., 31, 395-408, 2013.

Dudok de Wit, T., O. Alexandrova, I. Furno, L. Sorriso-Valvo, G. Zimbardo, Methods for Characterising Microphysical Processes in Plasmas, Space Sci. Rev., doi: 10.1007/s11214-013-9974-9, 2013.

Ezoe, Y., R. Fujimoto, N.Y. Yamasaki, K. Mitsuda, T. Ohashi, K. Ishikawa, S. Oishi, Y. Miyoshi, N. Terada, Y. Futaana, S.F. Porter, and G. Brown, Suzaku Observations of Charge Exchange Emission from Solar System Objects, Astronom. Nachrichten, 333, 4, 319-323, 2012.

Fernandes, V.A., J. Fritz, B.P. Weiss, I. Garrick-Bethell, D.L. Shuster, The bombardment history of the Moon as recorded by ^{40}Ar-^{39}Ar chronology, Meteoritics & Planetary Sci., 48, 2, 241-269, 2013.

Formisano, M., F. Costanzo, D. Turrini, A. Coradini, F. Capaccioni, M.C. De Sanctis, C. Pauselli, The heating history of Vesta and the onset of differentiation, Meteoritics and Planetary Science, 1-17, doi: 10.1111/maps.12134, 2013.

Foullon, C., E. Verwichte, K. Nykyri, M.J. Aschwanden, I.G. Hannah, Kelvin-Helmholtz Instability of the CME Reconnection Outflow Layer in the Low Corona Astrophys. J., 767, 170, 2013.

France, K., C.S. Froning, J.L. Linsky, A. Roberge, J.T. Stocke, F. Tian, R. Bushinsky, J.-M. Desert, P. Mauas, M. Vieytes, L.M. Walcowicz, The ultraviolet radiation environment around M dwarf exoplanet host stars, Astrophys. J., 763, 14, 2013.

Fritz, J., Impact ejection of lunar meteorites and the age of Giordano Bruno, Icarus, 221, 1183-1186, 2012.

Fu, H.S., Y.V. Khotyaintsev, A. Vaivads, A. Retinò, M. André, Energetic electron acceleration by unsteady magnetic reconnection, Nature Physics 9, 426-430, 2013.

Ganushkina, N.Yu., O. Amariutei, Y.Y. Shprits, M. Liemohn, Transport of the plasma sheet electrons to the geostationary distances, J. Geophys. Res.: Space Physics, 118, 2013.

Geller, M., M. Alexander, P. Love, J. Bacmeister, M. Ern, A. Hertzog, E. Manzini, P. Preusse, K. Sato, A. Scaife, and T. Zhou, A Comparison Between Gravity Wave Momentum Fluxes in Observations and Climate Models, J. Climate, 26, 6383-6405, 2013.

Graham, D.R., I.G. Hannah, L. Fletcher, R.O. Milligan, The Emission Measure Distribution of Impulsive Phase Flare Footpoints, Astrophys. J., 767, 83, 2013.

Grotzinger, J.P., J. Crisp, A.R. Vasavada et al., Mars Science Laboratory Mission and Science Investigation, Space Sci. Rev., doi: 10.1007/s11214-012-9892-2, 170, 1-4, 5-56, 2012.

Guillemant, S., V. Génot, J.-C. Matéo-Vélez, R. Ergun, and P. Louarn, Solar wind plasma interaction with solar probe plus spacecraft, Ann. Geophys., 30, 1075-1092, 2012.

Visitor Publications

Guillemant, S., V. Génot, J.-C. Matéo-Vélez, P. Sarrailh, A. Hilgers, Simulation Study of Spacecraft Electrostatic Sheath Changes With the Heliocentric Distances from 0.044 to 1 AU, Plasma Science, IEEE Transactions,doi: 10.1109/TPS.2013.2246193, 2013.

Gundlach, B., J. Blum, A new method to determine the grain size of planetary regolith, Icarus, 223, 1, 479-492, 2013.

Güttler, C., N. Hirata, A.M. Nakamura, Cratering experiments on the self armoring of coarse-grained granular targets, Icarus, 220, 1040-1049, 2012.

Haaland, S., B. Sonnerup, and G. Paschmann, More about arc-polarized structures in the solar wind, Ann. Geophys., 30, 867-883, 2012.

Haaland, S., A. Eriksson, E. Engwall, B. Lybekk, H. Nilsson, A. Pedersen, K. Svenes, M. André, M. Förster, K. Li, C. Johnsen, N. Østgaard, Estimating the capture and loss of cold plasma from ionospheric outflow, J. Geophys. Res., 117, A07311, 2012.

Haaland, S., K. Svenes, B. Lybekk, A. Pedersen, A survey of the polar cap density based on Cluster EFW probe measurements: Solar wind and solar irradiation dependence, J. Geophys. Res., 117, A01216, 2012.

Haaland, S., K. Li, A. Eriksson, M. André, E. Engwall, M. Förster, C. Johnsen, B. Lybekk, H. Nilsson, N. Østgaard, A. Pedersen, K. Svenes, Cold Ion Outflow as a Source of Plasma for the Magnetosphere, Geophys. Monograph Series, 199, 341-353, 2012.

Hocke, K., S. Studer, O. Martius, D. Scheiben, N. Kämpfer, A 20-day period standing oscillation in the northern winter stratosphere, Ann. Geophys., 31, 755-764, 2013.

Holsapple, K.A. Modeling granular material flows: The angle of repose, fluidization and the cliff collapse problem, Planet. Space Sci., 82, 11-26, 2013.

Huang, Z., M.S. Madjarska, J.G. Doyle, and D.A. Lamb, Coronal hole boundaries at small scales: IV. SOT view Magnetic field properties of small-scale transient brightenings in coronal holes, Astron. Astrophys., in press, 2013.

Hunt, L., L. Magrini, D. Galli, R. Schneider, S. Bianchi, R. Maiolino, D. Romano, M. Tosi, R. Valiante, Scaling relations of metallicity, stellar mass, and star formation rate in metal-poor starbursts: I. A fundamental plane, Mon. Not. R. Astron. Soc. 000, 1–14, 2012.

Imtiaz, N., R. Marchand, and J.P. Lebreton, Modeling of current characteristics of Segmented Langmuir 1 Probe on DEMETER, Physics of Plasmas, 20, 052903, 2013.

In 't Zand, J.J.M., D.K. Galloway, H.L. Marshall, D.R. Ballantyne, P.G. Jonker, F.B.S. Paerels, D.M. Palmer, A. Patruno, N.N. Weinberg, A bright thermonuclear X-ray burst simultaneously observed with Chandra and RXTE, Astron. Astrophys., 553, A83, 2013.

Imtiaz, N., R. Marchand and J.P. Lebreton, Modeling of current characteristics of Segmented Langmuir 1 Probe on DEMETER, Physics of Plasmas, 20, 052903, 2013.

Jackman, C.M., N. Achilleos, S.W.H. Cowley, E.J. Bunce, A. Radioti, D. Grodent, S.V. Badman, M.K. Dougherty, W. Pryor, Auroral counterpart of magnetic field dipolarizations in Saturn's tail, Planet. Space Sci., 82-83, 34-42, 2013.

Kaladze, T.D., W. Horton, L.Z. Kahlon, O. Pokhotelov, A. Smolyakov, O. Onishchenko, Generation of zonal flow and magnetic field by coupled internal-gravity and alfvén waves in the ionospheric E-layer, J. Geophys. Res., 89, 110, 2013.

Kitiashvili, I.N., A.G. Kosovichev, S.K. Lele, N.N. Mansour, A.A. Wray, Ubiquitous Solar Eruptions Driven by Magnetized Vortex Tubes, Astrophys. J., 770, 1, 37, 2013.

Kitiashvili, I.N., A.G. Kosovichev, N.N. Mansour, A.A. Wray, Self-organization of the Solar Turbulent Convection in Magnetic Field, ASP Conf. Series, Progress in Solar/Stellar Physics with Helio- and Asteroseismology, 462, 382-386, 2012.

Kitiashvili, I.N., A.G. Kosovichev, N.N. Mansour, S.K. Lele, A.A. Wray, Vortex tubes of turbulent solar convection, Physica Scripta, 86, 1, 018403, 2012.

