

## From the President of the Board of Trustees

Another highly successful year of teams and workshops with scientists from all over the world has come to a close. On January 31, 2000, ISSI had its unofficial fifth anniversary (the foundation was set up in January 1995). I think this fact was pretty much forgotten as a result of the continuing, extraordinary commitment of the Institute's directorate and staff to their activities.

The Board of Trustees saw the departure of one of its founding members, Professor Andreas Ludi, through retirement. However, it now has two new members, Professor Urs Würigler, University of Bern, replacing Professor Ludi, and Dr. Claude Nicollier, ESA astronaut from Switzerland. We are most pleased to welcome our distinguished colleagues to the Board of Trustees.

Fulfilling one of the recommendations of the special committee established by the European Space Agency (ESA) two years ago, members of the Science Committee now have terms limited to three years. All members accepted this new arrangement, and in late autumn 1999 the Science Committee continued its activities with its first new rotating members.

Due to the increased number of applications for the financial support of national science projects and the limited governmental funding available, ISSI's funding from the Swiss government was to be reduced. Based on action by the ISSI Directorate, in concert with the President of the Board, the Director of the Swiss Science Office, State Secretary Charles Kleiber, decided upon special measures to compensate for the reduced contributions to ISSI for the next business year and to provide some increase in the years to come. We are extremely grateful that, as a result of his action, the Swiss contribution to the financing of ISSI comes close to matching that of ESA.

The Executive Director of ISSI has reported that the number of astronomers and astrophysicists as well as of scientists from other disciplines who participate in Institute activities continues to grow, a good indicator of the quality of ISSI's performance.

In cooperation with the President of the Association Pro-ISSI, the Board is establishing a new procedure for electing its members. The reason for this is that Pro-ISSI is essentially a Swiss organisation, but Board members represent agencies funding the Institute and IACG members, which are not Swiss. We think that in the future these institutions should have a vote in electing Board members.

The Search Committee, set up by the Board in 1998 to provide proposals for the replacement of members of the Directorate of the Institute, has been active, especially in regard to the appointment of a successor for the Executive Director.

It is worth noting that, besides the *Space Sciences Series of ISSI* and the *Scientific Report* series and other scientific publications, the Institute is also helping the Association Pro-ISSI publish the series *Spatium*, in magazine format, which provides easily understandable information about space science, a welcome instrument of public relations.



H. Schneiter  
July 2000

# Who's Who

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Götz Paschmann, Director (part-time)  
Rudolf von Steiger, Director  
Kathrin Altwegg, Consultant (part-time)  
Stephan Graf, Junior Scientist  
Stein Håland, Junior Scientist  
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## From the Directors: The Fifth Year

The fifth year of ISSI was both a year of change and a year of continuity. First, the change:

This was the first year without Bengt Hultqvist, who was a director at ISSI almost since its founding in 1995. He chose to retire in June 1999, after serving for four years. It is difficult to overestimate Bengt's merits in the successful upbringing of the young ISSI. Not only was he a complementary and congenial partner in the directorate who led his projects with a mellow style and firm principles, but he also introduced the very large and active community of Solar-Terrestrial, or Magnetospheric, physicists to ISSI and guided them through an enormous, multi-workshop project that culminated in the synthesis of everything that is known on *Magnetospheric Plasma Sources and Losses* (Volume 6 in the *Space Sciences Series of ISSI*) – a remarkable feat in a community that is sometimes better known for controversy rather than consensus. We are fortunate that he will continue to visit the institute as a consultant for several weeks per year. Bengt was, of course, accompanied by his wife Gurli, who had brought up and maintained the ISSI library on a part-time basis.

At the beginning of this fifth year, two of the undersigned (Götz Paschmann and Rudolf von Steiger) began service as directors, to form a triumvirate directorate with the executive director (Johannes Geiss). Neither of us is a newcomer to ISSI, as we have been working for ISSI, as study director and as senior scientist, respectively. We will strive to continue the institute's activities and projects at the momentum given by its first directorate.

Changes to the ISSI scientific staff include the arrival of Stein Håland as a postdoctoral scientist in June 1999; he replaces Marit Øieroset, who left ISSI in November 1998 to join the space science group at the University of Cali-

fornia, Berkeley. Stefano Verani, who was a postdoctoral scientist at ISSI for two years, also left the institute at the end of June 2000 to join the astronomy institute in his native Padova. In addition, we would like to officially welcome Gabriela Indermühle, who joined us during the last business year and who has become the heart of our non-scientific activities.

Then the continuity:

The science programme of ISSI continues to develop and proceed at a steady rate. This includes both the Workshop projects, which are initiated and run by ISSI and result in a publication in the *Space Sciences Series of ISSI*, and the International Team projects, which are proposed to ISSI by members of the scientific community and result in publications in refereed journals or in the *ISSI Scientific Report* series.

If we include the workshop that straddled the fourth and fifth years, we had an unprecedented total of six workshops held during the reporting period: one on *Solar Variability and Climate*, one on *The Evolution of Mars*, two on *The Astrophysics of Galactic Cosmic Rays*, and two on *Auroral Plasma Physics*. This is clearly the maximum that ISSI can support with its present resources. In the future, the workshop programme will be somewhat reduced in favour of the growing International Teams programme. Volumes 7–9 in the *Space Sciences Series of ISSI* appeared as a result of earlier workshops under the titles *Corotating Interaction Regions* (Volume 7), *Composition and Origin of Cometary Materials* (Volume 8), and *From Dust to Terrestrial Planets* (Volume 9). Volumes 10 and 11 on *Cosmic Rays and Earth* and on *Solar Variability and Climate* are about to be delivered to Kluwer as of this writing. Editorial work on Volumes 12 to 14, on *Evolution of Mars*, *The Astrophysics of Galactic Cosmic Rays*, and *Auroral Plasma Physics* is ongoing.

The first of a new type of publication appeared during the fifth year: a special section of the *Journal of Geophysical Research on Interstellar Dust in the Heliosphere*. This resulted from team workshops held at ISSI in the previous years.

The number of International Teams that have been established at ISSI has now risen to 33 since their inception in 1997, a figure that speaks for the established and still increasing popularity of this branch of the institute programme. Sixteen of those teams have in the meantime completed their work and published their results in the open, refereed literature; the other 17 are currently active or just starting up, but many of those have already issued publications of their work as well, as an impressive list later in this report testifies.

We are quite satisfied that continuity could also be achieved in the funding of ISSI. In the last annual report we announced renewals from three of the four main funding sources of ISSI for several years to come: ESA, based on a thorough evaluation in 1998, the University and Canton of Bern, based on a new contract that went into effect at the beginning of this reporting period, and the Swiss National Science Foundation, based on a peer-reviewed proposal by the undersigned. Renewal of funding from the Swiss Confederation under Article 16 of the *Forschungsgesetz* had been applied for in March 1998, and a delegation of the Swiss Science Council visited ISSI in June 1998. Considering the very positive evaluations of the other funding agencies, we were disappointed when, in November 1999, we received notice that the Federal funding would be severely cut effective in 2000. Our immediate intervention did not go unnoticed, fortunately: In March 2000 State Secretary for Science Charles Kleiber received a delegation of the Board of Trustees and the Directorate in his office, and less than three months later we were informed that the funding would be restored to the current level, with a moderate increase. Moreover, as of 2001 the Federal funding will no longer come from Article 16 but from the Swiss Space Office, which is, as all sides have agreed, a more natural way of funding ISSI.

In conclusion, we take pleasure in extending our sincere thanks to everyone who has contributed to making ISSI what it is today. First of all, we thank all 303 scientists who worked at ISSI during the fifth year, bringing the total number of scientists who have participated in the ISSI programme to 699 (many of whom have made more than one visit). It is for them that ISSI exists, and they are the ones who make it a success by using it. But ISSI would not function without its small, dedicated staff of scientists and administrators who run the place and support our visitors in every possible way. It is they who create the hard-to-define, yet often-cited ISSI spirit that makes it an attractive place to our visitors. If we can keep that spirit, we believe the future of our institute looks quite bright.



Johannes Geiss



Götz Paschmann



Rudolf von Steiger

August 2000

# About ISSI

The International Space Science Institute (ISSI) was set up in January 1995 in Bern as a foundation under Swiss law, with an endowment from Oerlikon-Contraves AG. ISSI received tax-exempt status from the Canton of Bern in May 1995. Three bodies govern ISSI: the Board of Trustees, the Science Committee and the Directorate. A fourth important body, the Association Pro-ISSI, promotes the idea of ISSI, especially within Switzerland, and appoints the members of the Board of Trustees. A list of the members of the board of the Association Pro-ISSI is found on page 2 of this report.

## Governing Bodies

ISSI's **Board of Trustees** oversees the work of the institute, controls the budget, and appoints the directors and members of the Science Committee. The board is composed of representatives of the Inter-Agency Consultative Group (IACG) member agencies, the scientific community, Swiss industry, and the Swiss government, all appointed by the **Association Pro-ISSI**. Presided over by Hanspeter Schneiter of Contraves Space AG, the board met twice during the fifth business year, on 21 October 1999 and 15 June 2000. Two new members were elected during the year: Urs Würigler, vice rector of the University of Bern (replacing Andreas Ludi, who retired) and Claude Nicollier, ESA astronaut from Switzerland. A complete list of members is on page 2 of this report.

The **Science Committee** is made up of internationally known scientists active in the fields covered by ISSI. The committee, chaired by David J. Southwood of Imperial College in London, provides guidance for the science programme by advising the directorate of ISSI and the Board of Trustees. Members serve three-year terms, with possible extension to five years. To facilitate a rotation, all members submitted their resignations at the end of the fourth year. The board reappointed 11 members and appointed three new members: Angioletta Coradini of the Istituto di Astrofisica Spaziale, CNR, Frascati, Italy; Rosine Lallement of the Service d'Aéronomie, CNRS, Verrières-le-Buisson, France; and Risto Pellinen of the Finnish Meteorological Institute, Helsinki, Finland. They replaced Claudio

Chiuderi, S.M. Krimigis and James Lequeux. The 14 members are listed on page 2 of this report. The Science Committee met twice during the fifth business year, on 8 December 1999 and 19 May 2000.

Appointed by the Board of Trustees, the **directorate** during the fifth year was made up of Johannes Geiss, who serves as executive director, Rudolf von Steiger, and Götz Paschmann, who is at ISSI six months during the year. The directorate takes care of the scientific, operational, and administrative direction of the institute.

## Funding

ISSI receives funding from the European Space Agency (ESA), the Swiss Confederation, the Canton of Bern, and the Swiss National Science Foundation.

ISSI's first funding came from the Canton of Bern in August 1994 in the form of a one-time investment credit, as well as a deficit guaranty for the first four years.

A breakthrough came when the ESA Council in late 1994 unanimously approved funding through 1999. The Science Programme Committee of ESA and the ESA Council voted during 1998 to extend support to ISSI for the period 1999 to 2003.

In December 1994 the Swiss government, through its Federal Office for Education and Science (in the Federal Department of Home Affairs), approved funding for 1995 and 1996. On 9 April 1997, the Swiss Federal Council granted ISSI additional funding for 1997–1999. This was continued on 5 June 2000, when the Federal Council approved funding for the year 2000 under Article 16 of the *Forschungsgesetz*. Beginning in 2001, funding will come from the Swiss Space Office, also in the Federal Department of Home Affairs.

During the fourth business year, the board and the directorate worked to change the deficit guaranty from the canton to a more direct form of support. The fifth business year was a transition year, with a one-time cantonal contribution. The main change in coming years is that the salary of one of the direc-



tors will be provided by the University of Bern (funded by the Canton of Bern).

During the fourth business year, ISSI submitted an application to the Swiss National Science Foundation for a new grant of three years for its programme directly related to Workshops, Working Groups, International Teams, and Visiting Scientists. This grant was approved and began in the fifth business year.

ISSI's relationship to the Inter-Agency Consultative Group (IACG) continued throughout the fifth year. Although this group – made up of the European Space Agency (ESA), the Russian Space Agency, the Institute of Space and Astronautical Science of Japan (ISAS), and the National Aeronautics and Space Administration of the U.S. (NASA) – does not provide financial support to ISSI, it does provide important scientific and political support for the institute. At its meeting in Bern in October 1998, it established a permanent secretariat and archive at ISSI and appointed Vittorio Manno of the ISSI staff to serve as the executive secretary until 2002.

### Personnel

During the fifth business year, Johannes Geiss, Rudolf von Steiger and Götz Paschmann (also of the Max-Planck-Institut für extraterrestrische Physik in Garching) led the institute.

Full-time staff were: Vittorio Manno, Institute Programme Manager; Diane Taylor, Administrator/Public Affairs Specialist; Reinald Kallenbach, Staff Scientist; Stephan Graf, Junior Scientist; Stein Håland, Junior Scientist; Stefano Verani, Junior Scientist; Xavier Schneider, Computer Engineer and System Administrator; and Gabriela Indermühle, Secretary. On a part-time basis, Silvia Wenger provided secretarial support, Ursula Pfander gave editorial assistance, and Kathrin Altwegg of the University of Bern continued as a consultant on cometary science.

On a personal note, Marit Øieroset, who spent a little more than two years at ISSI before moving to the University of California, Berkeley, announced her marriage to Tai Phan in August 2000. They met at ISSI, proof that ISSI's international cooperation goes beyond science!

### Furnishings / Infrastructure

During the fifth business year, controls to regulate the cooling in the seminar room, energy-efficient lighting throughout office and public areas on the main floor, and new carpeting in the cafeteria areas were installed.

The institute continued to provide two two-bedroom apartments and a one-bedroom apartment for long-term visiting scientists.



*ISSI staff at the end of the fifth business year: (left to right) Johannes Geiss, Götz Paschmann, Silvia Wenger, Rudolf von Steiger, Kathrin Altwegg, Stein Håland, Gabriela Indermühle, Stephan Graf, Reinald Kallenbach, Vittorio Manno, Stefano Verani, Xavier Schneider, and Diane Taylor. Missing is Ursula Pfander. (Photo by Urs Lauterburg)*

ISSI has had the generous loan of two paintings by Ludek Pešek, *Dust Storm on Mars* and *Mars Seen from Its Moon Deimos*, both painted in 1971. The artist, born in 1919 in Prague, moved with his wife, Beatrice, to Switzerland in 1969. His paintings have appeared in *National Geographic* magazine and numerous books and publications and have been exhibited extensively in Europe and the U.S., including at the National Air and Space Museum (NASM) in Washington, D.C. Mr. Pešek died in early December 1999, but donated the paintings posthumously to ISSI, with the stipulation that they be sent to NASM should ISSI cease to exist.

### Computing Facilities

The institute's workgroup provides a heterogeneous workstation environment with a total of 38 PCs, PowerMacintoshes and SUN workstations. The workgroup network is part of the university's local area network, so that its resources (e.g. the SUN, SP2 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.

Special attention was paid to avoiding "Y2K" problems. During the whole of 1999, the institute's system administrator, Xavier Schneider, updated PCs' BIOS and software and applied security patches to SUN workstations. The arrival of 1 January 2000 was uneventful.