Kiyani, K.H., S.C. Chapman, F. Sahraoui, B. Hnat, O. Fauvarque, and Yu.V. Khotyaintsev, Enhanced Magnetic Compressbility and Isotropic ScaleE Invariance at Sub-Ion Larmor Scales in Solar Wind Turbulence, Astrophys. J., 763, 10, 2013.

Krivolutsky, A.A., A.I. Repnev, Impact of Space Energetic Particles on the Earth's Atmosphere (a Review), Geomagnetism and Aeronomy, 52, 6, 685-716, 2012.

Korovinskiy, D.B., A. Divin, N.V. Erkaev, V.V. Ivanova, I.B. Ivanov, V.S. Semenov, G. Lapenta, S. Markidis, H.K. Biernat, M. Zellinger, MHD modeling of the double-gradient (kink) magnetic instability, J. Geophys. Res., 118, 3, 1146-1158, 2013.

Koskinen, T.T., M.J. Harris, R.V. Yelle, P. Lavvas, The escape of heavy atoms from the ionosphere of HD 209458b. I. A photochemical-dynamical model of the thermosphere, Icarus, in press, 2013.

Kovaltsov, G.A., I.G. Usoskin, Occurrence Probability of Large Solar Energetic Particle Events: Assessment from Data on Cosmogenic Radionuclides in Lunar Rocks, Solar Physics, in press, 2013.

Kowalski, A.F., S.L. Hawley, J.P. Wisniewski, R.A. Osten, E.J. Hilton, J.A. Holtzman, S.J. Schmidt, and J.R.A. Davenport, Time resolved properties and global trends in dMe Flares from simultaneous photometry and spectra, Astrophys. J., 207, 15, 2013.

Koskinen, T.T., M.J. Harris, R.V. Yelle, P. Lavvas, The escape of heavy atoms from the ionosphere of HD209458b. I. A photochemical-dynamical model of the thermosphere, Icarus, in press, 2013.

Kopeikin, S., Celestial Ephemerides in an Expanding Universe, Phys. Rev. D, 86, 064004, 2012.

Krivolutsky, A.A., and A.I. Repnev, Impact of Space Energetic Particles on the Earth's Atmosphere (a Review), Geomagnetism and Aeronomy, 52, 6, 685-716, 2012.

Kucera, T.A., S.E. Gibson, D.J. Schmit, E. Landi, D. Tripathi, Temperature and EUV intensity in a coronal prominence cavity, Astrophys. J., 757, 73, 2012.

Lahoz, W.A., G.J.M. De Lannoy, Closing the Gaps in our Knowledge of the Hydrological Cycle Over Land: Conceptual Problems, Surv. Geophys., doi: 10.1007/s10712-013-9221-7, 2013.

Lammer, H., N.V. Erkaev, P. Odert, K.G. Kislyakova, M. Leitzinger, M.L. Khodachenko, Probing the Blow-Off Criteria of Hydrogen-Rich "Super-Earths", MNRAS, 430, 2, 1247-1256, 2013.

Lavraud, B., E. Larroque, E. Budnik, V. Génot, J.E. Borovsky, M.W. Dunlop, C. Foullon, H. Hasegawa, C. Jacquey, K. Nykyri, A. Ruffenach, M.G.G.T. Taylor, I. Dandouras, H. Rème, Asymmetry of magnetosheath flows and magnetopause shape during low Alfvén Mach number solar wind, J. of Geophys. Res.: Space Physics, 118, 1089-1100, doi:10.1002/jgra.50145, 2013.
Lemaire, J.F., and S.F. Singer, What Happens When the Geomagnetic Field Reverses?, Geophys. Monograph Series, 199, 355-363, 2012.

Liemohn, M.W., N.Yu. Ganushkina, R.M. Katus, D.L. De Zeeuw, D.T. Welling, The magnetospheric banana current, J. of Geophys. Res.: Space Physics, 118, 3, 1009-1021, 2013.

Liemohn, M.W., D.L. De Zeeuw, N.Y. Ganushkina, J.U. Kozyra, D.T. Welling, Magnetospheric cross-field currents during the January 6–7, 2011 high-speed stream-driven interval, J. of Atmospheric and Solar-Terrestrial Physics, 99, 78-84, 2013.

Limousin, M., A. Morandi, M. Sereno, M. Meneghetti, S. Ettori, M. Bartelmann, T. Verdugo, The Three-Dimensional Shapes of Galaxy Clusters, Space Sci. Rev., doi: 10.1007/s11214-013-9980-y, 2013.

Litvak, M.L., I.G. Mitrofanov, A. Sanin, A. Malakhov, W.V. Boynton, G. Chin, G. Droege, L.G. Evans, J. Garvin, D.V. Golovin, K. Harshman, T.P. McClanahan, M.I. Mokrousov, E. Mazarico, G. Milikh, G. Neumann, R. Sagdeev, D.E. Smith, R. Starr, M.T. Zuber, Global maps of lunar neutron fluxes from the LEND instrument, J. of Geophysical Research: Planets, 117, E12, 2012.

Magrini, L., L. Hunt, D. Galli, R. Schneider, S. Bianchi, R. Maiolino, D. Romano, M. Tosi, R. Valiante, Scaling relations of metallicity, stellar mass, and star formation rate in metal-poor starbursts: II. Theoretical models, Mon. Not. R. Astron. Soc. 000, 1-17, 2012.

Martinez Pillet, V., Solar surface and atmospheric dynamics: The Photosphere, Space Sci. Rev., doi 10.1007/s112 14-013-9967-8, 2013.

Matcheva, K.I., D.J. Barrow, Small-scale variability in Saturn's lower ionosphere, Icarus, 221, 525-543, 2012.

Matthias, V., P. Hoffmann, A. Manson, C. Meek, G. Stober, P. Brown, M. Rapp, The impact of planetary waves on the latitudinal displacement of sudden stratospheric warmings, Ann. Geophys., in press, 2013.

McCracken, K.G., J. Beer, F. Steinhilber, J. Abreu, A Phenomenological Study of the Cosmic Ray Variations over the Past 9400 Years, and Their Implications Regarding Solar Activity and the Solar Dynamo, Solar Phys., 286, 609-627, 2013.

Meneghetti, M., M. Bartelmann, H. Dahle, M. Limousin, Arc Statistics, Space Sci. Rev., doi: 10.1007/s11214-013-9981-x, 2013.

Miller, A., H. Schmidt, F. Bunzel, Vertical coupling of the middle atmosphere during stratospheric warming events, J. of Atmospheric and Solar-Terrestrial Physics, 97, 11-21, 2013.

Visitor Publications

Mironova, I.A., I.G. Usoskin, Possible effect of extreme solar energetic particle events of September–October 1989 on polar stratospheric aerosols: a case study, Atmos. Chem. Phys. Discuss., 13, 5411-5428, 2013.

Misra, A.P., P.K. Shukla, Rossby rogons in atmosphere and in the solar photosphere, EPL, 100, 55001, 2012.

Mitrofanov, I.G., M.L. Litvak, A.B. Varenikov et al., Dynamic Albedo of Neutrons (DAN) Experiment Onboard NASA's Mars Science Laboratory, Space Sci. Rev., 170, 1-4, 559-582, 2012.

Moore, L., G. Fischer, I. Müller-Wodarg, M. Galand, and M. Mendillo, Diurnal Variation of Electron Density in the Saturn Ionosphere: Model Comparisons with Saturn Electrostatic Discharge (SED) Observations, Icarus, 221, 508-516, 2012.

Müller, S., C. Ferrigno, M. Kühnel, G. Schönherr, P.A. Becker, M.T. Wolff, D. Hertel, F.-W. Schwarm1, V. Grinberg, M. Obst, I. Caballero, K. Pottschmidt, F. Fürst, I. Kreykenbohm, R.E. Rothschild, P. Hemphill, S.M. Núñez, J.M. Torrejón, D. Klochkov, R. Staubert, J. Wilms, No anticorrelation between cyclotron line energy and X-ray flux in 4U 0115+634, Astron. Astrophys., 551, A6, 2013.

Müller-Wodarg, I.C.F., L. Moore, M. Galand, and M. Mendillo, Magnetosphere-atmosphere coupling at Saturn: 1. Response of thermosphere and ionosphere to steady state polar forcing, Icarus, 221, 481-494, 2012.

Murdoch, N., P. Michel, D.C. Richardson, K. Nordstrom, C.R. Berardi, S.F. Green, W. Losert, Numerical simulations of granular dynamics: II. Particle dynamics in a shaken granular material, Icarus, 219, 321-335 [corrigendum 220, 296], 2012.

Murdoch, N., B. Rozitis, K. Noordstrom, S.F. Green, P. Michel, T.-L. de Lophem, W. Losert, Granular Convection and Plastic Deformation in Zero Gravity, Phys. Rev. Lett., 110, 018307, 2013.

Murdoch, N., B. Rozitis, S.F. Green, T.-L. de Lophem, P. Michel, W. Losert, Granular shear flow in varying gravitational environments, Granular Matter, 15, 2,129-137, 2013.
Nakamura, A., M. Setoh, K. Wada, Y. Yamashita, K. Sangen, Impact and intrusion experiments on the deceleration of low-velocity impactors by small-body regolith, Icarus, 223, 222-233, 2013.

Nakamura, R., W. Baumjohann, E. Panov, M. Volwerk, J. Birn, A. Artemyev, A.A. Petrukovich, O. Amm, L. Juusola, M.V. Kubyshkina, S. Apatenkov, E.A. Kronberg, P.W. Daly, M. Fillingim, J.M. Weygand, A. Fazakerley, and Y. Khotyaintsev, Flow bouncing and electron injection observed by Cluster, J. of Geophys. Res.: Space Physics, 118, 2055-2072, 2013.

Okamoto, T., A.M. Nakamura, S. Hasegawa, K. Kurosawa, K. Ikezaki, A. Tsuchiyama, Impact experiments of exotic dust grain capture by highly porous primitive bodies, Icarus, 224, 209-217, 2013.

Onishchenko, O.G., and O. A. Pokhotelov, Generation of Zonal Structures by Internal Gravity Waves in the Earth's Atmosphere, Doklady Earth Sci., 445, Part 1, 845-848, 2012.

Onishchenko, O., O. Pokhotelov, and V. Fedun, Convective cells of internal gravity waves in the Earth's atmosphere with finite temperature gradient, Ann. Geophys., 31, 459-462, 2013.

Osman, K.T., W.H. Matthaeus, B. Hnat, S.C. Chapman, Kinetic Signatures and Intermittent Turbulence in the Solar Wind Plasma, PRL, 108, 26, 261103, 2012.

Osman, K.T., W.H. Matthaeus, M. Wan, A.F. Rappazzo, Intermittency and Local Heating in the Solar Wind, PRL, 108, 26, 261102, 2012.

Østgaard, N., B.K. Humberset, K.M. Laundal, J.P. Reistad, Correction to "Evolution of auroral asymmetries in the conjugate hemispheres during two substorms", Geophys. Res. Lett., 40, 3, 471, 2013.

Østgaard, N., K.M. Laundal, L. Juusola, A. Aasnes, S.E. Haaland, and J.M. Weygand, Correction to "Interhemispherical asymmetry of substorm onset locations and the interplanetary magnetic field", Geophys. Res. Lett., 39, L10104, 2012.

Ozsoy-Cicek, B., S. Ackley, H. Xie, D. Yi, J. Zwally, Sea ice thickness retrieval algorithms based on in-situ surface elevation and thickness values for application to altimetry, J. Geophys. Res.: Oceans, 118, 1–16, 2013.

Paschmann, G., S. Haaland, B. Sonnerup, and T. Knetter, Discontinuities and Alfvénic fluctuations in the solar wind, Ann. Geophys., 31, 871-887, 2013.

Perri, S., M.L. Goldstein, J.C. Dorelli, and F. Sahraoui, Detection of Small-Scale Structures in the Dissipation Regime of Solar-Wind Turbulence, Phys. Rev. Lett. 109, 191101, 2012.

Perri, S., V. Carbone, A. Vecchio, R. Bruno, H. Korth, T.H. Zurbuchen, and L. Sorriso-Valvo, Phase-Synchronization, Energy Cascade, and Intermittency in Solar-Wind Turbulence, Phys. Rev. Lett. 109, 245004, 2012.

Peterson, B.M., Measuring the Masses of Supermassive Black Holes, Space Sci. Rev., doi: 10.1007/s11214-013-9987-4, 2013.

Pogorelov, N.V., S.T. Suess, S.N. Borovikov, R.W. Ebert, D. J. McComas, G.P. Zank, Three-Dimensional Features of the outer Heliosphere due to Coupling between the interstellar and interplanetary Magnetic Fields. IV. Solar Cycle Model Based on Ulysses Observations, Astrophys. J., 772, 2, 2013.

Pokhotelov, O.A. and M. A. Balikhin, Weibel instability in a plasma with nonzero external magnetic field, Ann. Geophys., 30, 1051-1054, 2012.

Ponti, G., M.R. Morris, R. Terrier, A. Goldwurm, Traces of past activity in the Galactic Centre, Cosmic Rays in Star-Forming Environments, Astrophysics and Space Science Proc., 34, 331-369, 2013.

Popel, S.I., S.I. Kopnin, A.P. Golub, G.G. Dolnikov, A.V. Zakharov, L.M. Zelenyi, and Yu.N. Izvekova, Dusty Plasmas near the Surface of the Moon, Solar System Research, Astronomicheskii Vestnik, in press, 2013.

Reale, F., E. Landi, The role of radiative losses in the late evolution of pulse-heated coronal loops/strands, Astron. Astrophys., 543, 90, 2012.

Reep, J.W., S.J. Bradshaw, and J.A. Klimchuk, Diagnosing the time-dependence of active region core heating from the emission measure: II. Nanoflare trains, Astrophys. J., 764, 193, 2013.

Rehman, S., J. Burchill, A. Eriksson, R. Marchand, Earth magnetic field effects on Swarm electric field instrument, Planet. Space Sci., 73, 145-150, 2012.

Rehman, S., R. Marchand, J.-J. Berthelier, T. Onishi and J. Burchill, Earth magnetic field effects on particle sensors on LEO satellites, IEEE Trans. Plasma Science, in press, 2013.

Reichle, R.H., G.J.M. De Lannoy, B.A. Forman, C.S. Draper, and Q. Liu, Connecting Satellite Observations with Water Cycle Variables through Land Data Assimilation: Examples Using the NASA GEOS-5 LDAS, Surv. in Geophys., doi:10.1007/s10712-013-9220-8, 2013.

Reiprich, T.H., K. Basu, S. Ettori, H. Israel, L. Lovisari, S. Molendi, E. Pointecouteau, M. Roncarelli, Outskirts of Galaxy Clusters, Space Sci. Rev., 177, 1-4, 195-245, 2013.

Reisenfeld, D.B. , R.C. Wiens, B.L. Barraclough, J.T. Steinberg, M. Neugebauer, J. Raines, T.H. Zurbuchen, Solar Wind Conditions and Composition During the Genesis Mission as Measured by in situ Spacecraft, Space Sci. Rev., doi: 10.1007/s 11214-013-9960-2, 2013.

Romanelli N., C. Bertucci, D. Gomez, C. Mazelle, M. Delva, Proton Cyclotron Waves Upstream from Mars: Observations from Mars Global Surveyor, Planet. and Space Sci., 76, 1-9, 2013.

Romano, P., F. Zuccarello, Spatial distribution of the magnetic helicity flux measured with SDO/HMI in active regions hosting flares and CMEs, Mem. Soc. Astron. Ital., in press, 2013.

Rycroft, M.J., K.A. Nicoll, K.L. Aplin, R. Giles Harrison, Recent advances in global electric circuit coupling between the space environment and the troposphere, J. of Atmospheric and Solar-Terrestrial Physics, 90-91, 198-211, 2012.

Sanna, A., M. Méndez, T. Belloni, D. Altamirano, The time derivative of the kilohertz quasi-periodic oscillations in 4U 1636-53, MNRAS, 424 (4), 2936-2942, 2012.

Schwartz, S.R., D.C. Richardson, P. Michel, An implementation of the soft-sphere discrete element method in a high-performance parallel gravity tree-code, Granular Matter, 14, 363-380, 2012.