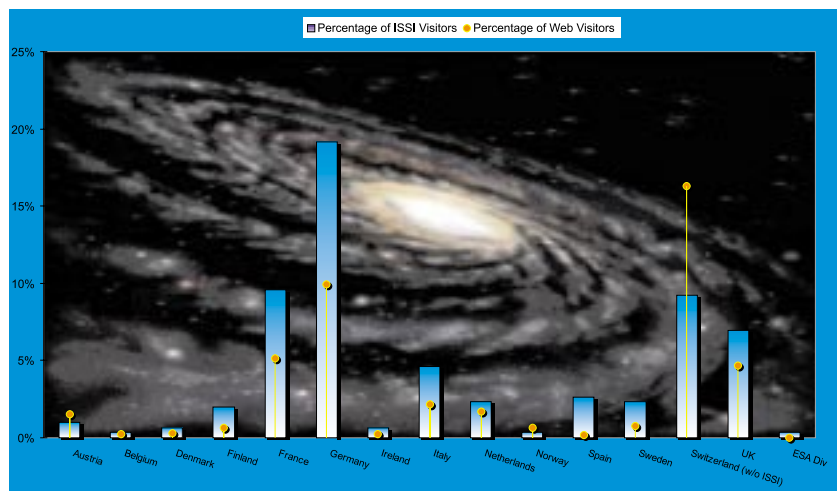
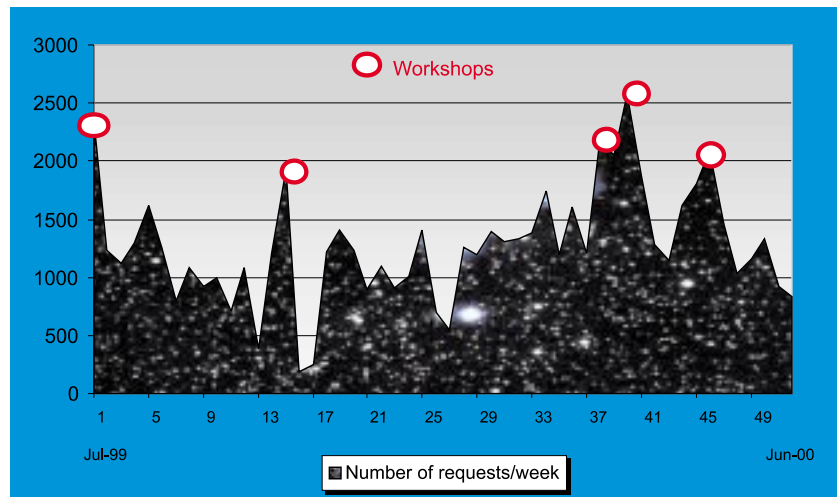
The most important update during the last year was the replacement of the alpha server with an IBM PC server. In addition, several of the older PCs were replaced with new, more powerful ones, and four of the old monitors were replaced by 18-inch flat screens. The institute continues to update software regularly and uses the large scientific packages (including IDL and Matlab) either locally or by connecting to the university servers.

As the number of computers running Linux continues to in-

crease, two PCs run this operating system and two others have both Windows NT4 and Linux. All other PCs run Windows NT4. Macintosh units use MacOS 8.1 and 8.6, and the SUN use Solaris 2.5.1, 2.6 and 7.

The ISSI Web server ([www.issi.unibe.ch](http://www.issi.unibe.ch)) is visited frequently, especially before workshops. The Web pages offer general information about the institute as well as more specific details about a workshop or a team.

Of the site visitors, more than 44 percent are in an ESA member state, almost 48 percent in the United States, 2 percent in Russia, and about 6 percent are elsewhere in the world. This is in contrast to ISSI visitors, where about 62 percent come from an ESA member state, 25 percent from the United States, 5 percent from Russia, and 8 percent from elsewhere.



Graphics by Xavier Schneider, ISSI

# Scientific Activities: The Fifth Year

ISSI's scientific programme is presently focussed on heliospheric physics, solar-terrestrial physics, cometary physics and chemistry, solar wind and solar processes, planetary science, and astrophysics and cosmological questions.

The programme is realised through **Workshops and Working Groups, International Teams, and Individual Visiting Scientists.**

The directors, in consultation with the Science Committee and other experts, select Workshops and Working Groups. These last one week and are attended by up to 45 invited scientists.

International Teams are proposed by individual scientists and agreed upon by the directorate, usually after peer review.

Individual Visiting Scientists are invited for extended periods by the directors to pursue their research and perform scientific tasks of relevance to ISSI's programme.

All scientific activities result in some form of publication. Volumes in the *Space Sciences Series of ISSI (SSSI)*, edited by Kluwer Academic Publishers in Dordrecht, The Netherlands, also appear as special issues of *Space Science Reviews* and report the results of workshops. Publications in refereed scientific journals and/or volumes in the *ISSI Scientific Report* series, published by the ESA Publications Division, report the scientific output of the teams and the activity of individual visitors.

## WORKSHOPS AND WORKING GROUPS

Six workshops, including one that straddled the fourth and fifth years, were held during the fifth business year. Three volumes were added to the *Space Sciences Series of ISSI*.

The full schedule of workshops and activities can be found at: [http://www.issi.unibe.ch/pc\\_meet.html](http://www.issi.unibe.ch/pc_meet.html). Publications are at: [http://www.issi.unibe.ch/cur\\_pub.html](http://www.issi.unibe.ch/cur_pub.html).

## HELIOSPHERIC PHYSICS

No workshops were held in this area during the fifth business year. However, one volume and a special reprint appeared, with a second volume in preparation.

The workshop *Corotating Interaction Regions* (CIRs) took place at ISSI in June 1998, following a series of two workshops at Elmau castle in Germany, convened by Horst Kunow, University of Kiel. The resulting book, Volume 7 of the *Space Sciences Series of ISSI*, appeared as Volume 89 of *Space Science Reviews* (1 July 1999). It was edited by André Balogh, Imperial College, London; John T. Gosling, Los Alamos National Laboratory, New Mexico; J. R. Jokipii, University of Arizona, Tucson; Reinald Kallenbach, ISSI; and Horst Kunow. More than 50 participants from the international space science community contributed to the volume, which contains nine introductory and seven working group articles, an introduction, and a glossary by the editors.

The integrated book gives a comprehensive overview of current knowledge and understanding of CIRs, which form at the interface between the fast solar wind – originating in the northern and southern coronal holes – and the slow solar wind – originating near and within coronal streamers surrounding the heliomagnetic equator. During the declining phase and near the minimum of the 11-year solar cycle, CIRs are the dominant structure in the heliosphere, anchored in the magnetic structure of the solar atmosphere and dissipating in the outer heliosphere. Papers included in the volume discuss the complexities associated with CIR evolution as they move away from the Sun and their three-dimensional structure. As CIRs are the dominant source of energetic particles in the heliosphere during solar activity minimum, the myriad effects related to the injection and acceleration of ions, originating in the solar system and in the interstellar medium, at CIR shocks are reviewed in detail in several articles. Other chapters are devoted to solving questions about the transport of energetic particles, such as the galactic cosmic rays, through the heliosphere during solar activity minimum. This includes models of the solar magnetic field and of the successors of CIRs in the outer heliosphere such as merged interaction regions.



In honour of the 50th anniversary of the invention of the neutron monitor, a key research tool in the field of space physics and solar-terrestrial relations, by John A. Simpson in 1948, a workshop entitled *Cosmic Rays and Earth* was convened in March 1999 by John W. Bieber, Bartol Research Institute, Newark, Delaware; Evgenia Eroshenko, IZMIRAN, Moscow region, Russia; Paul Evenson, National Science Foundation, Arlington, Virginia, and Bartol Research Institute; and Erwin Flückiger, University of Bern. The results from the detection of cosmic rays at the surface and in the lower atmosphere of Earth during the last half-century were reviewed.

Editorial work by the convenors together with Reinald Kallenbach of ISSI was finished at the end of this business year. *SSSI* Volume 10 with the title of the workshop will appear as the July 2000 issue of *Space Science Reviews*, also published by Kluwer Academic Publishers.

Following up on discussions and results of the first ISSI workshop (*The Heliosphere in the Local Interstellar Medium*, Volume 1, *Space Sciences Series of ISSI*), an ISSI working group led by Priscilla Frisch of the University of Chicago and Eberhard Grün of the Max-Planck-Institut für Kernphysik, Heidelberg, continued to study the *Interstellar Dust*.

Interstellar grains are difficult to investigate; most of the information we have is from spectroscopy in the infrared, optical and UV wavelength region. In early 1992, with their experiment on Ulysses, Eberhard Grün and colleagues detected interstellar dust particles that had penetrated deep into the heliosphere. This discovery opened up a new era in research on interstellar solid matter.

The working group organised a team, which met several times at ISSI and discussed the full range of methods and results of interstellar dust research, comparing spectroscopic data obtained in the Galaxy, observations of interstellar grains by Ulysses and Galileo, and isotopic measurements in “pre-solar grains” separated from meteorites and analysed with the SIMS technique in the laboratory. The results were published in 1999 in a paper by the team (Frisch et al., *Astrophysical Journal*, Vol. 525).

Following a team workshop held at ISSI in October 1998, the team published a set of 19 papers as a special section in the *Journal of Geophysical Research*,

Volume 105, 2000. This publication gives a comprehensive account of the state of the art in the complex field of interstellar dust research.

## SOLAR-TERRESTRIAL PHYSICS

The current major ISSI project in the field of Solar-Terrestrial Physics is devoted to *Auroral Plasma Physics*. The aurora is arguably the most intriguing phenomenon in all of space plasma physics. Not only is it the most spectacular manifestation of the Sun-Earth connection chain, but the underlying plasma processes are expected to be ubiquitous in the entire Universe. As decisive new insights into the physics of the aurora were obtained by recent satellite missions, sounding rocket flights, and high-resolution optical observations from the ground and from space, it seemed timely to try to write a comprehensive and integrated textbook on the subject.

The aurora is created by the impact of fast electrons on Earth’s upper atmosphere. Recent progress includes the clarification of the nature of the acceleration process of these electrons, the fundamental role of the large-scale current systems in organising the auroral morphology, and the interplay between particles and electromagnetic fields. Particularly important was the proof that it is indeed electric fields aligned with the magnetic field that accelerate the electrons, an idea that has created a lot of controversy in the past.



An auroral arc (Photo by Jan Curtis, Geophysical Institute, University of Alaska Fairbanks)

The project is coordinated by a core group consisting of: Joseph E. Borovskiy, Los Alamos National Laboratory, New Mexico; Charles W. Carlson, University of California, Berkeley; Gerhard Haerendel, Max-Planck-Institut für extraterrestrische Physik, Garching; Bengt Hultqvist, Swedish Institute of Space Physics, Kiruna; Hannu Koskinen, Finnish Meteorological Institute, Helsinki; William Lotko, Dartmouth College, Hanover, New Hampshire; Kristina Lynch, University of New Hampshire, Durham; Göran Marklund, Royal Institute of Technology, Stockholm; and Götz Paschmann, ISSI (project leader).

Following the core group meeting in March 1999 to prepare the project, two workshops were held, 25–29 October 1999 and 27–31 March 2000, with almost 30 participants invited. While the first workshop focussed on discussions of the science, the second workshop produced a detailed outline of the book. Another meeting by the full team is scheduled for December 2000. The result will be published in the *Space Sciences Series of ISSI* in late 2001.

After the *ISSI Scientific Report 001, Analysis Methods for Multi-Spacecraft Data*, was published in 1998, one of the editors, Patrick W. Daly, began to experiment with an electronic version in PDF. It was thought that the availability in electronic form, with navigation aids, internal links for cross-references, and its capability for quick search, would naturally enhance the book's usefulness as a reference. The editors and authors decided that an electronic edition would also provide an opportunity for correcting errors, making additional comments, and otherwise extending the original material. To accomplish this without losing the correlation to the pages of the paper edition, it was decided to make use of endnotes, collected together in a separate section at the end of the book. A marker in the margins provides a dynamic link to the note. In addition, extensive new material has been made available as separate PDF files, attached at the end of the book. Dynamic links are provided to direct the reader immediately to these pages. The size of the complete PDF file is only 8 megabytes. It is now publicly available and can be downloaded from the ISSI website.

## COMETARY PHYSICS AND CHEMISTRY

Comets contain more pristine material than any other object in the solar system. It is primarily for this reason that comet research is essential for studying the formation and early history of the solar system.

The workshop on *Composition and Origin of Cometary Materials* was held in September 1998. The results of this workshop were published in the October 1999 issue of *Space Science Reviews* and as Volume 8 of the *Space Sciences Series of ISSI*. The editors were: Kathrin Altwegg of the University of Bern; Pascale Ehrenfreund of the Leiden Observatory, The Netherlands; Johannes Geiss of ISSI; and Walter F. Huebner of the Southwest Research Institute, San Antonio, Texas.

The volume contains a subject index, an index of comets and a table with abbreviations. In addition, Stephan Graf and Ursula Pfander of ISSI prepared two molecule indices listing the relevant atomic and molecular species. One index is ordered by formula, the other one – with 168 entries – is ordered by name. This surprisingly large number indicates how much the investigation of cometary gases and grains has progressed during the last decade.



*Halley's Comet*

Following the publication of the results of the workshop, an advisory group on cometary research was established by ISSI, with members Kathrin Altwegg of the University of Bern; Dominique Bockelée-Morvan of the Observatoire de Paris; Johannes Geiss of ISSI (chair); Walter F. Huebner of the Southwest Research Institute; Wesley T. Huntress, Jr., of the Carnegie Institution, Washington, D.C.; Elmar Jessberger of the University of Münster; Anny-Chantal Levasseur-Regourd of the University of Paris 6; and Gisbert Winnewisser of the University of Cologne. The group met 27–28 January 2000 and – after a thorough discussion of possible future avenues for cometary research at ISSI – decided to set up five teams, each dealing with different questions concerning comets, interstellar molecular clouds, and the origin of the solar system. These teams were being formed at the end of the business year and will begin with their work towards the end of 2000.

## SOLAR WIND AND SOLAR PROCESSES

The week spanning the transition from ISSI's fourth to fifth business year, 28 June–2 July 1999, was devoted to a workshop on *Solar Variability*

**and Climate.** It was conceived as a spin-off initiative from the earlier workshop on *Solar Composition and Its Evolution* in 1998 and represented a significant first step towards the expansion of the ISSI programme in the direction of Earth sciences. The convenors, Eigil Friis-Christensen (Danish Space Research Institute, Copenhagen), Claus Fröhlich (Physikalisch-Meteorologisches Observatorium Davos / World Radiation Center, Davos), Joanna Haigh (Imperial College, London), Manfred Schüssler (Kiepenheuer Institut, Freiburg; now at Max-Planck-Institut für Aeronomie, Lindau), and Sami Solanki (ETH, Zurich; now at Max-Planck-Institut für Aeronomie, Lindau), nominated some 50 participants and set up a programme that included not only 22 plenary talks, but also six topical, moderated discussion sessions as well as 20 poster papers. This format and the highly controversial topic ensured a very lively atmosphere during the whole week. Whereas the convictions of the different workshop participants may not have changed fundamentally, the workshop nevertheless came to a consensus that was presented at a “public forum”, co-organised with ProClim–, the Swiss Forum for Climate and Global Change of the Swiss Academy of Sciences: The Sun is an important factor affecting the Earth’s climate, possibly including the warming observed during the first half of the 20th century; yet the warming in the past 20 years is clearly beyond what may be attributed to solar variability and must be significantly influenced by anthropogenic causes.

The workshop will result in Volume 11 of the *Space Sciences Series of ISSI*, currently being edited by the convenors (except Sami Solanki) and Rudolf von

Steiger of ISSI, and is scheduled to appear in the fall of 2000. It will consist of introductory and contributed papers plus a paper from each of the discussion sessions and a workshop summary paper, so the spirit of the workshop should be conveyed to the reader quite well.