Schwartz, S.R., P. Michel, D.C. Richardson, Numerically simulating impact disruptions of cohesive glass bead agglomerates using the soft-sphere discrete element method, Icarus, in press, 2013.

Silva Aguirre, V., L. Casagrande, S. Basu, et al., Verifying Asteroseismically Determined Parameters of Kepler Stars Using Hipparcos Parallaxes: Self-consistent Stellar Properties and Distances, Astrophys. J., 757, 1, 2012.

Silva Aguirre, V., S. Basu, I.M. Brandão, et al., Stellar Ages and Convective Cores in Field Main-Sequence Stards: First Asteroseismic Application to Two Kepler Targets, Astrophys. J., 769, 141, 2013.

Snekvik, K., E. Tanskanaen, N. Østgaard, L. Juusola, K.M. Laundal, E.I. Gordeev, A.L. Borg. Changes in the magnetotail configuration before near-Earth reconnection, J. Geophys. Res, 117, A02219, 2012.

Stone, E.C., A.C. Cummings, F.B. McDonald, B.C. Heikkila, N. Lal, W.R. Webber, Voyager 1 Observes Low-Energy Galactic Cosmic Rays in a Region Depleted of Heliospheric Ions, Science, doi: 10.1126/science.1236408, 2013.

Suzuki, A.I., T. Kadono, M. Arakawa, K. Wada, S. Yamamoto, A.M. Nakamura, Formation mechanism for concentric ridges in ejecta surrounding impact craters in a layer of fine glass beads, Icarus, 225, 1, 298-307, 2013.

Visitor Publications

Testa, P., B. De Pontieu, J. Martínez-Sykora, V. Hansteen, and M. Carlsson, Investigating the Reliabilityof Coronal Emission Measure Distribution Diagnostics Using Three-Dimensional Radiative Magnetohydrodynamic Simulations, Astrophys. J., 758, 54, 2012.

Tripathi, D., H.E. Mason and J.A. Klimchuk, Active Region Moss: Doppler Shifts from Hinode/Extreme-Ultraviolet Imaging Spectrometer Observations, Astrophys. J., 753, 37, 2012.

Tripathi, D., H.E. Mason, G. Del Zanna, S. Bradshaw, Observations of Plasma Upflow in a warm loop with Hinode/EIS, Astrophys. J. Lett., 754, L4, 2012.

Tsugawa, Y., Y. Katoh, N. Terada, T. Ono, H. Tsunakawa, F. Takahashi, H. Shibuya, H. Shimizu, M. Matsushima, Y. Saito, S. Yokota, and M.N. Nishino, Statistical study of broadband whistler-mode waves detected by Kaguya near the Moon, Geophys. Res. Lett., 39, L16101, 2012.

Viall, N.M., J.A. Klimchuk, Modeling the Line-of-Sight Integrated Emission in the Corona: Implications for Coronal Heating, Astrophys. J., 771, 115, 2013.

Vogt, M.F., M.G. Kivelson, Relating Jupiter's Auroral Features to Magnetospheric Sources, in Keiling, A., E. Donovan, F. Bagenal, T. Karlsson (Eds.), Auroral Phenomenology and Magnetospheric Processes: Earth And Other Planets, American Geophysical Union, Washington, D.C., doi: 10.1029/2011GM001181, 2012.

Voitcu, G., M. Echim, R. Marchand, Comparative study of forward and backward test-kinetic simulation approaches, Computer Physics, Communications, 183, 2561-2569, doi:10.1016/j.cpc.2012.07.005, 2012.

Volwerk, M., N. André, C.S. Arridge, C.M. Jackman, X. Jia, S.E. Milan, A. Radioti, M.F. Vogt, A.P. Walsh, R. Nakamura, A. Masters, and C. Forsyth, Comparative magnetotail flapping: an overview of selected events at Earth, Jupiter and Saturn, Ann. Geophys., 31, 817-833, 2013.

Vörös, Z., A. Runov, A. Kendl, Occurrence of Magnetic Reconnection in the Deep Magnetotail: ARTEMIS Results, in Multi-scale Dynamical Processes in Space and Astrophysical Plasmas, ed. by M.P. Leubner and Z. Vörös, Astrophys. Space Sci. Proc., 33, 61-66, 2012.

Walsh, A.P., C.S. Arridge, A. Masters, G.R. Lewis, A.N. Fazakerley, G.H. Jones, C.J. Owen and A.J. Coates, An indication of the existence of a solar wind strahl at 10 AU, Geophys, Res. Lett., doi: 10.1002/grl.50529, 2013.

Wang, C., S.G. Zaharia, L.R. Lyons, V. Angelopoulos, Spatial distributions of ion pitch-angle anisotropy in the near-Earth magnetosphere and tail plasma sheet, J. Geophys. Res.: Space Physics, 118, 244-255 doi:10.1029/2012JA 018275, 2013.

Warren, H.P., A.R. Winebarger and D.H. Brooks, A Systematic Survey of High-Temperature Emission in Solar ctive Regions, Astrophys. J., 759, 141, 2012.

White, R., E. Verwichte, C. Foullon, Anti-phase Signature of Flare Generated Transverse Loop Oscillations, Astrophys. J., 774, 104, 2013.

Whiter, D.K., B.S. Lanchester, T. Sakanoi, K. Asamura, Estimating high-energy electron fluxes by intercalibrating Reimei optical and particle measurements using an ionospheric model, J. of Atmospheric and Solar-Terrestrial Physics, 89, 8-17, 2012.

Wiedenbeck, M.E., Cosmic-Ray Energy Spectra and Time Variations in the Local Interstellar Medium: Constraints and Uncertainties, Space Sci. Rev., 176, 1-4, 35-46, 2013.

Yoshikawa, I., F. Tsuchiya, N. Terada, Overview of the Sprint-A/Exceed mission, Yuseijin, 21, 16-21, 2012.

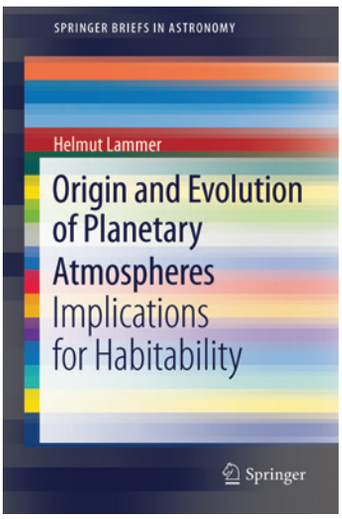
Zelenyi, L. and A. Artemyev, Mechanisms of Spontaneous Reconnection: From Magnetospheric to Fusion Plasma, Space Sci. Rev., doi: 10.1007/s11214-013-9959-8, 2013.

Zieger, B., M. Opher, N.A. Schwadron, D.J. McComas, G. Tôth, A slow bow shock ahead of the heliosphere, Geophys. Res. Lett., 40, 1-6, doi:10.1002/grl.50576, 2013.

Zuccarello, F., S.L. Guglielmino, An orphan penumbra observed with Hinode and DOT, Mem. Soc. Astron. Ital., 84, 375, 2013.

Zuccarello, F., L. Balmaceda, G. Cessateur, H. Cremades, S.L. Guglielmino, J. Lilensten, T. Dudok de Wit, M. Kretzschmar, F.M. Lopez, M. Mierla, S. Parenti, J. Pomoell, P. Romano, L. Rodriguez, N. Srivastava, R. Vainio, M. West, F.P. Zuccarello, Solar activity and its evolution across the corona: recent advances, J. Space Weather Space Clim., 3, COST Action ES0803, 2013.

Zülicke, C., and E. Becker, The structure of the mesosphere during sudden stratospheric warmings in a global circulation model, J. Geophys. Res. Atmos., 118, 2255–2271, doi:10.1002/jgrd.50219, 2013.



Origin and Evolution of Planetary Atmospheres

Implications for Habitability

by

Helmut Lammer

Space Research Institute, Austrian Academy of Sciences, Graz, Austria

published by Springer-Verlag Heidelberg Berlin, 2012. ISBN 978-3-642-32087-3.

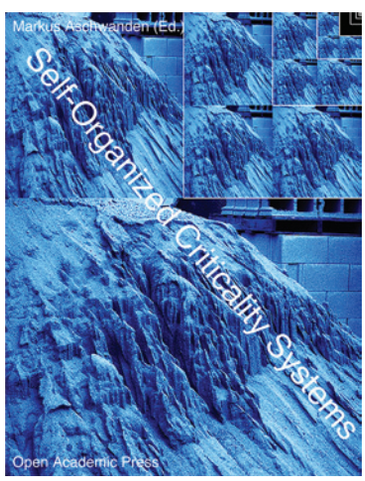
Self-Organized Criticality Systems

e-book edited by

Markus J. Aschwanden

Lockheed Martin Advanced Technology Center, Palo Alto , USA

published by Open Academic Press Berlin Warsaw, 2013.



Space Sciences Series of ISSI (SSSI)

Published Volumes

These volumes may be ordered directly from Springer or for a substantially reduced price through ISSI. If you are interested in buying our books, please contact `secretary@issibern.ch`. More information is provided on the websites `www.issibern.ch` (go to 'Publications') or `www.springer.com`.

Volume 1: The Heliosphere in the Local Interstellar Medium
R. von Steiger, R. Lallement, and M.A. Lee (eds.), ISSI-Workshop held in November 1995, published in October 1996. Reprinted from Space Science Reviews, Vol. 78, No. 1-2, 1996. ISBN 0-7923-4320-4.

Volume 2: Transport Across the Boundaries of the Magnetosphere
B. Hultqvist, and M. Øieroset (eds.), ISSI-Workshop held in October 1996, published in October 1997. Reprinted from Space Science Reviews, Vol. 80, No. 1-2, 1997. ISBN 0-7923-4788-9. This volume is out of print.

Volume 3: Cosmic Rays in the Heliosphere
L.A. Fisk, J.R. Jokipii, G.M. Simnett, R. von Steiger, and K.-P. Wenzel (eds.), two ISSI-Workshops held in September 1996, March 1997 respectively, published in May 1998. Reprinted from Space Science Reviews, Vol. 83, No. 1-2, 1998. ISBN 0-7923-5069-3.

Volume 4: Primordial Nuclei and Their Galactic Evolution
N. Prantzos, M. Tosi, and R. von Steiger (eds.), ISSI-Workshop held in May 1997, published in August 1998. Reprinted from Space Science Reviews, Vol. 84, No. 1-2, 1998. ISBN 0-7923-5114-2.

Volume 5: Solar Composition and its Evolution — From Core to Corona
C. Fröhlich, M.C.E. Huber, S.K. Solanki, and R. von Steiger (eds.), ISSI-Workshop held in January 1998, published in December 1998. Reprinted from Space Science Reviews, Vol. 85, No. 1-2, 1998. ISBN 0-7923-5496-6.

Volume 6: Magnetospheric Plasma Sources and Losses
B. Hultqvist, M. Øieroset, G. Paschmann, and R. Treumann (eds.), ISSI-Workshop held in October 1997, published in September 1999. Reprinted from Space Science Reviews, Vol. 88, No. 1-2, 1999. ISBN 0-7923-5828-7.

Volume 7: Corotating Interaction Regions
A. Balogh, J.T. Gosling, J.R. Jokipii, R. Kallenbach, and H. Kunow (eds.), ISSI-Workshop held in June 1998, published in January 2000. Reprinted from Space Science Reviews, Vol. 89, No. 1-2, 1999. ISBN 0-7923-6080-3.

Volume 8: Composition and Origin of Cometary Materials
K. Altwegg, P. Ehrenfreund, J. Geiss, and W.F. Huebner (eds.), ISSI-Workshop held in September 1998, published in January 2000. Reprinted from Space Science Reviews, Vol. 90, No. 1-2, 1999. ISBN 0-7923-6154-7.

Volume 9: From Dust to Terrestrial Planets
W. Benz, R. Kallenbach, and G. Lugmair (eds.), ISSI-Workshop held in February 1999, published in October 2000. Reprinted from Space Science Reviews, Vol. 92, No. 1-2, 2000. ISBN 0-7923-6467-8.

Volume 10: Cosmic Rays and Earth
J.W. Bieber, E. Eroshenko, P. Evenson, E.O. Flückiger, and R. Kallenbach (eds.), ISSI-Workshop held in March 1999, published in December 2000. Reprinted from Space Science Reviews, Vol. 93, No. 1-2, 2000. ISBN 0-7923-6712-X.

Volume 11: Solar Variability and Climate
E. Friis-Christensen, C. Fröhlich, J.D. Haigh, M. Schüssler, and R. von Steiger (eds.), ISSI-Workshop held in June 1999, published in December 2000. Reprinted from Space Science Reviews, Vol. 94, No. 1-2, 2000. ISBN 0-7923-6741-3.

Volume 12: Chronology and Evolution of Mars
R. Kallenbach, J. Geiss and W.K. Hartmann (eds.), ISSI-Workshop held in April 2000, published in September 2001. Reprinted from Space Science Reviews, Vol. 96, No. 1-4, 2001. ISBN 0-7923-7051-1.

Volume 13: The Astrophysics of Galactic Cosmic Rays
R. Diehl, E. Parizot, R. Kallenbach, and R. von Steiger (eds.), two ISSI-Workshops held in October 1999, May 2000 respectively, published in February 2002. Reprinted from Space Science Reviews, Vol. 99, No. 1-4, 2001. ISBN 1-4020-0107-9.

Volume 14: Matter in the Universe
Ph. Jetzer, K. Pretzl, and R. von Steiger (eds.), ISSI-Workshop held in March 2001, published in June 2002. Reprinted from Space Science Reviews, Vol. 100, No. 1-4, 2002. ISBN 1-4020-0666-7.

Volume 15: Auroral Plasma Physics
G. Paschmann, S. Haaland, and R. Treumann (eds.), three ISSI-Workshops held in October 1999, March and December 2000, published in April 2003, 2nd edition in April 2005. Reprinted from Space Science Reviews, Vol. 103, No. 1-4, 2002. ISBN 1-4020-0963-1.

Volume 16: Solar System History from Isotopic Signatures of Volatile Elements
R. Kallenbach, T. Encrenaz, J. Geiss, K. Mauersberger, T. Owen, and F. Robert (eds.), ISSI-Workshop held in January 2002, published in July 2003. Reprinted from Space Science Reviews, Vol. 106, No. 1-4, 2003. ISBN 1-4020-1177-6.

Volume 17: Earth Gravity Field from Space — From Sensors to Earth Sciences
G. Beutler, R. Rummel, M.R. Drinkwater, and R. von Steiger (eds.), ISSI-Workshop held in March 2002, published in November 2003. Reprinted from Space Science Reviews, Vol. 108, No. 1-2, 2003. ISBN 1-4020-1408-2.

Volume 18: Mars' Magnetism and its Interaction with the Solar Wind
D. Winterhalter, M. Acuña, and A. Zakharov (eds.), ISSI-Workshop held in October 2001, published in June 2004. Reprinted from Space Science Reviews, Vol. 111, No. 1-2, 2004. ISBN 1-4020-2048-1.

Volume 19: The Outer Planets and their Moons
T. Encrenaz, R. Kallenbach, T. Owen, and C. Sotin (eds.), ISSI-Workshop held in January 2004, published in June 2005. Reprinted from Space Science Reviews, Vol. 116, No. 1-2, 2005. ISBN 1-4020-3362-1.

Volume 20: Outer Magnetospheric Boundaries: Cluster Results
G. Paschmann, S. Schwartz, C.P. Escoubet, S. Haaland (eds.), two ISSI-Workshops held in March and November 2003, published in June 2005. Reprinted from Space Science Reviews, Vol. 118, No. 1-4, 2005. ISBN 1-4020-3488-1, ISSI price Euro 65.40.

Volume 21: Coronal Mass Ejections
H. Kunow, N. Crooker, J. Linker, R. Schwenn, and R. von Steiger (eds.), ISSI-Workshop held in March 2004, published in 2006. Reprinted from Space Science Reviews, Vol. 123, No. 1-3, 2006. ISBN 978-0-387-45086-5, ISSI price Euro 83.97.