## PLANETARY SCIENCE

The workshop *Dust to Terrestrial Planets* was convened in February 1999 by Willy Benz, University of Bern; Günter Lugmair, Max-Planck-Institut für Chemie, Mainz, Germany; and Frank Podosek, University of Washington in St. Louis, Missouri. The workshop brought together planetary scientists, astrophysicists, and cosmochemists to synthesize the current knowledge on the origin and evolution of our inner planetary system. In particular, this included appraisal of the newest results from astronomical observations by the Hubble Space Telescope, the Infrared Space Observatory, and other space and ground-based facilities of solar-like systems and nebular disks. They possibly represent early stages of the solar accretion disk and planet formation, when micron-sized or smaller dust grains assemble to form bodies more than 10,000 km in diameter. At the same time, the current models of the origin, evolution, transport, and accretion processes of circumstellar disks were presented. The new insights provided by the recent discovery of extrasolar giant planets were considered insofar as they are relevant to the overall dynamics of the inner part of the solar system.

Some 37 authors summarised current knowledge on the first ten to one hundred million years after the birth of the solar system. The resulting Volume 9 of the *Space Sciences Series of ISSI* with the title of the workshop appeared as Volume 92 of *Space Science Reviews*, April 1, 2000.

A core group on *The Chronology and Evolution of Mars* was invited to ISSI 8–10 September 1999 to review the present state of the radiometric and cratering chronology of the solar system, with special emphasis on Mars.

The main workshop on *The Evolution of Mars*, held 10–14 April 2000, was intended to provide an interdisciplinary forum aimed at understanding the way in which the planet Mars has evolved from its birth to the present day. The most recent geological, geophysical, and geochemical evidence was synthesised and observations from



Photo: Yohkoh STX / Apollo 17, NASA





The "Twin Peaks" of Mars (High-resolution photo by Dr. Timothy Parker, JPL, from the NASA / JPL Mars Pathfinder)

Martian meteorites were combined with those from spacecraft. The main meeting focussed on two aspects: 1) the development of surface features through time and their link to the internal structure, composition, and dynamics of Mars, and 2) the history of the Martian atmosphere and hydrosphere, evaluated from a combination of geological and geochemical observations and theories. Convenors were Otto Eugster, University of Bern; William K. Hartmann, Planetary Science Institute, Tucson, Arizona; Reinald Kallenbach, ISSI; Gerhard Neukum, Deutsches Zentrum für Luft- und Raumfahrt, Berlin; and Grenville Turner, University of Manchester, U.K.

Authors are currently preparing their articles for the resulting *SSSI* volume (No. 12), edited by Johannes Geiss, William Hartmann, Reinald Kallenbach, and Grenville Turner.

## ASTROPHYSICS AND COSMOLOGICAL QUESTIONS

Cosmic ray research is a bridge between astrophysics, the solar system sciences, and certain aspects of the Earth sciences. Thus, from the beginning, cosmic rays have played an important role in ISSI's programme (*SSSI* Volumes 1, 3, 10, and 11). During the business year 1999–2000 ISSI's activity in this area concentrated on processes in the Galaxy, where the main sources of cosmic rays are located. The workshop *Astrophysics of Galactic Cosmic Rays* was held in two parts: 18–22 October 1999 and 15–19 May 2000. This gave participants enough time for in-depth presentations of their respective fields and for thorough discussions.

The workshop convenors were: Luke Drury of the Dublin Institute for Advanced Studies; Donald Ellison of North Carolina State University, Raleigh; J.R. Jokipii of the University of Arizona, Tucson; Jean-Paul Meyer of the Service d'Astrophysique, Centre d'Etudes de Saclay, France; Dietrich Müller of the University of Chicago; and Heinrich J. Völk of the Max-Planck-Institut für Kernphysik, Heidelberg.

The workshop brought physicists working in the fields of cosmic ray origin and propagation together with astronomers and astrophysicists studying the structure, evolution, and composition of the Galaxy, including experts in radio, optical, X-ray, and gamma-ray astronomy.

The aim of the workshop was to examine the cosmic ray phenomenon in the context of our evolving understanding of the Galaxy as an astrophysical system. Observations of cosmic rays, as well as theoretical models of their origin, acceleration, and propagation, were surveyed and critically discussed. The comparison of cosmic ray measurements with other astronomical observations in the Galaxy was a major theme of the workshop. In addition, the participants discussed the extent to which galactic-scale processes can be illuminated by studies of analogous heliospheric processes.

The results of the workshops will be published as the July 2001 issue of *Space Science Reviews* and as Volume 13 of the *Space Sciences Series of ISSI*.

After the first workshop in the field of astrophysics on cosmology, *Primordial Nuclei and Their Galactic Evolution* in 1997, a topic in cosmology will again be taken up in a workshop in March 2001 on *Matter in the Universe*.

Following two advisory meetings with Klaus Pretzl of the University of Bern and Gustav Andreas Tammann of the University of Basel, a group of nine convenors was set up, consisting of the two advisors plus John Ellis (CERN), Philippe Jetzer (University of Zürich), Heinrich Leutwyler (University of Bern), Rafael Rebolo (University of La Laguna, Tenerife), Norbert Straumann (University of Zürich), and Johannes Geiss and Rudolf von Steiger of ISSI. The group met on 11 February 2000 to define the focus of the workshop and to draft a programme. The workshop will bring together active researchers in the fields of cosmology, astrophysics, nuclear and particle physics, and space science to assess the ex-



*The Crab Nebula, a source of cosmic rays, ©Malin / Pasachoff / Caltech*

citing new developments in the search for abundant and yet-unknown forms of matter in the Universe. The subjects include cosmic microwave background radiation (CMB), large-scale structures, clusters, intergalactic absorption, dark matter components of galaxies, globular clusters, supernovae of type Ia (SNe Ia) distance measurements, gravitational lensing and microlensing, X-ray observations, Lyman- $\alpha$  observations, detection of weakly interacting massive particles (WIMPs), detection of neutrino oscillations, particle candidates for dark matter, and baryonic matter (nucleosynthesis).

Some 30–40 participants are being invited to the workshop, which is scheduled to take place in March 2001. The workshop findings, to be edited by Philippe Jetzer, Klaus Pretzl, and Rudolf von Steiger, will be published as Volume 15 in the *Space Sciences Series of ISSI*.

## INTERNATIONAL TEAMS

Teams at ISSI are composed of up to about 15 scientists of different nationalities, institutions and areas of expertise who come together to jointly address scientific questions of particular relevance. The teams meet for variable periods at ISSI and present results in scientific journals. Their activity is organised and conducted by a team leader who initiated the proposal to ISSI. Although in close contact with ISSI's scientific staff, the teams work for the most part independently to complete their project.

Teams may be set up at any time, following review and acceptance of the proposal by external referees and ISSI's directorate. ISSI commits financial support to a team on a year-to-year basis, but extensions are possible. Details of the teams can be found at <http://www.issi.unibe.ch/teams.html>.

The following teams were at ISSI during the fifth business year:

- ***Incoherent Scattering from the Ionospheric Plasma***

**Objective:** To write a book on "Incoherent Scattering from the Ionospheric Plasma".

**Team leaders:** Thor Hagfors, Max-Planck-Institut für Aeronomie, Lindau, Germany, and Donald Farley, Cornell University, Ithaca, New York.

**Schedule:** June – mid-August 1999.

**Output:** Book, to be published by Cambridge University Press.

- ***Collisionless Shocks in the Earth Environment***

**Objective:** To analyse microphysics and radiation processes associated with different collisionless shocks in the Earth environment and compare results from sophisticated large-scale numerical simulations with experimental results gathered on the shocks by several space missions of NASA, ESA, and ISAS.

**Team leader:** Bertrand Lembège, CETP / UVSQ, Vélizy; 14 team members from France, Germany, Japan, the United Kingdom, and the United States.

**Schedule:** 11–16 October 1999, 2–5 November 1999, 7–12 February 2000.

**Output:** Papers published in scientific literature.

**Status:** Completed.



- **Mass Loading of Space Plasmas**

**Objective:** To summarise the existing knowledge on the physics of mass-loaded plasmas and related phenomena, to provide a basis for future co-operative work in this area.

**Team leaders:** Karl-Heinz Glassmeier of the University of Braunschweig and Karoly Szegő of KFKI Research Institute for Particle and Nuclear Physics, Budapest; 17 team members from France, Germany, Portugal, the United Kingdom, and the United States.

**Schedule:** Team workshop 30 August–4 September 1999.

**Output:** Review paper and other journal papers expected.

**Status:** Ongoing.

- **Small-Scale Plasma Structures**

**Objective:** To use AMPTE-IRM and UKS databases to look at small-scale structures at the bow shock, the magnetopause, and in the magnetosheath at the Larmor radius scale. To test new analysis methods in anticipation of the Cluster mission.

**Team leaders:** Steve Schwartz, Queen Mary & Westfield College, and Götz Paschmann, ISSI and Max-Planck-Institut für extraterrestrische Physik, Garching; 7 team members from Germany, the United Kingdom and the United States.

**Schedule:** 8–12 July 1999, 6–11 April 2000.

**Output:** Papers in the scientific literature.

**Status:** Completed.

- **Advanced Data Analysis Methods**

**Objective:** To collect in a handbook material on advanced analysis techniques for space data.

**Team leader:** Götz Paschmann, ISSI, 9 team members from France, Germany, Poland, Sweden, Switzerland, the United Kingdom, and the United States.

**Schedule:** 3–6 November 1999, 6–9 June 2000.

**Output:** Handbook in the *ISSI Scientific Report* series.

**Status:** Ongoing.

- **Observational Consequences of Sub-Resolution Physics in the Solar Atmosphere**

**Objective:** To investigate the solar activity as the result of events taking place at spatial scales well below the observational resolution and their observational manifestation.

**Team leader:** Giorgio Einaudi, University of Pisa; 15 team members from France, Germany, Greece, Italy, Russia, Switzerland, the United Kingdom, and the United States.

**Schedule:** 21–24 May 2000.

**Output:** Papers to be published in scientific literature.

**Status:** Completed.

- **Dust Plasma Interaction in Space**

**Objective:** To address issues of collective dust-plasma interactions in space and their applications to astrophysics, laboratory and industrial plasmas.

**Team leader:** Padma K. Shukla, Bochum University; 14 members from Belgium, Germany, India, Italy, Norway, Portugal, Russia, Sweden, the United Kingdom, and the United States.

**Schedule:** 26–29 October 1999, 22–26 February 2000.

**Output:** Papers to be published in scientific literature.

**Status:** Ongoing.

- **Lunar Surface Events**

**Objective:** To investigate the mechanism of the interaction between the lunar atmosphere and the regolith, and to identify the experimentation suitable for this research.

**Team leader:** Urs Mall, Max-Planck-Institut für Aeronomie, Lindau; 2 team members from Poland and Switzerland.

**Schedule:** 20–24 March 2000.

**Output:** Publications in scientific journals.

**Status:** Completed.

- **Local Late Galactic Evolution**

**Objective:** To study the galactic evolution as a function of time and galactocentric distances of a number of nucleosynthetically diverse species to address questions such as the birthplace of the Sun and inflow of material into the disc of our Galaxy. The evolution of the isotopes of hydrogen, helium, and neon near the solar ring of the Galaxy is investigated by comparing solar system data from various space missions with the data on interstellar gas flowing through the heliosphere obtained by SWICS/Ulysses.

**Team leader:** Johannes Geiss, ISSI; 3 members from France, Italy, and the United States.

**Schedule:** 12–13 October 1999, 3–4 April 2000.

**Output:** Publications in scientific journals.

**Status:** Ongoing.

- **Injection and Dissipation of the Energy in the Earth's Magnetosphere During Magnetic Storms**

**Objective:** To use concrete events to determine input parameters of the paraboloid model of the magnetosphere and relate to AMPTE/CCE satellite passes,

to compile the energy balance based on calculation of currents and comparison with actual solar wind energy input, and to determine the contribution of various ions to observed ground magnetic field variations.

**Team leader:** Y.I. Feldstein, IZMIRAN, Russia, and 3 team members from Germany and Russia.

**Schedule:** 5–9 July 1999, 26 June–7 July 2000.

**Output:** Publications in scientific journals.

**Status:** Ongoing.

- ***The Role of Laboratory Experiments in the Characterisation of Cosmic Materials***

**Objective:** To try to link laboratory results to the observational data: a) to verify to what extent laboratory simulations can be applied to interpret observations; and b) to check whether evolutionary paths simulated in the laboratory are observed in space. The formation of paths that strongly link dust, ices, molecules, and gas must be critically revised in order to define the compatibility of models, observations, and experiments.

**Team leader:** Luigi Colangeli, Observatory of Capodimonte, Italy, and 14 team members from France, Germany, Italy, Japan, The Netherlands and the United States.

**Schedule:** 6–8 October 1999, 6–10 May 2000.

**Output:** Publications in scientific journals.

**Status:** Ongoing.

- ***Constraints on the Physical Properties of Cometary Dust from In-Situ Measurements***

**Objective:** To derive physical properties of cometary dust from Giotto *in-situ* experiments (the Optical Probe and the Dust Detection Impact experiments) to test the validity of cometary coma models.

**Team leader:** Anny-Chantal Levasseur-Regourd, Service d'Aéronomie/CNRS, Verrières, and 4 members from France, Italy, and the United Kingdom.

**Schedule:** 23–27 August 1999.

**Output:** Publications in scientific journals.

**Status:** Completed.

- ***Modelling of the Nucleus and of the Inner Coma of Comets***

**Objective:** In a first phase, the team shall compare four independently developed or evolved one-dimensional algorithms to model heat and gas diffusion in porous comet nuclei and develop advanced models that include investigations of the effects of amorphous versus crystalline water ice, trapped gases versus frozen gases, seasonal effects, multi-dimensional calculations and development and removal of a

dust mantle. In a second phase, the team will investigate the processes in the innermost coma of comets and connect them with the gas flowing from the surface and the interior of the nucleus. These are: spectral lines of gas escaping from the nucleus, dust emission and its morphology, rotational-vibrational spectra of certain chemical species and other processes effective primarily within the contact surface of the coma.

**Team leader:** Walter Huebner, Southwest Research Institute, San Antonio, Texas, and about 6 members from France, Germany, Israel, Italy, and the United States.

**Schedule:** 8–12 November 1999.

**Output:** Publications in scientific journals.

**Status:** Ongoing.

- ***Analytic Study of Low Frequency Waves in High-Beta Plasma***

**Objective:** To develop a comprehensive kinetic theory for low frequency waves in a high- $\beta$  space plasma. The resulting model may then be applied to the analysis and interpretation of data from the Interball and Cluster II satellites. Particular attention will be paid to the development of a user-friendly interface to the analytical model, enabling experimenters to compare theoretical results with data.

**Team leader:** M. Balikhin, Sheffield University, United Kingdom, and 2 members from Germany and Russia.

**Schedule:** 10–29 January 2000.

**Output:** Publications in scientific journals.

**Status:** Ongoing.

- ***Multiscale Dynamic Processes near Magnetospheric Boundaries and in the Cusp***

**Objective:** To advance the understanding of plasma and magnetic energy transfers that take place at magnetospheric boundaries and in the cusp, on scales from the ion Larmor radius to several Earth radii. By comparing models and theory with data obtained in the framework of the International Solar Terrestrial Programme (ISTP), it will be possible to study the hierarchy of processes from small scales dominated by turbulence and kinetic effects up to global scales controlled by MHD.

**Team leader:** Arne Pedersen, University of Oslo, Norway, and 8 members from the Czech Republic, France, Germany, Japan, Russia, and the United States.

**Schedule:** 14–18 February 2000.

**Output:** Publications in scientific journals.

**Status:** Ongoing.

- *New Physical Parameters of LIM Through Coordinated Observations of the Gravitational Focussing Cone at 1 AU*

**Objective:** To combine complementary data sets taken during the last two passages of the Earth through the interstellar focussing cone, previous data, and modelling in order to derive a consistent set of interstellar parameters.