Volume 22: Solar Dynamics and its Effects on the Heliosphere and Earth
D. Baker, B. Klecker, S. Schwartz, R. Schwenn, and R. von Steiger (eds.), ISSI-Workshop held in April 2005, published in 2007. Reprinted from Space Science Reviews, Vol. 124, No. 1-4, 2006. ISBN 978-0-387-69531-0.

Volume 23: Solar Variability and Planetary Climates
Y. Calisesi, R.-M. Bonnet, L. Gray, J. Langen, and M. Lockwood (eds.), ISSI-Workshop held in June 2005, published in 2007. Reprinted from Space Science Reviews, Vol. 125, No. 1-4, 2006. ISBN 978-0-387-48339-9.

Volume 24: Geology and Habitability of Terrestrial Planets
K.E. Fishbaugh, P. Lognonné, F. Raulin, D. des Marais, and O. Korablev (eds.), ISSI-Workshop held in September 2005, published in September 2007. Reprinted from Space Science Reviews, Vol. 129, No. 1-3, 2007. ISBN 978-0-387-74287-8.

Volume 25: Strategies for Life Detection
O. Botta, J.L. Bada, J. Gomez-Elvira, E. Javaux, F. Selsis, and R. Summons (eds.), ISSI-Workshop held in April 2006, published in August 2008. Reprinted from Space Science Reviews, Vol. 135, No. 1-4, 2008. ISBN 978-0-387-77515-9.

Space Sciences Series of ISSI (SSSI)

Volume 26: Mercury
A. Balogh, L. Ksanfomality, and R. von Steiger (eds.), ISSI-Workshop held in June 2006, published in May 2008. Reprinted from Space Science Reviews, Vol. 132, No. 2-4, 2007. ISBN 978-0-387-77538-8.

Volume 27: The Composition of Matter - Symposium honouring Johannes Geiss on the occasion of his 80th birthday
R. von Steiger, G. Gloeckler, and G.M. Mason (eds.), ISSI-Workshop held in September 2006, published in November 2007. Reprinted from Space Science Reviews, Vol. 130, No. 1-4, 2007. ISBN 978-0-387-74183-3.

Volume 28: Origin and Early Evolution of Comet Nuclei
H. Balsiger, K. Altwegg, W. Huebner, T. Owen, and R. Schulz (eds.), ISSI-Workshop held in October 2006, published in October 2008. Reprinted from Space Science Reviews, Vol. 138, No. 1-4, 2008. ISBN 978-0-387-85454-0.

Volume 29: Comparative Aeronomy
A.F. Nagy, A. Balogh, T.E. Cravens, M. Mendillo, and I. Müller-Wodarg (eds.), ISSI-Workshop held in June 2007, published in January 2009. Reprinted from Space Science Reviews, Vol. 139, No. 1-4, 2008. ISBN 978-0-387-87824-9.

Volume 30: Planetary Atmospheric Electricity
F. Leblanc, K. Aplin, Y. Yair, G. Harrison, J.P. Lebreton, and M. Blanc (eds.), ISSI- and Europlanet-Workshop held in July 2007, published in October 2008. Reprinted from Space Science Reviews, Vol. 137, No. 1-4, 2008. ISBN 978-0-387-87663-4.

Volume 31: From the Outer Heliosphere to the Local Bubble
J. Linsky, E. Möbius, V.V. Izmodenov, and R. von Steiger (eds.), ISSI-Workshop held in October 2007, published in May 2009. Reprinted from Space Science Reviews, Vol. 143, No. 1-4, 2009. ISBN 978-1-4419-0246-7.

Volume 32: The Origin and Dynamics of Solar Magnetism
M.J. Thompson, A. Balogh, J.L. Culhane, A. Nordlund, S.K. Solanki, and J.-P. Zahn (eds.), ISSI-Workshop held in January 2008, published in May 2009. Reprinted from Space Science Reviews, Vol. 144, No. 1-4, 2009. ISBN 978-1-4419-0238-2.

Volume 33: Planetary Magnetism
U.R. Christensen, A. Balogh, D. Breuer, and K.-H. Glassmeier (eds.), ISSI-Workshop held in September 2008, published in October 2010. Reprinted from Space Science Reviews, Vol. 152, No.1-4, 2010. ISBN 978-1-4419-5900-3.

Volume 34: Probing the Nature of Gravity – Confronting Theory and Experiment in Space
C.W.F. Everitt, M.C.E. Huber, R. Kallenbach, G. Schäfer, B.F. Schutz, and R.A. Treumann (eds.), ISSI-Workshop held in October 2008, published in June 2010. Reprinted from Space Science Reviews, Vol. 148, No. 1-4, 2009. ISBN 978-1-4419-1361-6.

Volume 35: Satellites of the Outer Solar System – Exchange Processes Involving the Interiors
O. Grasset, M. Blanc, A. Coustenis, W.B. Durham, H. Hussmann, R. Pappalardo, and D. Turrini (eds.), ISSI- and Europlanet-Workshop held in November 2008, published in December 2010. Reprinted from Space Science Reviews, Vol. 153, No. 1-4, 2010. ISBN 978-1-4419-7438-9.

Volume 36: Terrestrial Magnetism
G. Hulot, A. Balogh, U.R. Christensen, C. Constable, M. Mandea, and N. Olsen (eds.), ISSI-Workshop held in March 2009, published in January 2011. Reprinted from Space Science Reviews, Vol. 155, No. 1-4, 2010. ISBN 978-1-4419-7954-4.

Volume 37: The Plasma Environment of Venus, Mars, and Titan
K. Szego (eds.), ISSI- and Europlanet Workshop held in November 2009, published in February 2012. Reprinted from Space Science Reviews, Vol. 162, No. 1-4, 2011. ISBN 978-1-4614-3289-0.

Volume 38: Multiscale Physics in Coronal Heating and Solar Wind Acceleration
D. Burgess, J. Drake, E. Marsch, M. Velli, R. von Steiger, T.H. Zurbuchen (eds.), ISSI-Workshop held in January 2010, published in January 2013. Reprinted from Space Science Reviews, Vol. 172, No. 1-4, 2012. ISBN 978-1-4614-6460-0.

Volume 39: Large-Scale Magnetic Fields in the Universe
R. Beck, A. Balogh, A. Bykov, R.A. Treumann, L. Widrow (eds.), ISSI-Workshop held in March 2010, to be published in January 2013. Reprinted from Space Science Reviews Vol. 166, No. 1-4, and Vol. 169, No. 1-4, 2012. ISBN 978-1-4614-5727-5.

Volume 40: The Earth's Cryosphere and Sea Level Change
L. Bengtsson, S. Koumoutsaris, R.-M. Bonnet, E.-A. Herland, P. Huybrechts, O.M. Johannessen, G. Milne, J. Oerlemans, A. Ohmura, G. Ramstein, P. Woodworth (eds.), ISSI-Workshop held in March 2010, published in October 2011. Reprinted from Surveys in Geophysics, Vol. 32, No. 4-5, 2011. ISBN 978-94-007-2062-6.

Volume 41: Observing and Modeling Earth's Energy Flows
L. Bengtsson, S. Koumoutsaris, R.-M. Bonnet, R.P. Allan, C. Fröhlich, J. Heintzenberg, P. Ingmann, R. Kandel, N.G. Loeb, B. Soden, K.E. Trenberth (eds.), ISSI-Workshop held in January 2011, published in September 2012. Reprinted from Surveys in Geophysics, Vol. 33, No. 3-4, 2012. ISBN 978-94-007-4326-7.

Volume 42: Dynamic Coupling between Earth's Atmospheric and Plasma Environments
T. Bösinger, J. LaBelle, H.J. Opgenoorth, J.-P. Pommereau, K. Shiokawa, S.C. Solomon, and R.A. Treumann (eds.), ISSI-Workshop held in September 2010, published in January 2013. Reprinted from Space Science Reviews Vol. 168, No. 1-4, 2012. ISBN 978-1-4614-5676-6.

Volume 43: Cosmic Rays in the Heliosphere – Temporal and Spatial Variations
B. Heber, J. Kóta, and R. von Steiger (eds.), ISSI-Workshop held in April 2010, published in September 2013. Reprinted from Space Science Reviews Vol. 176, No. 1-4, 2013. ISBN 978-1-4614-9199-6.