**Team leader:** Eberhard Moebius, University of New Hampshire, Durham, and 14 members from France, Germany, Poland, and the United States.

**Schedule:** 19–23 June 2000.

**Output:** Publications in scientific journals.

**Status:** Ongoing.

- *Tracing Coronal Hole Boundaries into the Solar Wind*

**Objective:** To study coronal hole boundaries using a combined set of UVCS and SWICS (Ulysses and ACE) data. The connection between solar and heliospheric data is performed using 3D-MHD simulations to account for stream-stream interactions in the heliosphere.

**Team leader:** Rudolf von Steiger, ISSI, and 5 members from ISSI, Italy, and the United States.

**Schedule:** 26–29 June 2000.

**Output:** Publications in scientific journals.

**Status:** Ongoing.

- *Atelier de Mars 1999*

**Objective:** ISSI took the opportunity provided by a planetary core group meeting to offer a two-day summer school (atelier) to introduce a limited number (13) of graduate students and young post-docs to the practical side of research on Mars, Moon and asteroids. The course was taught by leading scientists in the planetary field. The programme included photo-geology, mineralogy, and petrography using thin sections and determination of relative ages of geological units on Mars and Moon by crater counting.

**Instructors:** Otto Eugster, University of Bern; Johannes Geiss, ISSI; William K. Hartmann, Planetary Science Institute, Tucson, Arizona; Dieter Stöffler, Museum für Naturkunde, Berlin; and Francisco Anguita, Universidad Complutense de Madrid.

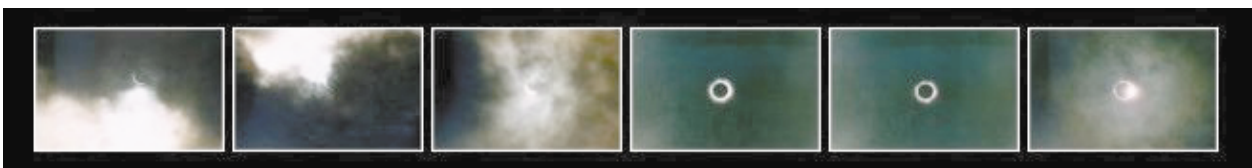
**Schedule:** 6–7 September 1999.

## VISITING SCIENTISTS

Individual scientists are invited for extended periods to work on scientific subjects at the forefront of research in areas of interest to ISSI. Their stay may include periods of joint activity with other colleagues. The results of this research are published as books or in major scientific journals, with appropriate acknowledgement to ISSI.

The following visiting scientists were at ISSI during the fifth business year:

- **Friedrich Begemann**, Max-Planck-Institut für Chemie, Mainz, 9–30 September 1999.
- **Tom Chang**, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1 July–30 August 1999.
- **William K. Hartmann**, Planetary Science Institute, Tucson, Arizona, 23 August–13 September 1999.
- **Bengt Hultqvist**, Swedish Institute of Space Physics, Kiruna, 17–29 October 1999, 23 March–16 April 2000.
- **Galina Korotova**, IZMIRAN, Moscow region, Russia, 15 December 1999–31 January 2000.
- **Marius Potgieter**, Potchefstroom University, Potchefstroom, South Africa, 1 April–12 July 1999.
- **Rudolf Treumann**, Max-Planck-Institut für extraterrestrische Physik, Garching, 3 October–6 November 1999, 19 March–16 April 2000, 13–27 May 2000,
- **Frank Verheest**, University of Gent, Belgium, 2–28 August 1999.
- **Thomas Zurbuchen**, University of Michigan, Ann Arbor, 19 June–18 July 2000.



*The Moon as it becomes aligned with the Sun in Strasbourg, France, during the full eclipse of the Sun in August 1999 (Photos by Xavier Schneider, ISSI)*

## ISSI SEMINARS

**7 July 1999:**

Misha Balikhin, University of Sheffield, New Method of Space Physics Data Analysis in Time Domain, in Application to Space Plasma Turbulence and to the Dynamics of the Magnetosphere.

**8 July 1999:**

Yasha Feldstein, IZMIRAN, Moscow region, Energetic Budget in Earth's Magnetosphere during Magnetic Storm.

**6 August 1999:**

Tom Chang, Massachusetts Institute of Technology, informal tutorial on Self-Organised Criticality.

**4 November 1999:**

Vladimir Krasnosel'skikh, LPCE/CNRS, Orléans, Nonstationarity Behavior of Collisionless Shock: Predictions and Evidence.

**10 February 2000:**

Misha Balikhin, University of Sheffield, Waves in the Magnetosheath Plasma.

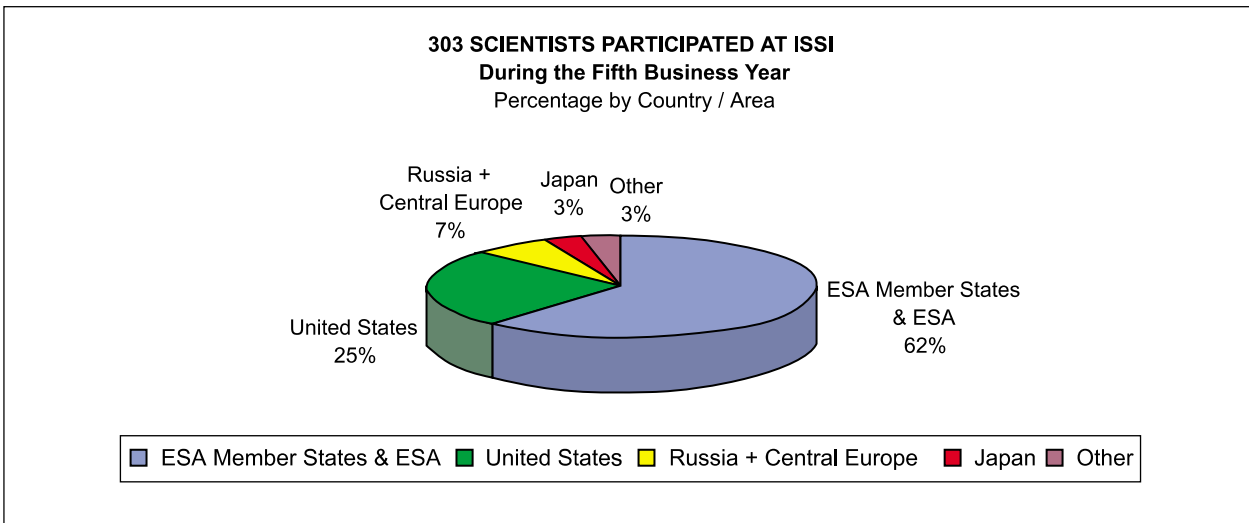


*The sky above Strasbourg, France, just before the Moon and the Sun are aligned during the full eclipse of the Sun in August 1999 (Photo by Xavier Schneider, ISSI)*

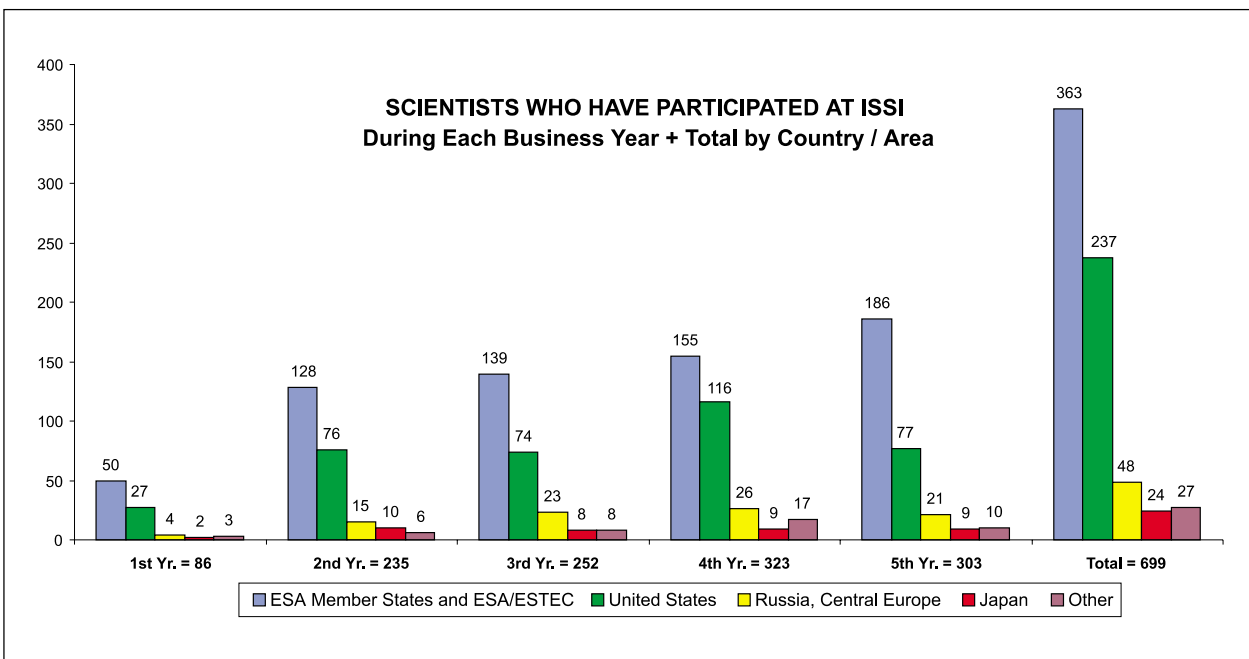
# External Participation

During ISSI's fifth business year, 303 scientists from around the world participated in the ISSI programme.

Scientists came from all the ESA member states and from ESA itself, Japan, Russia and Central European countries, and the United States as well as from Canada, Greece, India, Israel, Portugal, South Africa, and an international organisation (CERN).



During the first five business years, ISSI had a total of 699 participants from 33 countries and ESA and a variety of other international organisations, such as the European Southern Observatory, COSPAR, and CERN. Although many scientists have been to ISSI more than once, they have been counted only once.





# Financial Overview

ISSI's main sources of funding were again the European Space Agency (ESA), the Swiss Confederation, the Canton of Bern, and the Swiss National Science Foundation.

ISSI's funding from **ESA** will continue at a constant level until 2003, as approved by the Science Programme Committee (SPC) and the Council in 1998; it is split between the budget of the SPC and the General Budget. Continuation beyond that date is expected to be dependent on a review similar to the one conducted in 1998.

Funding from the **Swiss Confederation** for the years 2000–2003 had been applied for in March 1998 under Article 16 of the *Forschungsgesetz*. Following a visit by two members of the Swiss Science Council in June 1998, ISSI received notice, in November 1999, that this funding was to be cut to 50 percent of the applied level, i.e. even below the level of 1999. (Most, if not all, organisations funded through this source received similar notices.) The president of the board and the directorate therefore took immediate action and presented the case to State Secretary C. Kleiber. As a result, in June 2000 ISSI received notice that the Federal funding was restored to the level of 1999, with a moderate increase for the years to come. More importantly, from 2001 onward, Federal funding will no longer come from Article 16 but through the Swiss Space Office.

For the funding from the **Canton of Bern**, represented by the **University of Bern**, this past year was a year of transition. While the Canton had provided a deficit guarantee in previous years, a new contract between the board and the university went into effect in 1999. Under this contract one of the ISSI directors (currently R. von Steiger) is financed directly by the university. In order to facilitate the transition, a one-time contribution of 50 percent of the former deficit guarantee was additionally received this year.

Income and expenditures during the fifth business year, 1 July 1999 – 30 June 2000, were as follows (rounded off, in thousands of francs):

Income		Expenditures	
European Space Agency	1'596	Salaries and Related Costs*	1'249
Swiss Confederation	650	Investments, Depreciation	141
University and Canton of Bern	125	Fixed Costs	207
Swiss National Science Foundation (SNF)	240	Operating Costs	228
Other (i.e., Interest)	6	WS, WG, Teams, Visiting Scientists	
		ISSI-funded	502
		SNF-funded	240
		Carry Forward	50
<b>Total</b>	<b>2'617</b>		<b>2'617</b>

*In-kind contributions (estimates):*

University and Canton of Bern	240
Industry	80

The new proposal to the **Swiss National Science Foundation** (SNF), with R. von Steiger as the principal applicant, was approved in August 1999. For the period 1 October 1999 through 30 September 2002 this funding is to be used exclusively for research carried out at ISSI by external scientists.

Apart from providing ISSI's original endowment, Contraves Space AG in Zürich continued to provide valuable **in-kind support** through its activities with the Board of Trustees, including the president. Moreover, the University of Bern provided important parts of the infrastructure, including telephone and Internet and other computer connections.

Indirect support was also received during the fifth business year from ISAS, which provided travel funds and living costs for several scientists from Japan through a special grant. A similar arrangement with NASA was made by W. Hartmann, of the Planetary Science Institute in Tucson, to fund the travel and stays of U.S. scientists who attended the workshop on *The Evolution of Mars*. Finally, a project on *The Heliosphere in the Local Interstellar Cloud*, with R. Lallement, Service d'Aéronomie, CNRS, as principal investigator and participation by ISSI, was sponsored by the International Association for the promotion of co-operation with scientists from the New Independent States of the former Soviet Union (INTAS) and continued to fund scientists from Eastern Europe who are taking part in this work.

In summary, ISSI ended the past year with a modest surplus of nearly Fr. 50,000. Such a surplus is not in the interest of the institute, but cautious expenditure was necessary because of the uncertain situation regarding Federal funding this business year. In the sixth business year, the income and expenditures are expected to be balanced again.

\* It should be noted that, of the three directors and nine full-time staff members, seven were scientists actively conducting research as well as taking care of organisational, editorial, and administrative tasks.

# ISSI in the News

\* Some articles were distributed by the Swiss national wire services (Schweizerische Depeschentagentur in German or Agence Télégraphique Suisse in French)

Blattmann, Heidi (bt), "Wachsendes Interesse am Klimateffekt der Sonne: Indirekte Wirkungen möglicherweise unterschätzt," *Neue Zürcher Zeitung*, 14. Juli 1999, 49.

Wüthrich, Urs, "Exobiologen suchen nach Leben ausserhalb der Erde," *Berner Zeitung*, 20. Juli 1999, 29.

Christen, Markus, "Nur einen Schuldigen gibt es nicht," *Bieler Tagblatt*, 31. Juli 1999, 2. (about WS Solar Variability and Climate)

***In July 1999 Europe celebrated 30 years' Apollo. As Johannes Geiss, at the time a faculty member of the University of Bern, was the Principal Investigator of the Swiss Solar Wind Composition experiment on six Apollo flights, he was much in demand with journalists. ISSI was often mentioned.***

Abgottsporn, Peter, "Apollo veränderte die Welt," *Cockpit*, Juli 1999, 34–37.

Abgottsporn, Peter, "Auf zu neuen Welten," *Sonntag* (Olten), Nr. 27/99, 8. Juli 1999, 8ff.

Ziauddin, Bruno, "«Der Adler ist gelandet»,  
*Schweizer Familie*, Nr. 28/99, 15. Juli 1999, 10ff.

Keller, Roland, "21 juillet 1969: Il marche sur la lune!" *L'Echo Magazine*, 15 juillet 1999, 25–27.

Schmidt, Men J., "«Ein kleiner Schritt für einen Mann – ein grosser Sprung für die Menschheit»,  
*Der Bund*, 16. Juli 1999, 6.

"Uni Bern entwickelte für Apollo-11 ein Sonnensegel," *Neues Bülacher Tagblatt*, 16. Juli 1999.

Izard, Marcal, "1,5 Millionen waren Schweizer TV-süchtig," *Eiger Zeitung / Der Tössthaler*, 17. Juli 1999.