Volume 44: Quantifying the Martian Geochemical Reservoirs
M. Toplis, J. Bell III, E. Chassefière, C. Sotin, T. Spohn, M. Blanc, et al. (eds.), ISSI- and Europlanet Workshop held in April 2011, to be published in June 2013. Reprinted from Space Science Reviews Vol. 174, No. 1-4, 2013. ISBN 978-1-4614-7773-0.

Volume 45: Particle Acceleration in Cosmic Plasmas
A. Balogh, A. Bykov, R.P. Lin, J. Raymond, and M. Scholer (eds.), ISSI-Workshop held in May 2011, published in January 2013. Reprinted from Space Science Reviews Vol. 173, No. 1-4, 2012. ISBN 978-1-4614-6454-9.

Volumes In Press

Volume 46: The Earth's Hydrological Cycle
L. Bengtsson et al. (eds.), ISSI-Workshop held in February 2012, to be published in 2013/14.

Forthcoming Volumes

Volume 47: Microphysics of Cosmic Plasmas
A. Balogh et al. (eds.), ISSI-Workshop held in April 2012, to be published in 2014.

Volume 48: Helioseismology and Dynamics of the Solar Interior
L. Culhane et al. (eds.), ISSI-Workshop held in September 2012, to be published in 2014.

Volume 49: The Physics of Accretion on to Black Holes
M. Falanga et al. (eds.), ISSI-Workshop held in October 2012, to be published in 2014.

Volume 50: Giant Planet Magnetodiscs and Aurorae
K. Szego et al. (eds.), ISSI- and Europlanet Workshop held in November 2012, to be published in 2014.

ISSI Scientific Reports Series (SR)

Published Volumes

Electronic copies are available from the website `www.issibern.ch` (go to 'Publications'). Hard copies of volumes 1-8 are available from `www.spacebooks-online.com` (go to 'ESA-sponsored Publications'). Volumes 9-11 can be ordered on `www.springer.com`.

Volume 1: Analysis Methods for Multi-Spacecraft Data
G. Paschmann, P.W. Daly (eds.), Results of an ISSI-Working Group, published in July 1998. ISBN 1608-280X.

Volume 2: The Radiometric Calibration of SOHO
A. Pauluhn, M.C.E. Huber, R. von Steiger (eds.), Results of an ISSI-Working Group, published in August 2002. ISBN 1608-280X.

Volume 3: The Solar System and Beyond – Ten Years of ISSI
J. Geiss, B. Hultqvist (eds.). Published on the occasion of ISSI's ten-year anniversary in June 2005. ISBN 1608-280X.

Volume 4: Heat and Gas Diffusion in Comet Nuclei
W.F. Huebner, J. Benkhoff, M.-T. Capria, A. Coradini, C. De Sanctis, R. Orosei, D. Prialnik (eds.), Results from an ISSI-Team, published in August 2006. ISBN 1608-280X.

Volume 5: The Physics of the Heliospheric Boundaries
V.V. Izmodenov, R. Kallenbach (eds.), Results from an ISSI-Team, published in 2006. ISBN 1608-280X.

Volume 6: Planetary Systems and Planets in Systems
S. Udry, W. Benz, R. von Steiger (eds.), Results of an ISSI-Workshop, published in 2006. ISBN 978-92-9221-935-2.

Volume 7: Calibration of Particle Instruments in Space Physics
M. Wüest, D.S. Evans, R. von Steiger (eds.), Results of an ISSI-Working Group, published in December 2007. ISBN 987-92-9221-936-9.

Volume 8: Multi-Spacecraft Analysis Methods Revisited
G. Paschmann, P.W. Daly (eds.), Results of an ISSI-Working Group, published in April 2008. ISBN 987-92-9221-937-6.

Volume 9: Observing Photons in Space
M.C.E. Huber, A. Pauluhn, J.L. Culhane, J.G. Timothy, K. Wilhelm, A. Zehnder (eds.), Results of an ISSI-Working Group, published in September 2010. ISBN 978-92-9221-938-3.

Volume 10: Monitoring Atmospheric Water Vapour – Ground-Based Remote Sensing and In-situ Methods
N. Kämpfer (eds.), Results of an ISSI International Team, published in 2012. ISBN 978-1-4614-3908-0.

Volume 11: Towards Understanding the Climate of Venus – Applications of Terrestrial Models to Our Sister Planet
L. Bengtsson, R.-M. Bonnet, D. Grinspoon, S. Koumoutsaris, S. Lebonnois, D. Titov (eds.), Results of an ISSI-Working Group, published in 2012. ISBN 978-1-4614-5063-4.

Volume 12: Physics of Collisionless Shocks – Space Plasma Shock Waves
A. Balogh, R.A. Treumann, published in 2013. ISBN 978-1-4614-6098-5.

Volume 13: Cross-Calibration of Far UV Spectra of Solar System Objects and the Heliosphere
E. Quémerais, M. Snow, R.-M. Bonnet (eds.), Results of an ISSI-Working Group, published in 2013. ISBN 978-1-4614-6383-2.

Forthcoming Volumes

Volume 14: Space Instrumentation for Space Physics
A. Balogh et al. (eds.), Results of an ISSI-Working Group.

The SPATIUM magazine containing the lectures of the Association Pro ISSI in a form that is easily understandable by using attractive visual information. For hard copies of the SPATIUM volumes please contact `pro-issi@issibern.ch`. Electronic editions in PDF format can be downloaded from `www.issibern.ch` under 'Publications'.

No. 1: *Die ersten Minuten und das weitere Schicksal des Universums,* by Johannes Geiss, published in April 1998.

No. 2: *Das neue Bild der Sonne* (out of print), by Rudolf von Steiger, published in November 1998.

No. 3: *Birth, Age and the Future of the Universe,* by Gustav Andreas Tammann, published in May 1999.

No. 4: *Kometen als Schwerpunkt der europäischen Weltraumforschung,* by Kathrin Altwegg, published in October 1999.

No. 5: *Earth, Moon and Mars* (out of print), by Johannes Geiss, published in June 2000.

No. 6: *From Dust to Planets,* by Willy Benz, published in October 2000.

No. 7: *In Search of the Dark Matter in the Universe,* by Klaus Pretzl, published in May 2001.

No. 8: *Sun and Climate,* by Jürg Beer, published in November 2001.

No. 9: *The Fourfold Way Through the Magnetosphere: The Cluster Mission,* by Götz Paschmann, published in June 2002.

No. 10: *Satellite Navigation Systems for Earth and Space Sciences,* by Gerhard Beutler, published in June 2003.

No. 11: *Cosmic Rays,* by Hansjörg Schlaepfer, published in November 2003.

No. 12: *Ten Years Hubble Space Telescope,* by Roger-Maurice Bonnet, published in June 2004.

No. 13: *Woher kommen Kohlenstoff, Eisen und Uran?*, by Rudolf von Steiger, published in October 2004.

No. 14: *Grundlagen der Physik im extraterrestrischen Test*, by Martin C.E. Huber, published in June 2005.

No. 15: *Titan and the Huygens Mission*, by Nicolas Thomas, published in November 2005.

No. 16: *Astrobiology*, by Oliver Botta, published in July 2006.

No. 17: *The Heliosphere: Empire of the Sun,* by André Balogh, published in October 2006.

No. 18: *Einstein in Bern: The Great Legacy*, by Thomas H. Zurbuchen, Rudolf von Steiger, and Brian Grimm, published in February 2007.

No. 19: *4440: A Secret Number in Astronomy*, by Giovanni Fabrizio Bignami, published in August 2007.

No. 20: *What the Universe Consists of: From Luminous to Dark Matter and Quintessence,* by Uwe-Jens Wiese, published in November 2007.

No. 21: *The Earth's Ozone Layer*, by Yasmine Calisesi, published in February 2008.

No. 22: *Solar Magnetism – Discovery and Investigation,* by Eugene Parker, published in August 2008.

No. 23: *Meteorites*, by Beda Hofmann, published in February 2009.

No. 24: *Cosmic Vision*, summary of a talk by David Southwood edited by Hansjörg Schlaepfer, published in February 2010.