"La nuit la plus longue du siècle" and "Le passé," *24 heures*, 17-18 juillet 1999, 12–13.

Reye, Barbara, "Einmal zum Mond hin und zurück," *Tages-Anzeiger*, 20. Juli 1999, 2.

Schönenberger, Esther, "Auf dem Mond sind die Berner schnell," *Coop-Zeitung*, 21. Juli 1999, 6–8. (interview with J. Geiss).

Matter, Katharina (kmb), "Genial konstruiert," *Der Bund*, 23. Juli 1999.

Abgottsporn, Peter, "«Es ist ein besonderes Gefühl zu wissen, dass ein eigenes Experiment mitfliegt»,  
*Der Bund*, 23. Juli 1999, 9.

TV interview, "Ein grosser Schritt für die Menschheit?" with Thomas Hillebrand, director, on ARTE, 18 July 1999.

Radio interview, "30 Jahre Mondlandung," DRS 1 and 2, "Echo der Zeit," with Tina Herren, 20 July 1999.

Live TV programme, "Die Nacht der Mondfahrer," on WDR, 20 July 1999.

TV interview with Urs Egger, for the news programme "10 vor 10" on DRS, 20 July 1999.

Radio interview, Swiss Radio International, with Peter Haller (English), 20 July 1999.

Radio interview, Swiss Radio International, with Gabriela Ochsenbein (German), 22 July 1999.

Exceptionally, ISSI was one of several sponsors of "Auf der Jagd nach Zwerggalaxien," the profile of Helmut Jerjen, a young astronomer from the University of Basel, that was part of a series for the Swiss National Science Foundation on its projects. The programme aired on SF 2 (TV) on 9 January 2000.

***After the press conference at ISSI on February 14, 2000, by the crew of STS-103, the third Hubble Repair mission, the following articles in which ISSI was mentioned appeared:***

\*"Herzlicher Empfang für Nicollier," *Basellandschaftliche Zeitung*, 15. Februar 2000.

Feusi, Alois (fsi), "Claude Nicollier im Bundeshaus empfangen," *Neue Zürcher Zeitung*, 38, 15. Februar 2000, 14.

Michel Gratzl, "Discovery pour un tour de Suisse," *Nouvelliste et Feuille d'Avis du Valais*, 15 février 2000.

\*"Berne reçoit le héros Nicollier," *24 heures*, 15 février 2000.

\*"Ein weit gereister Besuch," *Die Südostschweiz*, 15. Februar 2000.

\*"«Discovery»-Besatzung beim Bundesrat," *Thurgauer Tagblatt*, 15. Februar 2000.

Herbez, Ariel, "L'homme doit aller dans l'espace pour assurer la survie de l'humanité," *Le Temps*, 16. février 2000, 14.

*After 30 years' Apollo and the Shuttle crew press conference, life returned to science-as-usual at ISSI:*

NASA press release no. 00-55, "Strangers in the Night: Ulysses Spacecraft Meets a Comet," 5 April 2000 (concerning *Nature* article by Gloeckler / Geiss, et al).

University of Bern press release, "Der lange Schweif des Hyakutake," 5 April 2000 (concerning *Nature* article by Gloeckler / Geiss, et al).

Schwab, Antoinette, "Bern – Treffpunkt der Weltraumforscher," *Schweiz global*, Ausgabe 3, 2000, 14–15 (publication of the Foreign Ministry).

Schwab, Antoinette, "Berne au coeur de la recherche spatiale," *La Suisse et le monde* (French version).

Schwab, Antoinette, "Berna, centro d'incontro della ricerca spaziale," *Svizzera oltre* (Italian version).

Galli, Remo, "Das International Space Science Institute ISSI der Uni Bern," *VRB Horizonte* (VRB Verein Region Bern), Nr. 2, Juni, 2000, 10.

## Special Events

**11 August 1999:** ISSI was nearly closed, as most staff spread out to experience the total eclipse of the Sun in part of Europe.

**21 October 1999:** Tenth meeting of the ISSI Board of Trustees.

**21 October 1999:** Celebration of ISSI's fourth anniversary, with some 85 guests, at the Hotel Bellevue Palace, Bern. Johannes Geiss of ISSI gave the keynote address on "Earth, Moon and Mars" at the event, which was sponsored by Contraves Space.

**3 November 1999:** Association Pro-ISSI lecture, "From Dust to Planets," by Willy Benz, Physikalisches Institut of the University of Bern.

**4–5 November 1999:** Visit of ISSI staff to the Observatoire François-Xavier Bagnoud, St. Luc.

**17–18 November 1999:** Report submitted to the annual meeting of the Inter-Agency Consultative Group, Okinawa.

**8 December 1999:** Ninth meeting of the ISSI Science Committee.

**9–10 December 1999:** COST-712 Workshop on Microwave Radiometry, Lead organiser: N. Kämpfer, University of Bern.

**7 February 2000:** Visit by Nationalrat (National Councillor) Remo Galli, from the Canton of Bern, who is a member of the "Kommission für Wissenschaft, Bildung und Kultur" (Committee for Science, Education and Culture).

**14 February 2000:** Press conference at ISSI by crew members of STS-103 (Claude Nicollier, Michael Foale, John M. Grunsfeld, Scott J. Kelly, and Steven Smith). At the end, C. Nicollier presented a small plaque they had carried along on their mission to ISSI's directors.

**3 March 2000:** Visit to State Secretary for Science Charles Kleiber by J. Geiss, R. von Steiger, and H. Schneider.

**15 March 2000:** Association Pro-ISSI lecture on "Die Suche nach der dunklen Materie im Universum" by Klaus Pretzl, High-Energy Physics Laboratory, University of Bern.

**19 May 2000:** Tenth meeting of the ISSI Science Committee.

**15 June 2000:** Eleventh meeting of the ISSI Board of Trustees.

# ISSI Staff Activities

*Note: Listed are activities in which ISSI staff scientists participated between 1 July 1999 and 30 June 2000. These include meetings attended, presentations and lectures given, honours received, and ongoing memberships in space science organisations maintained.*

## **Geiss, Johannes:**

Presentation during the Alpbach Summer School at Alpbach, Austria, 1–5 August 1999.

Keynote address on "Earth, Moon and Mars" at the Fourth Anniversary dinner of ISSI, 21 October 1999.

Talk on "From the Interstellar Molecular Cloud to the Comets" at the Rosetta / Rosina Meeting, Kemmeribodenbad, Switzerland, 6–7 March 2000.

Member, Board of Advisors, International Space University, Strasbourg, France.

Chairman, COSPAR Nomination Committee.

## **Graf, Stephan:**

Participation in the Atelier de Mars, ISSI, 6–7 September 1999.

Participation in the Spring Meeting 2000 of the Swiss Association of Computational Chemistry, Bern, 3 March 2000.

## **Håland, Stein:**

Talk on "Accumulation and release of energy in the magnetotail," NFR meeting, Oslo, Norway, 2–4 September 1999.

Talk on "Boundaries in space inferred from minimum variance analysis," 35th Nordic Plasma and Gas Discharge Symposium, Wadahl, Norway, 30 January–2 February 2000.

Talk on "Boundary normal determination using minimum variance analysis of wavelet de-noised magnetic field data" (with G. Paschmann), European Geophysical Society, Nice, France, 25–29 April, 2000.

## **Kallenbach, Reinald:**

Review talk on "Pickup ion measurements in the heliosphere" (with J. Geiss, G. Gloeckler, and

R. von Steiger), International Conference on "Progress in Cosmic Gas Dynamics," Moscow, Russia, 19–23 September 1999.

Participation and presentations at the 7th CELIAS Postlaunch Workshop and Co-Investigator Meeting, Couvet, Neuchâtel, Switzerland, 4–6 October 1999.

Poster on "Signatures of the interstellar  $^4\text{He}$  neutral gas distribution in the heliosphere:  $^4\text{He}^+$  pickup ion observations over 360 degrees heliolongitude with SOHO/CELIAS/STOF" (with M. Hilchenbach), American Geophysical Union (AGU) Fall Meeting, San Francisco, California, 13–17 December 1999.

Lecture to receive the *Venia Docendi* on "Gravitationswellen: Quellen und mögliche direkte Nachweismethoden," University of Bern, 20 January 2000.

Solicited paper on "Isotopic abundances in the solar atmosphere" at the General Assembly of the European Geophysical Society, Nice, 26 April 2000.

Guest lecture on "Das physikalische Weltbild" at the Theologisch-Praktisches Seminar of the University of Heidelberg, Germany, 26 June 2000.

## **Manno, Vittorio:**

Participation and presentation of the IACG at the COSPAR Symposium on "Recent Progress and Future Exploration of the Solar System" at UNISPACE, Vienna, Austria, 20–27 July 1999.

Participation in the DPS and IACG Working Group 1 meetings, Abano Terme (Padova), Italy, 12–14 October 1999.

Organisation of and participation in the 19th plenary meeting of the IACG, Okinawa, Japan, 16–18 November 1999.

Participation in session on Solar System Exploration and meeting of IACG WG 1 at the European Geophysical Society, Nice, 26–28 April 2000.

## **Paschmann, Götz:**

Invited talk on "ISSI Book on Analysis Methods for Multi-Spacecraft Data" at the Cluster-II Workshop, Imperial College, London, 22–24 September 1999.

Invited talk on "EDI Multipoint Analysis" at the Cluster-II Workshop, Imperial College, London, 22–24 September 1999.

Invited talk on "Quantitative Aspects of Magnetopause Plasma Entry," European Geophysical Society 25th General Assembly, Nice, April 2000.

Chairman, Cluster Science Operations Working Group, November 1999 and April 2000.

Participation in the AGU Fleming Award Committee, San Francisco, California, December 1999.

#### **Verani, Stefano:**

Participation in the Atelier de Mars, ISSI, 6–7 September 1999.

Participation in the Scuola Nazionale di Astrofisica, Il Corso, Marciana Marina (Li), Italy, 20–25 September 1999.

Participation in 31st Annual Meeting of the Division for Planetary Sciences of the American Astronomical Society, Padova–Abano, Italy, 10–15 October 1999.

#### **von Steiger, Rudolf:**

Co-chair, COSPAR sub-commission D2/E3 "Transition from the Sun to the Heliosphere" (with G. Simnett).

Invited talk on "Variability of the Solar Wind and Its Composition" at the IUGG99 Scientific Assembly, Birmingham, U.K., 18–30 July 1999.

Presentation on "Entstehung des Universums" at Gymnasium Thun, 28 September 1999.

Invited talk on "Solar Wind: Composition" at the HESSI Symposium, Goddard Space Flight Center and University of Maryland, 18–20 October 1999.

Participation in the Ulysses Science Working Team, San Diego, California, 26–28 October 1999.

Colloquium on "Elementhäufigkeiten und Ladungszustände im Sonnenwind" at the Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany, 18 November 1999.

Presentation of "Unser neues Bild der Sonne" at Contraves Space AG, Zürich, 2 December 1999.

Talk on "Solar wind composition from nine years of SWICS/Ulysses observations," AGU Fall Meeting, San Francisco, California, 13–17 December 1999.

Talk on "CMEs observed with SWICS/Ulysses" (first author R. Neukomm), AGU Fall Meeting, San Francisco, California, 13–17 December 1999.

Invited plenary talk on "Solar-terrestrische Beziehungen" at the Deutsche Physikalische Gesellschaft Jahrestagung, Bremen, Germany, 21–24 March 2000.

Introductory talk on "CMEs at high latitudes and in the outer heliosphere" at the CME workshop, Schloss Elmau, Germany, 27 March–1 April 2000.

Presentation on "Weltraumwissenschaft am ISSI" at the Fachhochschule für Technik und Architektur, Bern, 2 May 2000.

Presentation on "Die ersten Minuten und das Schicksal des Universums" at the Fachhochschule Flensburg, Germany, 8 May 2000.

## **ISSI Visitor Activities**

*Note: Listed are talks given by ISSI visitors, with some acknowledgement to ISSI, between 1 July 1999 and 30 June 2000.*

#### **Treumann, Rudolf A.:**

Invited talk on "Theory of Collisionless Minor Nodes: A Superconducting Analogue" (with N. Sckopke), American Geophysical Union Fall Meeting, San Francisco, California, December 1999.

Invited talk on "Thermodynamics of Turbulent Plasma" at OBS2000 in Meudon, France, 10 January 2000.

Invited talk on "Origin of Resistivity in Reconnection," Symposium on Magnetic Reconnection 2000, Tokyo, Japan, February 2000.

Invited talk on "Fine-Structure of Auroral Kilometric Radiation," Geotail Workshop, ISAS, Tokyo, Japan, February 2000.

Invited talk on "Theory of Collisionless Reconnection," European Geophysical Society General Assembly, Nice, France, April 2000.



# ISSI Staff Publications

**Note: Listed are all papers written or co-authored by ISSI staff that appeared or were submitted between 1 July 1999 and 30 June 2000.**