No. 25: *Climate Change*, by Thomas Stocker, published in July 2010.

No. 26: *Spaceship Earth*, by Roger-Maurice Bonnet, published in May 2011.

No. 27: *Science First,* by Hansjörg Schlaepfer, published in September 2011.

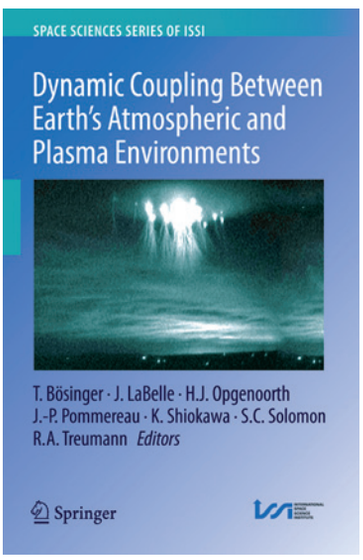
No. 28: *How Black are Black Holes?,* by Maurizio Falanga, published in December 2011.

No. 29: *Mysterious Mercury,* by Peter Wurz, published in May 2012.

No. 30: *Planets and Life*, by Tilman Spohn, published in October 2012.

No. 31: *Earth Gravity From Space,* by Reiner Rummel, published in May 2013.

ISSI Publications published in the 18th Business Year



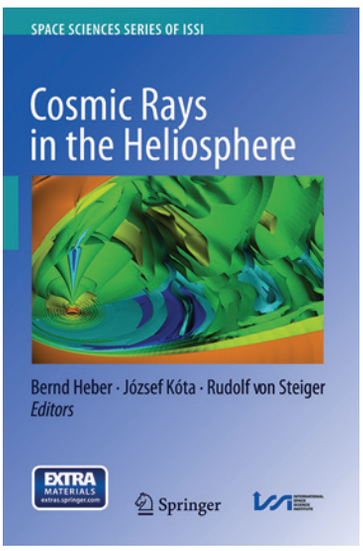
Dynamic Coupling Between Earth's Atmospheric and Plasma Environments

edited by

Tilmann Bösinger, University of Oulu, Finland
James LaBelle, Dartmouth College, Hanover, NH, USA
Hermann J. Opgenoorth, Swedish Institute of Space Physics, Uppsala, Sweden
Jean-Pierre Pommereau, National Center for Scientific Research, Paris, France
Kazuo Shiokawa, Nagoya University, Japan
Stan C. Solomon, University Corporation for Atmospheric Research, Boulder, USA
Rudolf A. Treumann, International Space Science Institute, Bern, Switzerland

Volume 42 resulting from an ISSI Workshop, published in 2013, Space Science Series of ISSI (SSSI), ISBN 978-1-4614-5676-6.

Table of Contents



Cosmic Rays in the Heliosphere – Temporal and Spatial Variations

edited by

Bernd Heber, Christian-Albrechts-Universität zu Kiel, Kiel, Germany

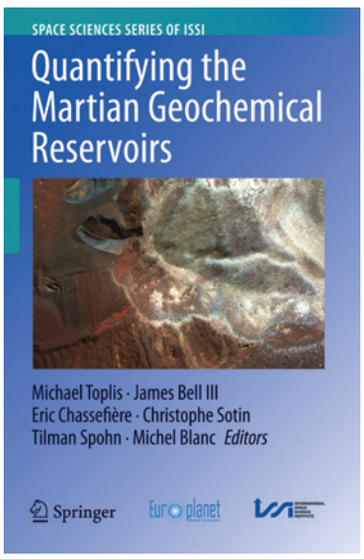
József Kóta, Lunar and Planetary Laboratory, University of Arizona, Tucson, USA

Rudolf von Steiger, International Space Science Institute, Bern, Switzerland

Volume 43 resulting from an ISSI Workshop, published in 2013, Space Science Series of ISSI (SSSI), ISBN 978-1-4614-9199-6.

Table of Contents

ISSI Publications published in the 18th Business Year



Quantifying the Martian Geochemical Reservoirs

edited by

Michael Toplis
DTP, Observatoire Midi-Pyrénées, Toulouse, France

James F. Bell III
School of Earth and Space Exploration, Arizona State University, USA

Eric Chassefière
Interactions et Dynamique des Environnements de Surface, Université Paris-Sud, France

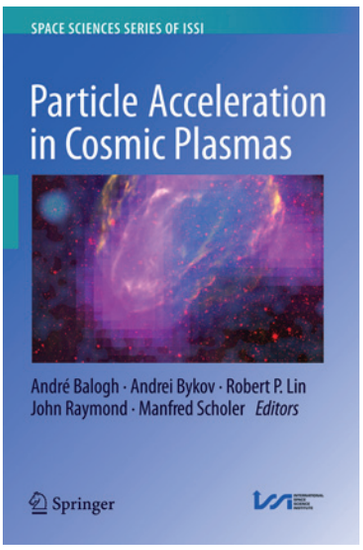
Christophe Sotin
NASA Jet Propulsion Laboratory, Pasadena, USA

Tilman Spohn
Deutsches Zentrum für Luft- und Raumfahrt (DLR), Berlin, Germany

Michel Blanc
International Space Science Institute, Bern, Switzerland

Volume 44 resulting from an ISSI Europlanet Workshop, published in 2013, Space Science Series of ISSI (SSSI), ISBN 978-1-4614-7773-0.

Table of Contents



Particle Acceleration in Cosmic Plasmas

edited by

André Balogh
International Space Science Institute, Bern, Switzerland

Andrei Bykov
Russian Academy of Science, St. Petersburg, Russia

Robert P. Lin
University of California, Berkeley, CA, USA

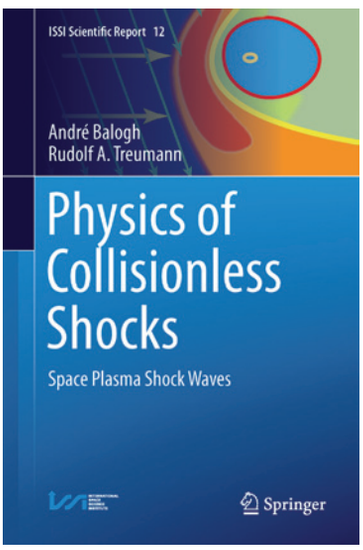
John Raymond
Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA

Manfred Scholer
Max-Planck-Institute, Garching, Germany

Volume 45 resulting from an ISSI Workshop, published in 2013, Space Science Series of ISSI (SSSI), ISBN 978-1-4614-6454-9.

Table of Contents

ISSI Publications published in the 18th Business Year



Physics of Collisionless Shocks

Space Plasma Shock Waves

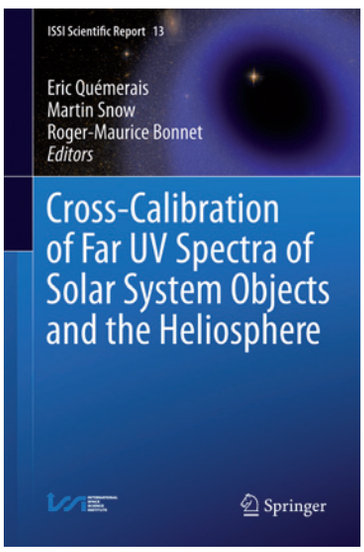
by

André Balogh, Imperial College London, United Kingdom

Rudolf A. Treumann, International Space Science Institute, Bern, Switzerland

Volume 12 published in January 2013, ISSI Scientific Report Series (SR), ISBN 978-1-4614-6098-5.

Table of Contents



Cross-Calibration of Far UV Spectra of Solar System Objects and the Heliosphere

edited by

Eric Quémerais, University of Versailles Saint-Quentin, Guyancourt, France

Martin Snow, University of Colorado, Boulder, CO, USA

Roger-Maurice Bonnet, International Space Science Institute, Bern, Switzerland

Volume 13 resulting from an ISSI Working Group, published in May 2013, ISSI Scientific Report Series (SR), ISBN 978-1-4614-6383-2.

Table of Contents

International Space Science Institute ISSI
Hallerstrasse 6
CH-3012 Bern
Switzerland
Tel. +41 31 631 48 96
www.issibern.ch
info@issibern.ch