- Altwegg, K., H. Balsiger, and J. Geiss, Composition of the Volatile Material in Halley's Coma from *In Situ* Measurements, in: K. Altwegg, P. Ehrenfreund, J. Geiss, and W. Huebner (eds.), *Composition and Origin of Cometary Materials*, Vol. 8, *Space Sciences Series of ISSI*, Dordrecht: Kluwer Academic Publishers, 1999, and *Space Science Reviews*, 90, 3–18, 1999.
- Altwegg, K., P. Ehrenfreund, J. Geiss, W. Huebner, and A.C. Levasseur-Regourd, Cometary Materials: Progress Toward Understanding the Fringes of the Solar Nebula, in: K. Altwegg, P. Ehrenfreund, J. Geiss, and W. Huebner (eds.), *Composition and Origin of Cometary Materials*, Vol. 8, *Space Sciences Series of ISSI*, Dordrecht: Kluwer Academic Publishers, 1999, and *Space Science Reviews*, 90, 373–389, 1999.
- Baker, E.S., C. Allende Prieto, T.L. Farnham, D.B. Goldstein, R.S. Nerem, J.V. Austin, J.Y. Shim, A.B. Storrs, S.A. Stern, A.B. Binder, T. Bida, T. Morgan, S.M. Larson, A.L. Sprague, D.M. Hunten, R.E. Hill, R.W.H. Kozlowski, B. Ludwig, S. Rubinson, J. Baumgardner, M. Mendillo, J. Wilson, J. Wroten, S. Verani, C.R. Benn, R.J. Garcia Lopez, E. Gates, D.L. Talent, A. Alday, A. Pozar, D. Witte, B. Africano, B. Villanueva, R. Anderson, P. Kervin, G.S. Rossano, R.W. Walker, S. Hoss, C.M. Anderson, W. Offutt, Lunar Prospector Team, Results of Observational Campaigns Carried Out During the Impact of Lunar Prospector into a Permanently Shadowed Crater near the South Pole of the Moon, American Astronomical Society, *DPS meeting 31*, 59.03, December 1999.
- Balogh, A., and R. von Steiger, The heliosphere at solar minimum: Ulysses observations during its fast latitude scan in 1994–95, *Reviews of Geophysics*, submitted, 2000.
- Balogh, A., J.T. Gosling, J.R. Jokipii, R. Kallenbach, and H. Kunow, Corotating Interaction Regions: Introduction, *Space Science Reviews*, 89, 1–3, 1999.
- Balogh, A., J.T. Gosling, and R. Kallenbach, Corotating Interaction Regions: Glossary, *Space Science Reviews*, 89, 403–405, 1999.
- Bieber, J.W., E. Eroshenko, P. Evenson, E.O. Flückiger, and R. Kallenbach, Cosmic Rays and Earth – A Summary, *Space Science Reviews*, 93, 1–8, 2000.
- Frisch, P.C., J.M. Dorschner, J. Geiss, J.M. Greenberg, E. Grün, M. Landgraf, P. Hoppe, A.P. Jones, W. Krätschmer, T. Linde, G.E. Morfill, W. Reach, J.D. Slavin, J. Svestka, A.N. Witt, and G.P. Zank, Dust in the Local Interstellar Wind, *The Astrophysical Journal*, 525, 492–516, 1999.
- Geiss, J.G., Earth, Moon and Mars, *Spatium No. 5*, June 2000.
- Geiss, J., Lune, et retour! in: *La Suisse, l'Europe et l'Espace: une aventure, une nécessité / Die Schweiz, Europa und die Raumfahrt: Abenteuer und Notwendigkeit*, (in the series *Les Cahiers rouges*), Lausanne-Dorigny: Fondation Jean Monnet pour l'Europe/Centre de recherches européennes, in press, 2000.
- Geiss, J., K. Altwegg, H. Balsiger, and S. Graf, Rare Atoms, Molecules and Radicals in the Coma of P/Halley, in: K. Altwegg, P. Ehrenfreund, J. Geiss, and W. Huebner (eds.), *Composition and Origin of Cometary Materials*, Vol. 8, *Space Sciences Series of ISSI*, Dordrecht: Kluwer Academic Publishers, 1999, and *Space Science Reviews*, 90, 253–268, 1999.
- Gloeckler, G., L.A. Fisk, J. Geiss, N. Schwadron and T.H. Zurbuchen, The Elemental Composition of the Inner Source Pickup Ions, *Journal of Geophysical Research*, 105, 7459–7463, 2000.
- Gloeckler, G., and J. Geiss, Deuterium and Helium-3 in the Protosolar Cloud, in: L. da Silva, M. Spite, and J.R. de Medeiros (eds.), *The Light Elements and Their Evolution*, ASP Conference Series, Astronomical Society of the Pacific, in press, 2000.
- Gloeckler, G., J. Geiss, N.A. Schwadron, L.A. Fisk, T.H. Zurbuchen, F.M. Ipavich, R. von Steiger, H. Balsiger, and B. Wilken, Interception of comet Hyakutake's ion tail at a distance of 500 million kilometres, *Nature*, 404, 576–578, 2000.
- Håland, S., and N. Østgaard, Multi-Spacecraft Study of a Magnetospheric Substorm, in: *Space Science in Norway, 1998–2000*, in press, 2000.
- Håland, S., N. Østgaard, J. Bjordal, J. Stadsnes, S. Ullaland, B. Wilken, T. Yamamoto, T. Doke, D.L. Chenette, G.K. Parks, M.J. Brittner, and G.D. Reeves, Magnetospheric and ionospheric response to a substorm: Geotail HEP-LD and Polar PIXIE observations, *Journal of Geophysical Research*, 104, 28,459–28,474, 1999.

- Håland, S., F. Søråas, and S. Ullaland, Propagation Velocities and Dimensions of Plasmoid Structures in the Near-Earth Magnetotail, *Geophysical Research Letters*, 26, 3269–3272, 1999.
- Hamonou, E., P. Chazette, D. Balis, F. Dulac, X. Schneider, E. Galani, G. Ancellet, and A. Papayannis, Characterization of the vertical structure of Saharan dust export to the Mediterranean basin, *Journal of Geophysical Research*, in press, 2000.
- Henke, T., J. Woch, R. Schwenn, U. Mall, G. Gloeckler, R. von Steiger, R.J. Forsyth, and A. Balogh, Ionisation states and magnetic topology of coronal mass ejections, *Journal of Geophysical Research*, submitted, 1999.
- Hilchenbach, M., H. Grünwaldt, R. Kallenbach, B. Klecker, H. Kucharek, F.M. Ipavich, and A.B. Galvin, Observation of suprathermal helium at 1 AU: Charge states in CIRs, in: S.R. Habbal, R. Esser, J.V. Hollweg, and P.A. Isenberg (eds.), *Solar Wind 9, The Proceedings of the Ninth International Solar Wind Conference*, Nantucket, Massachusetts, 1998, Woodbury, NY: American Institute of Physics, 605–608, 1999.
- Kallenbach, R., Fractionation in shock-accelerated particles, *Proc. 5th European Workshop on Collisionless Shocks, June 16–18, 1999*, Paris, France.
- Kallenbach, R., Glossary – Meteorites and Asteroids, *Space Science Reviews*, 92, 415–418, 2000.
- Kallenbach, R., Isotopic composition of the solar wind, Habilitationsschrift, University of Bern, 1999.
- Kallenbach, R., M.R. Aellig, P. Bochsler, N.U. Crooker, B. Forsyth, S. Hefti, M. Hilchenbach, and R.F. Wimmer-Schweingruber, Compositional and Kinematic Signatures of Solar Wind Stream Interfaces and Their Relationship with Solar and Coronal Features, in: A. Balogh, J.T. Gosling, J.R. Jokipii, R. Kallenbach, and H. Kunow (eds.), *Corotating Interaction Regions*, Vol. 7, *Space Sciences Series of ISSI*, Dordrecht: Kluwer Academic Publishers, 1999, and *Space Science Reviews*, 89, 155–162, 1999.
- Kallenbach, R., W. Benz, and G. Lugmair, From dust to terrestrial planets – An introduction, *Space Science Reviews*, 92, 1–10, 2000.
- Kallenbach, R., J. Geiss, G. Gloeckler, and R. von Steiger, Pickup ion measurements in the heliosphere – a review, *Astrophysics and Space Science*, in press, 2000.
- Kallenbach, R., F.M. Ipavich, H. Kucharek, P. Bochsler, A.B. Galvin, J. Geiss, F. Gliem, G. Gloeckler, H. Grünwaldt, M. Hilchenbach, and D. Hovestadt, Solar wind isotopic abundance ratios of Ne, Mg, and Si measured by SOHO/CELIAS/MTOF as diagnostic tool for the inner corona, *Physics and Chemistry of the Earth C*, 24, 415–419, 1999.
- Kallenbach, R., and M.A. Lee, Shock Surfing and Shock Drift, in: M. Scholer and G. Mann, et al., Origin, injection, and acceleration of CIR particles: Theory, in: A. Balogh, J.T. Gosling, J.R. Jokipii, R. Kallenbach, and H. Kunow (eds.), *Corotating Interaction Regions*, Vol. 7, *Space Sciences Series of ISSI*, Dordrecht: Kluwer Academic Publishers, 1999, and *Space Science Reviews*, 89, 383–387, 1999.
- Kunow, H., M.A. Lee, L.A. Fisk, R.J. Forsyth, B. Heber, T.S. Horbury, E. Keppler, J. Kóta, Y.-Q. Lou, R.B. McKibben, C. Paizis, M.S. Potgieter, E.C. Roelof, T.R. Sanderson, G.M. Simnett, R. von Steiger, B. Tsurutani, R.F. Wimmer-Schweingruber, and J.R. Jokipii, Co-rotating Interaction Regions at High Latitudes, in: A. Balogh, J.T. Gosling, J.R. Jokipii, R. Kallenbach, and H. Kunow (eds.), *Corotating Interaction Regions*, Vol. 7, *Space Sciences Series of ISSI*, Dordrecht: Kluwer Academic Publishers, 1999, and *Space Science Reviews*, 89, 221–268, 1999.
- Mall U., M. Banaszekiewicz, and S. Verani, Investigating the lunar sodium atmosphere by an in-situ mass spectrometer, *Planetary & Space Science*, submitted, 2000.
- Mason, G.M., R. von Steiger, R. Decker, M.I. Desai, J.R. Dwyer, L.A. Fisk, G. Gloeckler, J.T. Gosling, M. Hilchenbach, R. Kallenbach, E. Keppler, B. Klecker, H. Kunow, G. Mann, I.G. Richardson, T.R. Sanderson, G.M. Simnett, Y.-M. Wang, R.F. Wimmer-Schweingruber, M. Fränz, and J.E. Mazur, Origin, Injection, and Acceleration of CIR Particles: Observations, in: A. Balogh, J.T. Gosling, J.R. Jokipii, R. Kallenbach, and H. Kunow (eds.), *Corotating Interaction Regions*, Vol. 7, *Space Sciences Series of ISSI*, Dordrecht: Kluwer Academic Publishers, 1999, and *Space Science Reviews*, 89, 327–367, 1999.
- Neugebauer, M., T.E. Cravens, C.M. Lisse, F.M. Ipavich, D. Christian, R. von Steiger, P. Bochsler, P.D. Shah, and T.P. Armstrong, The relation of temporal variations of soft X-ray emission from comet Hyakutake to variations of ion fluxes in the solar wind, *Journal of Geophysical Research*, submitted, 1999.
- Neugebauer, M., and R. von Steiger, The solar wind, in: J. Bleeker, J. Geiss, M.C.E. Huber, and A. Russo (eds.), *The Century in Space Science*, Dordrecht: Kluwer Academic Publishers, submitted, 2000.
- Øieroset, M., M. Yamauchi, L. Liszka, and S.P. Christon, Energetic ion outflow from the dayside ionosphere and its

- relationship to the interplanetary magnetic field and sub-storm activity, *Journal of Atmospheric and Solar-Terrestrial Physics*, 62 (6), 485–493, 2000.
- Øieroset, M., M. Yamauchi, L. Liszka, and B. Hultqvist, Energetic ion outflow from the dayside ionosphere: Categorization, classification, and statistical study, *Journal of Geophysical Research*, 104, 24,915–24,927, 1999.
- Paschmann, G., and S.J. Schwartz, ISSI Book on Analysis Methods for Multi-Spacecraft Data, in: *Cluster-II Workshop on Multiscale/Multipoint Plasma Measurements*, Imperial College, London, U.K., 22–24 September 1999, ESA SP-449, 99, 2000.
- Phan, T.D., L.M. Kistler, B. Klecker, G. Haerendel, G. Paschmann, B.U.Ö. Sonnerup, W. Baumjohann, M.B. Bavasano-Cattaneo, C.W. Carlson, A.M. DiLellis, K.-H. Fornacon, L.A. Frank, M. Fujimoto, E. Georgescu, S. Kokubun, E. Moebius, T. Mukai, M. Øieroset, W.R. Paterson, and H. Reme, Extended magnetic reconnection at the Earth's magnetopause from detection of bi-directional jets, *Nature*, 404, 848, 2000.
- Sabo, D., Z. Bacic, S. Graf, and S. Leutwyler, Calculated and experimental rotational constants of  $(D_2O)_3$ : Effects of intermolecular torsional and symmetric stretching excitations, *Journal of Chemical Physics*, 111, 5331, 1999.
- Schwadron, N.A., J. Geiss, L.A. Fisk, G. Gloeckler, T.H. Zurbuchen, and R. von Steiger, Inner source distributions: Theoretical interpretation, implications, and evidence for inner source protons, *Journal of Geophysical Research*, 105, 7465–7472, 2000.
- Schwadron, N.A., G. Gloeckler, L.A. Fisk, J. Geiss, and T.H. Zurbuchen, The Inner Source for Pickup Ions, in: S.R. Habbal, R. Esser, J.V. Hollweg, and P.A. Isenberg (eds.), *Solar Wind 9, The Proceedings of the Ninth International Solar Wind Conference*, Nantucket, Massachusetts, 1998, Woodbury, NY: American Institute of Physics, 487–490, 1999.
- Schwadron, N.A., and J. Geiss, On the Processing and Transport of Inner Source Hydrogen, *Journal of Geophysical Research*, 105, 7473–7481, 2000.
- Schwartz, S.J., and G. Paschmann, ISSI Small Scale Plasma Structures Team: Results and Lessons, in: *Cluster-II Workshop on Multiscale/Multipoint Plasma Measurements*, Imperial College, London, U.K., 22–24 September 1999, ESA SP-449, 25, 2000.
- Schwartz, S.J., G. Paschmann, N. Sckopke, T.M. Bauer, M.W. Dunlop, A.N. Fazakerley, and M.F. Thomsen, Conditions for the formation of hot flow anomalies at the Earth's bow shock, *Journal of Geophysical Research*, 105, 12,639, 2000.
- Schwartz, S.J., G. Paschmann, N. Sckopke, T.M. Bauer, M.W. Dunlop, A.N. Fazakerley, and M.F. Thomsen, Hot flow anomalies revisited, *International Journal of Geomagnetism and Aeronomy*, 2, 25, 2000.
- Verani S., C. Barbieri, C. Benn, G. Cremonese, and M. Mendillo, Observations of the lunar sodium atmosphere during the 1999 Quadrantids meteor shower, *DPS meeting 31*, 38.01, 1999.
- Verani S., C. Barbieri, C. Benn, G. Cremonese, and M. Mendillo, Quadrantid meteor shower in the lunar sodium atmosphere, *Monthly Notices of the Royal Astronomical Society*, submitted, 1999.
- von Steiger, R., Transition region: First ionisation potential effect, in: P. Murdin (ed.), *Encyclopaedia of Astronomy and Astrophysics*, Bristol: Institute of Physics Publishing, in press, 2000.
- von Steiger, R., L.A. Fisk, G. Gloeckler, N.A. Schwadron, and T.H. Zurbuchen, Composition variations in fast solar wind streams, in: S.R. Habbal, R. Esser, J.V. Hollweg, and P.A. Isenberg (eds.), *Solar Wind 9, The Proceedings of the Ninth International Solar Wind Conference*, Nantucket, Massachusetts, 1998, Woodbury, NY: American Institute of Physics, 143–146, 1999.
- von Steiger, R., and N.A. Schwadron, Solar wind composition, in: R. Ramaty and N. Mandzhavidze (eds.), *High Energy Solar Physics: Anticipating HESSI, ASP Conference Series, Vol. 209*, San Francisco: Astronomical Society of the Pacific, 54–63, 2000.
- von Steiger, R., N.A. Schwadron, J. Geiss, G. Gloeckler, L.A. Fisk, S. Hefti, B. Wilken, R.F. Wimmer-Schweingruber, and T.H. Zurbuchen, Composition of quasi-stationary solar wind flows from Ulysses/SWICS, *Journal of Geophysical Research*, in press, 2000.
- von Steiger, R., and T.H. Zurbuchen, Kinetic properties of heavy solar wind ions from Ulysses/SWICS, *Advances in Space Research*, submitted, 2000.
- Wimmer-Schweingruber, R.F., P. Bochsler, G. Gloeckler, F.M. Ipavich, J. Geiss, R. Kallenbach, L.A. Fisk, S. Hefti, and T.H. Zurbuchen, On the bulk isotopic composition of magnesium and silicon during the May 1998 CME: ACE/SWIMS, *Geo-physical Research Letters*, 26, 165–168, 1999.
- Zurbuchen, T. H., S. Hefti, L. A. Fisk, G. Gloeckler, and R. von Steiger, The Transition Between Fast and Slow Solar Wind from Composition Data, in: J.L. Kohl and S.R. Cranmer (eds.), *Coronal Holes and Solar Wind Acceleration, Proceedings of the SOHO-7 Workshop*, held at Asticou Inn in Northeast Harbor, Maine, U.S.A., from 28 September–1 October, 1998, and *Space Science Reviews*, 87, 353–356, 1999.

# ISSI Visitor Publications

**Note: Listed are papers written or co-authored by ISSI visitors, with some acknowledgement to ISSI, that appeared or were accepted for publication between 1 July 1999 and 30 June 2000.**

Astafyeva, N.M., and G.A. Bazilevskaya, Long-term changes of cosmic ray intensity: Spectral behaviour and 27-day variation, *Physics and Chemistry of the Earth (C)*, 25 (1–2), 129–132, 1999.

Astafyeva, N.M., and G.A. Bazilevskaya, Long-term changes in cosmic ray intensity variations: Characteristic time scales around 27 days, *International Symposium Space Plasma Studies by In-Situ and Remote Measurements*, Moscow, 1–5 June, 1998, in press.

Balikhin, M.A., H.St.C.K. Alleyne, R.A. Treumann, M.N. Nozdrachev, S.N. Walker, and W. Baumjohann, The role of non-linear interaction in the formation of LF whistler turbulence upstream of a quasi-perpendicular shock, *Journal of Geophysical Research*, 104, 12,525, 1999.

Balikhin, M.A., S.J. Schwartz, S.N. Walker, H.St.C.K. Alleyne, M. Dunlop, and H. Lühr, Dual spacecraft observations of standing waves in the magnetosheath, *Journal of Geophysical Research*, in press, 2000.

Ball, A. J., H.U. Keller, and R. Schulz, Critical Questions and Future Measurements – Collated Views of the Workshop Participants, in: K. Altwegg, P. Ehrenfreund, J. Geiss and W. Huebner (eds.), *Composition and Origin of Cometary Materials*, Vol. 8, *Space Sciences Series of ISSI*, Dordrecht: Kluwer Academic Publishers, 1999, and *Space Science Reviews*, 90, 363–369, 1999.

Ball, A. J., and N.I. Kömle, Forces on the Lander at the Nucleus Surface, *Report of the Rosetta Nucleus Modelling Group*, ESA SP1165, in press 1999.

Bates, I., M.A. Balikhin, H.St.C.K. Alleyne, M.W. Dunlop, and H. Lühr, Coherence lengths of the low frequency turbulence at the bow shock and in the magnetosheath, in: *Cluster-II Workshop on Multiscale/Multipoint Plasma Measurements*, Imperial College, London, U.K., 22–24 September 1999, ESA SP-449, 283, 2000.

Bauer, T.M., M.W. Dunlop, B.U.Ö. Sonnerup, N. Sckopke, A.N. Fazakerley, and A.V. Khrabrov, Dual spacecraft

determinations of magnetopause motion, *Geophysical Research Letters*, 27, 1835, 2000.

Bazilevskaya, G.A., E. Flueckiger, M.B. Krainev, V.S. Makhmutov, A.I. Sladkova, and M. Storini, The Gnevyshev Gap Effect in Solar Cosmic Rays, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 6, 240–243, 1999.

Bazilevskaya, G.A., E.O. Fluckiger, M.B. Krainev, V.S. Makhmutov, A.I. Sladkova, and M. Storini. Structure of the Maximum Phase of the Solar Cycles 21 and 22, *Solar Physics*, in press, 1999.

Burger, R.A., and M.S. Potgieter, The Effect of Large Heliospheric Current Sheet Tilt Angles in Numerical Modulation Models: A Theoretical Assessment, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 7, 13, 2000.

Burger, R.A., M.S. Potgieter, and B. Heber, Rigidity Dependence of Near-Earth Latitudinal Proton Density Gradients, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 7, 242, 2000.

Chang, T., Self-Organized Criticality, Multi-Fractal Spectra, and Intermittent Merging of Coherent Structures in the Magnetotail, *Astrophysics and Space Science*, 264, 303–316, 1999.

Chang, T., Self-organized criticality, multi-fractal spectra, sporadic localized reconnections and intermittent turbulence in the magnetotail, *Physics of Plasmas*, 6, 4137–4145, 1999.

Chang, T., The Role of Coarse-Grained Helicity and Self-Organized Criticality in Magnetotail Dynamics, in: M.R. Brown, R.C. Canfield, and A.A. Pevtsov (eds.), *Magnetic Helicity in Space and Laboratory Plasmas*, AGU Monograph No. 111, Washington, D.C.: American Geophysical Union, 277–284, 1999.

Coca, D., M.A. Balikhin, S.A. Billings, H.St.C.K. Alleyne, M.W. Dunlop, and H. Lühr, Time-domain identification of nonlinear processes in space-plasma turbulence using multi-

- point measurements, in: *Cluster-II Workshop on Multiscale/Multipoint Plasma Measurements*, Imperial College, London, U.K., 22–24 September 1999, ESA SP-449, 111, 2000.
- Dunlop, M.W., T.M. Bauer, B.U.Ö. Sonnerup, N. Sckopke, A.V. Khrabrov, T. Woodward, and A.N. Fazakerley, Dual spacecraft verification of magneto-pause orientation and motion: Preliminary results, in: *Cluster-II Workshop on Multiscale/Multipoint Plasma Measurements*, Imperial College, London, U.K., 22–24 September 1999, ESA SP-449, 103, 2000.
- Dunlop, M.W., and T.I. Woodward, The use of dual-spacecraft data for the identification of non-planar magnetic structure, in: *Cluster-II Workshop on Multiscale/Multipoint Plasma Measurements*, Imperial College, London, U.K., 22–24 September 1999, ESA SP-449, 355, 2000.
- Fan, Z., and Y. Lou, Energy, angular momentum and wave action associated with density waves in a rotating magnetized gas disc, *Monthly Notices of the Royal Astronomical Society*, 307, 645, 1999.
- Feldstein, Y.I., L.A. Dremukhina, U. Mall, and J. Woch, On the two phase decay of the Dst-variation, *Geophysical Research Letters*, in press, 2000.
- Ferreira, S.E.S., M.S. Potgieter, and R.A. Burger, Comparison of a Two- and Three-Dimensional Drift Model, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 7, 77, 2000.
- Ferreira, S.E.S., M.S. Potgieter, and R.A. Burger, Implications of Increased Perpendicular Diffusion on the Tilt Angle Dependence of Electron Modulation in the Heliosphere, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 7, 53, 2000.
- Ferreira, S.E.S., and M.S. Potgieter, Effects of anisotropic perpendicular diffusion on the energy and spatial dependence of galactic electron modulation in the heliosphere, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 7, 25, 2000.
- Fichtner, H., M. Potgieter, S. Ferreira, and A. Burger, On the propagation of Jovian electrons in the heliosphere: Transport modelling in 4-D phase space, *Geophysical Research Letters*, 27, 1611, 2000.
- Frisch, P.C., J.M. Dorschner, J. Geiss, J.M. Greenberg, E. Grün, M. Landgraf, P. Hoppe, A.P. Jones, W. Krätschmer, T.J. Linde, G.E. Morfill, W. Reach, J.D. Slavin, J. Svestka, A.N. Witt, and G.P. Zank, Dust in the Local Interstellar Wind, *Astrophysical Journal*, 525, 492–516, 1999.
- Fulle, M., A.C. Levasseur-Regourd, N. McBride, and E. Hadamcik, In Situ Dust Measurements from within the Coma of 1P/Halley: First-Order Approximation with a Dust Dynamical Model, *Astronomical Journal*, 119, 1968, 2000.
- Garry, J.R.C., M.C. Towner, A.J. Ball, J.C. Zarnecki, and G. Marcou, The Effect of Vacuum and Impactor Geometry on Low-Speed Penetration of Regolith Simulants, *Advances in Space Research*, 23 (7), 1229–1234, 1999.
- Giacalone, J., and D.C. Ellison, Three-dimensional numerical simulations of particle injection and acceleration at quasi-perpendicular shocks, *Journal of Geophysical Research*, 105, 12,541, 2000.
- Hartmann, W. K., Martian cratering VI. Crater count isochrons and evidence for recent volcanism from Mars Global Surveyor, *Meteoritics and Planetary Science*, 34, 167, 1999.
- Hartmann, W. K., and G. Esquerdo, Pathological Martian craters: Evidence for a transient obliteration event?, *Meteoritics and Planetary Science*, 34, 159, 1999.
- Heber, B., P. Ferrando, A. Raviart, G. Wibberenz, C. Paizis, V. Bothmer, H. Kunow, R. Müller-Mellin, A. Posner, H. Sierks, and M.S. Potgieter, Charge sign dependent modulation: Ulysses COSPIN/KET results, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 7, 99, 2000.
- Hu, Q., and B.U.Ö. Sonnerup, Magnetopause transects from two spacecraft: A comparison, *Geophysical Research Letters*, 27, 1443, 2000.
- Hultqvist, B., Source and loss processes of magnetospheric plasma, *Reviews of Geophysics*, in press, 2000.
- Izmodenov, V.V., R. Lallement, and Y.G. Malama, Heliospheric Interface Filtration of the Interstellar Hydrogen, in: S.R. Habbal, R. Esser, J.V. Hollweg, and P.A. Isenberg (eds.), *Solar Wind 9, The Proceedings of the Ninth International Solar Wind Conference*, Nantucket, Massachusetts, 1998, Woodbury, NY: American Institute of Physics, Conf. Proc. 471, 803, 1999.
- Kabin, K., T.I. Gombosi, D.L. DeZeeuw, and K.G. Powell, Interaction of Mercury with the Solar Wind, *Icarus*, 143, 397, 2000.
- Kecskeméty, K., H. Kunow, E. Valtonen, P. Király, R. Müller-Mellin, J. Torsti, and V. Bothmer, Energy spectra



- of protons, deuterium, and helium nuclei during quiet solar activity periods in 1996-97, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 6, 167, 2000.
- Kecskeméty, K., Yu.I. Logachev, and M.A. Zeldovich, Variation of parameters of quiet-time proton energy spectra, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 6, 159, 2000.
- Király, P., Energetic Particle Flux Distributions at 1 AU, Proceedings of the Third Solar Wind-Magnetosphere Workshop, Graz, Austria, in press, 2000.
- Király, P., MeV and Sub-MeV Ion Flux Distributions at 1 AU, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 6, 216, 2000.
- Király, P., Observational Aspects of Solar and Heliospheric Particles, in: M. Ostrowski and R. Schlickeiser (eds.), *International Conference Proceedings on Plasma Turbulence and Energetic Particles in Astrophysics*, in Cracow, Poland, 5–10 September 1999, 147–153, 1999.
- Király, P., and J. Rodriguez-Pacheco, Sub-MeV Ion Fluxes and Anisotropies Measured aboard ISEE-3 from 1978 to 1982, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 6, 171, 2000.
- Király, P., and A.W. Wolfendale, Long-Term Particle Fluence Distributions and Short-Term Observations, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 6, 163, 2000.
- Kömlé, N.I., G. Kargl, W. Macher, and A.J. Ball, Application of Dynamic Penetrometry to Determine the Strength of Extraterrestrial Surface Layers, in: *Proceedings of an International Workshop on the Solar Wind-Magnetosphere System 3*, Graz, 23–25 September 1998, Graz: Verlag der Österreichischen Akademie der Wissenschaften, in press, 2000.
- Korotova, G.I., M.G. Kivelson, D.G. Sibeck, T.A. Potemra, and P. Stauning, Multipoint Observations of Global Magnetospheric Compressions, *Journal of Geophysical Research*, in press, 2000.
- Kraiev, M.B., M. Storini, G.A. Bazilevskaya, E. Flueckiger, V.S. Makhmutov, A.I. Sladkova, and S.A. Starodubtsev, The Gnevyshev Gap Effect in Galactic Cosmic Rays, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 7, 155–158, 1999.
- Kucharek, H., M. Scholer, and A.P. Matthews, Three dimensional simulation of the e.m ion/ion beam instability: Cross field diffusion; *Nonlinear Processes in Geophysics*, in press, 2000.
- Lembège, B., S.N. Walker, P. Savoini, M.A. Balikhin, and V. Krasnosel'skikh, The spatial sizes of electric and magnetic field gradients in a simulated shock, *Advances in Space Research*, 24, 109, 1999.
- Logachev, Yu.I., K. Kecskeméty, M.A. Zeldovich, and P. Király, Minimum spectra of non-galactic protons in interplanetary space near 1 AU, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 6, 208, 2000.
- Lou, Y.Q., Magneto-Gravity Waves Trapped in the Lower Solar Corona, in: J.L. Kohl and S.R. Cranmer (eds.), *Coronal Holes and Solar Wind Acceleration, Proceedings of the SOHO-7 Workshop*, held at Asticou Inn in Northeast Harbor, Maine, U.S.A., from 28 September–1 October, 1998, *Space Science Reviews*, 87, 261, 1999.
- Lou, Y., J.L. Han, and Z. Fan, Fast magnetohydrodynamic density waves in spiral galaxies, *Monthly Notices of the Royal Astronomical Society*, 308, L1 1999.
- Lyatsky, W., A possible role of ion demagnetization in substorm generation, *Journal of Geophysical Research*, 104, 19,905, 1999.
- Lyatsky, W., A.V. Kustov, G.J. Sofko, B. Jacobsen, D. Andre, and L. Cogger, Ionospheric convection and equivalent ionospheric currents in the dayside high-latitude winter ionosphere, *Journal of Geophysical Research*, 104, 22525, 1999.
- McCaffrey, D., M.A. Balikhin, and V.V. Krasnosel'skikh, Particle dynamics in strong electromagnetic field gradients: In view of ion dynamics in an auroral arc, *Advances in Space Research*, 23, 1725, 1999.
- Myasnikov, A.V., V.V. Izmodenov, D.B. Alexashov, and S.V. Chalov, Self-consistent model of the solar wind interaction with three-component circumsolar interstellar cloud: Mutual influence of thermal plasma, galactic cosmic rays, and H-atoms, *Journal of Geophysical Research*, 105, 5167–5177, 2000.
- Myasnikov, A.V., V.V. Izmodenov, D.B. Alexashov, and S.V. Chalov, Self-consistent model of the solar wind interaction

- with two-component circumsolar interstellar cloud: Mutual influence of thermal plasma and galactic cosmic rays, *Journal of Geophysical Research*, *105*, 5179–5188, 2000.
- Onishchenko, O.G., O.A. Pokhotelov, P.K. Shukla, and L. Stenflo, Nonlinear Drift-Alfvén Waves in Relativistically Hot Nonuniform Electron-Positron Plasmas, *Astrophysics and Space Science*, *262*, 249, 1999.
- Onishchenko, O.G., O.A. Pokhotelov, P.K. Shukla, L. Stenflo, A.V. Bogdanov, and F.F. Kamenets, Nonlinear Flute-Drift Waves in Relativistic Electron-Positron Plasmas, *Physica Scripta*, *T84*, 139, 2000.
- Paizis, C., B. Heber, P. Ferrando, A. Raviart, B. Falconi, S. Marzolla, M.S. Potgieter, V. Bothmer, H. Kunow, R. Müller-Mellin, A. Posner, Amplitude evolution and rigidity dependence of the 26-day recurrent cosmic ray decreases: COSPIN/KET results, *Journal of Geophysical Research*, *104*, 28241, 1999.
- Pokhotelov, O.A., M.A. Balikhin, H.St-C.K. Alleyne, and O.G. Onishchenko, Mirror instability with finite electron temperature effects, *Journal of Geophysical Research*, *105*, 2393, 2000.
- Pokhotelov, O.A., M.A. Balikhin, V. Pavlenko, and R.A. Treumann, Drift mirror instability revisited, I: Cold electron temperature limit, *Journal of Geophysical Research*, in press, 2000.
- Pokhotelov, O.A., O.G. Onishchenko, P.K. Shukla, and L. Stenflo, Drift-Alfvén vortices in dusty plasmas, *Journal of Geophysical Research*, *104*, 19,797–19,800, 1999.
- Pokhotelov, O.A., O.G. Onishchenko, P.K. Shukla, and L. Stenflo, Drift-Alfvén vortices in dusty plasmas with non-zero ion temperature effects, *Journal of Plasma Physics*, in press, 2000.
- Pokhotelov, O.A., O.G. Onishchenko, and A. Streltsov, Nonlinear Drift-Alfvén waves in magnetized electron-positron plasmas, *Physica Scripta*, *T82*, 17–19, 1999.
- Pokhotelov, O.A., D. Pokhotelov, A. Streltsov, V. Khrushev, and M. Parrot, Dispersive ionospheric Alfvén resonator, *Journal of Geophysical Research*, *105*, 7737, 2000.
- Potgieter, M. S., and S.E.S. Ferreira, Implications of Cosmic Ray Electron Observations on the Modeling of Electron Modulation in the Heliosphere, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol.7, 21, 2000.
- Potgieter, M.S., S.E.S. Ferreira, and B. Heber, The Heliospheric Modulation of Cosmic Ray Electrons: Rigidity Dependence of the Perpendicular Diffusion Coefficient, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 7, 57, 2000.
- Rao, N.N., Dust-Coulomb waves in dense dusty plasmas, *Physics of Plasmas*, *6*, 4414–4417, 1999.
- Rao, N.N., Dust-Coulomb and dust-acoustic wave propagation in dense dusty plasmas with high fugacity, *Physics of Plasmas*, *7*, 795–807, 2000.
- Scholer, M., H. Kucharek, and J. Giacalone, Cross-field diffusion of charged particles and the problem of ion injection and acceleration at quasi-perpendicular shocks, *Journal of Geophysical Research*, in press, 2000.
- Scholer, M., H. Kucharek, V.V. Krasnosel'skikh, and K.-H. Trattner, Injection and acceleration of ions at collisionless shocks: Kinetic simulations, *Proceedings ACE2000*, American Institute of Physics, in press, 2000.
- Scholer, M., H. Kucharek, and K.H. Trattner, Injection and acceleration of H and He at Earth's bow shock, *Annales Geophysicae*, in press, 1999.
- Schwartz, S.J., and G. Paschmann, ISSI Small Scale Plasma Structures Team: Results and Lessons, in: *Cluster-II Workshop on Multiscale/Multipoint Plasma Measurements*, Imperial College, London, U.K., 22–24 September 1999, ESA SP-449, 25, 2000.
- Schwartz, S.J., G. Paschmann, N. Sckopke, T.M. Bauer, M.W. Dunlop, A.N. Fazakerley, and M.F. Thomsen, Conditions for the formation of hot flow anomalies at the Earth's bow shock, *Journal of Geophysical Research*, *105*, 12,639, 2000.
- Schwartz, S.J., G. Paschmann, N. Sckopke, T.M. Bauer, M.W. Dunlop, A.N. Fazakerley, and M.F. Thomsen, Hot flow anomalies at the Earth's bow shock, in: B. Lembège (ed.), *Proceedings of the 5th European Workshop on Collisionless Shocks*, Vélizy, France, in press, 2000.
- Schwartz, S.J., G. Paschmann, N. Sckopke, T.M. Bauer, M.W. Dunlop, A.N. Fazakerley, and M.F. Thomsen, Hot flow anomalies revisited, *International Journal of Geomagnetism and Aeronomy*, *2*, 25, 2000.
- Sckopke, N., B.U.Ö. Sonnerup, T.M. Bauer, M.W. Dunlop, and A.V. Khrabrov, Minimum variance and de Hoffmann-Teller Techniques, in: *Cluster-II Workshop on Multiscale/Multipoint Plasma Measurements*, Imperial College, London, U.K., 22–24 September 1999, ESA SP-449, 101, 2000.

- Shukla, P.K., Dust ion-acoustic shocks and holes, *Physics of Plasmas*, 7, 1044–1046, 2000.
- Shukla, P.K., R. Bingham, J.F. McKenzie, and W.I. Axford, Solar coronal heating by high-frequency dispersive Alfvén waves, *Solar Physics*, 186, 61, 1999.
- Shukla, P.K., and L. Stenflo, Plasma density cavitation due to inertial Alfvén wave heating, *Physics of Plasmas*, 6, 4120–4122, 1999.
- Shukla, P.K., and D. Resendes, Dust acoustic waves with dust charge fluctuations—revisited, *Physics of Plasmas*, 7, 1614–1616, 2000.
- Sibeck, D. G., and G.I. Korotova, Testing models for traveling convection vortices: Two case studies, *Geophysical Research Letters*, 27, 325, 2000.
- Stenflo, L., P.K. Shukla, and M.Y. Yu, Dust acoustic surface waves on a dusty plasma slab, *Physics of Plasmas*, 7, 2731–2732, 2000.
- Storini, M., F. Feminella, A. Antalova, and S. Masetti, On the Double-Peaked Cycle of Solar Activity: A Connection with the Heliomagnetic Field, in: A. Antalova, H. Balthasar, and A. Kucera (eds.), *JOSO Annual Report 1998*, 153–155, 1999.
- Storini, M., F. Feminella, A. Antalova, and S. Masetti, On the Double-Peaked Cycle of Solar Activity: A Connection with the Heliomagnetic Field, in: A. Antalova, H. Balthasar, and A. Kucera (eds.), *JOSO Annual Report 1998*, 153–155, 1999.
- Storini, M., M. Jakimiec, A. Antalova, and J. Sykora, Cosmic ray modulation versus corona variability during the maximum phase of the 11-year cycle, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 7, 151, 2000.
- Szegö, K., K.-H. Glassmeier, et al., Physics of mass loaded plasmas, *Space Science Reviews*, in press, 1999.
- Tam, S.W.Y., and T. Chang, Kinetic evolution and acceleration of the solar wind, *Geophysical Research Letters*, 26, 3189–3192, 1999.
- Treumann, R.A., Planetary Radio Emission Mechanisms: A Tutorial, in R. Stone (ed.), *Radio Astronomy at Long Wavelengths*, Geophysical Monograph 119, Washington, D.C.: American Geophysical Union, 13–26, 2000.
- Treumann, R.A., Quantum statistical mechanics in the Lorentzian domain, *Europhysics Letters*, 48 (1), 8–14, 1999.
- Treumann, R.A., Wave turbulence in the plasma sheet and low latitude boundary layers, *Advances in Space Research*, 24, 3, 1999.
- Treumann, R.A., E. Georgescu, and W. Baumjohann, Lion Roar Trapping in Mirror Modes, *Geophysical Research Letters*, 27, 1843, 2000.
- Treumann, R.A., and A. Kull, Kullback’s contrast and Lorentzian entropy, *Physica Scripta*, 61, 403, 2000.
- Treumann, R.A., A. Kull, and H. Böhringer, Neutrino dark matter in clusters of galaxies, *New Journal of Physics*, 2, 11.1–11.13, 2000.
- Treumann, R.A., and R. Potelette, Auroral Microprocesses: Acceleration and Radiation, *Advances in Space Research*, 23, 1705, 1999.
- Treumann, R.A., and R. Potelette, Plasma Soliton Turbulence and Statistical Mechanics, in: M. Ostrowski and R. Schlickeiser (eds.), *Conference Proceedings on Plasma Turbulence and Energetic Particles in Astrophysics*, Cracow (Poland), 5–10 September 1999, 167–181, 1999.
- Treumann, R.A., N. Sckopke, and W. Baumjohann, Collisionless mirror mode trapping, *Nonlinear Processes in Geophysics*, MS No.: NPG 99037, in press, 2000.
- Tsintsadze, N.L., J.T. Mendonca, P.K. Shukla, L. Stenflo, and J. Mahmoodi, Regular structures in self-gravitating dusty plasmas, *Physica Scripta*, in press, 2000.
- Valtonen, E., K. Kecskeméty, H. Kunow, P. Király, R. Müller-Mellin, A. Posner, and J. Torsti, A method for the background reduction of solid state detectors during low-flux periods, in: D. Kieda, M. Salamon, and B. Dingus (eds.), *Proceedings of 26th International Cosmic Ray Conference*, Salt Lake City, Utah, August 17–25, 1999, Vol. 6, 220, 2000.
- Woodward, T.I., M.W. Dunlop, A.N. Fazakerley, and N. Sckopke, Observations of magnetosheath structure upstream of the magnetopause, in: *Cluster-II Workshop on Multiscale/Multipoint Plasma Measurements*, Imperial College, London, U.K., 22–24 September 1999, ESA SP-449, 347, 2000.
- Zarka, P., R.A. Treumann, B.P. Ryabov, and V.B. Ryabov, Magnetically-driven Planetary Radio Emissions and Application to Extrasolar Planets, *Astrophysics and Space Science*, in press, 2000.

#### **BOOKS** (worked on or completed at ISSI)

- Verheest, Frank, *Waves in dusty space plasmas*, (Vol. 245, Astrophysics and Space Science Library series), Dordrecht: Kluwer, 276 pp., 2000 (ISBN 0-7923-6232-2).

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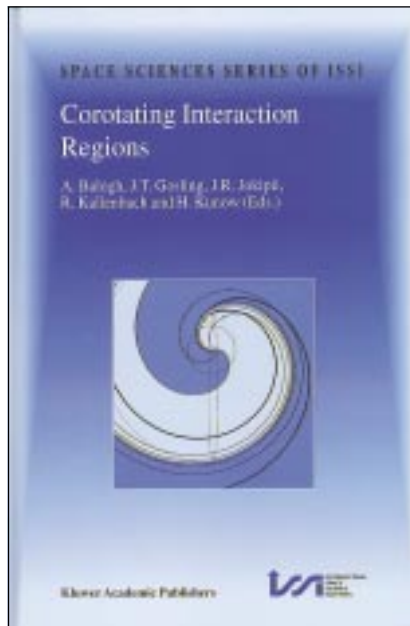
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1.	Analysis Methods for Multi-Spacecraft Data	Mar., Jun. 1996 / Jan. 1997	Jul. 1998
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### ***Corotating Interaction Regions***

Edited by A. Balogh (Imperial College, London, U.K.), J.T. Gosling (Los Alamos National Laboratory, New Mexico), J.R. Jokipii (University of Arizona, Tucson), R. Kallenbach (ISSI), H. Kunow (Universität Kiel, Germany), *Space Sciences Series of ISSI* (Vol. 7), Dordrecht: Kluwer Academic Publishers, Hardbound, ISBN 0-7923-6080-X, January 2000, 432 pp., and *Space Science Reviews* (Vol. 89, Nos. 1-2, 1999).

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A. Balogh, J.T. Gosling, J.R. Jokipii, R. Kallenbach, and H. Kunow, Introduction

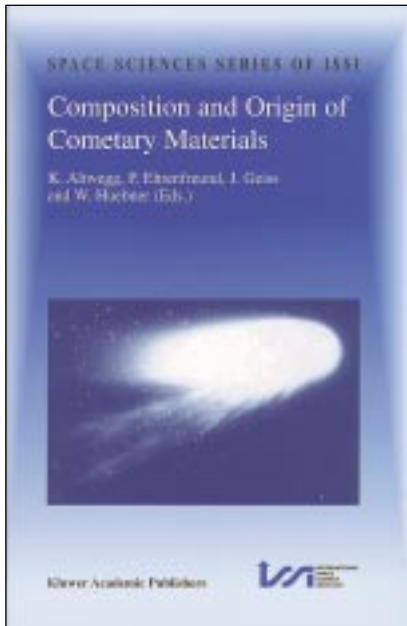
### **Introductory Papers:**

- R.J. Forsyth and E. Marsch, Solar Origin and Interplanetary Evolution of Stream Interfaces  
 J.T. Gosling and V.J. Pizzo, Formation and Evolution of Corotating Interaction Regions and Their Three-Dimensional Structure  
 A.J. Lazarus, et al., Voyager 2 Observations of Corotating Interaction Regions (CIRs) in the Outer Heliosphere  
 T.S. Horbury and J.M. Schmidt, Development and Effects of Turbulence in Connection with CIRs  
 G.M. Mason and T.R. Sanderson, CIR Associated Energetic Particles in the Inner and Middle Heliosphere

- G. Gloeckler, Observation of Injection and Pre-Acceleration Processes in the Slow Solar Wind  
 M. Scholer, Injection and Acceleration Processes in Corotating Interaction Regions: Theoretical Concepts  
 L.A. Fisk and J.R. Jokipii, Mechanisms for Latitudinal Transport of Energetic Particles in the Heliosphere  
 B. Heber and R.A. Burger, Modulation of Galactic Cosmic Rays at Solar Minimum

### **Working Group Reports:**

- A. Balogh, et al., The Solar Origin of Corotating Interaction Regions and Their Formation in the Inner Heliosphere – Report of Working Group 1  
 N.U. Crooker, et al., CIR Morphology, Turbulence, Discontinuities, and Energetic Particles – Report of Working Group 2  
 H. Kunow, et al., Corotating Interaction Regions at High Latitudes – Report of Working Group 3  
 P.R. Gazis, et al., Corotating Interaction Regions in the Outer Heliosphere – Report of Working Group 4  
 R.B. McKibben, et al., Modulation of Cosmic Rays and Anomalous Components by CIRs – Report of Working Group 5  
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### ***Composition and Origin of Cometary Materials***

Edited by K. Altwegg (University of Bern), P. Ehrenfreund (Leiden Observatory, The Netherlands), J. Geiss (ISSI), and W.F. Huebner (Southwest Research Institute, San Antonio, Texas), *Space Sciences Series of ISSI* (Vol 8), Dordrecht: Kluwer Academic Publishers, Hardbound, ISBN 0-7923-6154-7, 412 pp., and *Space Science Reviews* (Vol. 90, Nos. 1–2), 1999.

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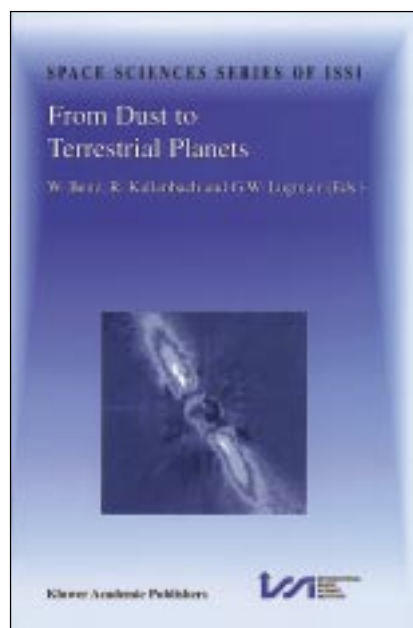
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### *From Dust to Terrestrial Planets*

Edited by Willy Benz (University of Bern), Reinald Kallenbach (ISSI), and Günter Lugmair (Max-Planck-Institut für Chemie, Mainz). *Space Sciences Series of ISSI* (Vol. 9), Dordrecht: Kluwer Academic

Publishers, Hardbound, ISBN 0-7923-6467-8, 432 pp., and *Space Science Reviews* (Vol. 92, Nos. 1-2, 2000).

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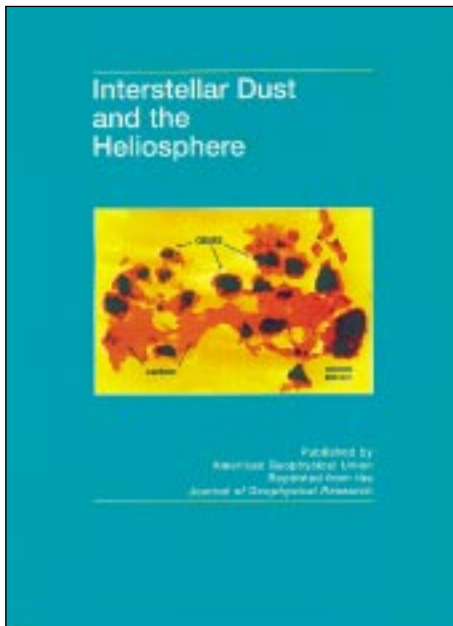
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