

## 1999 ANNUAL REPORT

### SCIENTIFIC COMMITTEE FOR SOLAR-TERRESTRIAL PHYSICS (SCOSTEP)

Joe H. Allen, Scientific Secretary

#### INTRODUCTION:

In 1978, by virtue of an action of the 17th ICSU General Assembly, SCOSTEP (previously an Inter-Union Commission in 1966-72, and a Special Committee in 1972-1978) became a Scientific Committee of ICSU with the following principal tasks:

- To promote international interdisciplinary programmes in solar-terrestrial physics, and to organize and coordinate such programmes of interest to and approved by at least two of the Participating Bodies.
- To define the data relating to these programmes that should be exchanged through the World Data Centres.
- To provide such advice as may be required by the ICSU bodies and World Data Centres concerned with these programmes. And,
- To work with other ICSU bodies in the coordination of symposia in solar-terrestrial physics, especially on topics related to SCOSTEP's programmes.

#### MEMBERSHIP:

SCOSTEP's Bureau consists of a President, Vice President, Scientific Secretary, and one representative each from the Participating Bodies (COSPAR, IAMAP, IAGA, IAU, IUPAP, and URSI). Current officers were elected in July 1999; they are: M.A. Geller (President), R.A. Vincent (Vice-president). J.H. Allen continues as Scientific Secretary. The other Bureau members and organizations they represent are: S.K. Avery (URSI), Yu.I. Galperin (COSPAR), B. Schmieder (IAU), F. W. Sluijter (IUPAP), T. Tsuda (IAMAS), and D. J. Williams (IAGA).

The General Council consists of representatives from 29 subscribing Adherents. Scientific Discipline Representatives (SDRs) are chosen for expertise in the various disciplines related to solar-terrestrial physics and involving scientists from differing geographical locations (47 scientists from some 19 countries are SDRs). Other members are Steering Committee, Working Group, and Panel Chairmen, as well as members of the Finance and Awards Committees. In addition, there are Representatives of three World Data Centres for STP; Representatives of two Affiliates (IUWDS and WMO); Representatives from eight ICSU participating bodies, and an ICSU Representative plus Correspondents from 12 countries. In total, some 400 scientists worldwide comprised SCOSTEP

at the end of 1999. The distribution list for SCOSTEP publications includes some 4,000 currently active scientists. Membership changes monthly in both groups, but an up-to-date list of the SCOSTEP Directory of members is on-line on the World Wide Web at:

<http://www.ngdc.noaa.gov/stp/SCOSTEP/scostep.html>.

#### VITAL STATISTICS:

Number of Members: Bureau Members - 9; Scientific Discipline Representatives - 47; Adherent countries - 29; Representatives from Affiliates - 2; World Data Centres - 3; ICSU - 1; Finance Committee - 2; Awards Committee - 3; Steering Committee and Working Group members - 150; Honorary Members - 4 (Sir Granville Beynon died in 1995); Correspondents - 12. (Some persons hold more than one position.)

#### ORGANIZATIONAL MATTERS:

SCOSTEP provides annual support of various levels to many different scientific meetings organized by ICSU bodies and other international scientific groups. Support ranges from co-sponsorship without funding, to a modest contribution toward the cost of some meetings in which SCOSTEP takes particular interest. Often, we provide support through participation by SCOSTEP members who provide expertise in solar-terrestrial physics and may represent on-going SCOSTEP scientific programs. As a minimum, the "International SCOSTEP Newsletter" provides a printed and on-line distribution mechanism for information about meetings involving some aspects of solar-terrestrial physics.

Scientific and Planning Meetings receiving SCOSTEP support in 1999:

- SCOSTEP Bureau, Program Directors and Long-Range Planning Group
- SCOSTEP General Meeting
- INTERBALL-ISTP Zvenigorod scientific meeting
- ISEA-10 scientific meeting
- Spring-99 American Geophysical Union scientific sessions
- IUGG-99 (IAGA and IAMAS-MAC) scientific sessions
- URSI-99 scientific meeting
- URSI-Urbana Workshop on Radio Studies of Turbulence

The SCOSTEP Bureau provides co-sponsorship of scientific meetings involving STP disciplines upon assurance that they are international in scope and that some representation among the program planning committee and meeting organization is accorded SCOSTEP. Current programs of SCOSTEP may, upon decision by their Steering Committee, provide co-sponsorship of meetings independently of the Bureau. Bureau co-sponsorship may be at the highest level with financial support and direct involvement in planning. It may be at the medium level with no financial support from the Bureau but with a support

recommendation to an existing program steering committee, or it may be at the lowest level involving only listing SCOSTEP as a co-sponsor.

### International Scientific Programs Conducted by SCOSTEP

Four new Post-STEP scientific programs began in January 1998 and continued operations during 1999. Each is scheduled to run for five years. Their activities are reported in the pages of the quarterly "International SCOSTEP Newsletter" (March, June, Sept and Dec 1999) and summarized in annual reports to the Bureau and the SCOSTEP General Council (see "STP Newsletter 1997/98", published December 1998 and mailed in 1999). The programs are:

- (I) S-RAMP (STEP Results, Applications and Modeling Program);
- (II) EPIC (Equatorial Processes Including Coupling);
- (III) PSMOS (Planetary Scale Mesosphere Observing System); and
- (IV) ISCS (International Solar Cycle Study).

Each of the programs has one or more websites on WWW. All may be accessed through the SCOSTEP homepage at: <http://www.ngdc.noaa.gov/stp/SCOSTEP>. The Space Weather Clearing House website serves as a self-contained site on the topic, but also provides a "clearinghouse" function to provide efficient links to both real-time monitoring and research sites devoted to Space Weather topics. In 1999, this site became the primary coordinator for the S-RAMP "Space Weather Month Campaign", September 1999.

### **S-RAMP (STEP: Results, Applications and Modelling Phase)**

Chairman: Prof. D.N. Baker (Dir. LASP, U. Colorado-Boulder)

<http://www.ngdc.noaa.gov/stp/S-RAMP/sramp.html>

Three major programs have been the focus of S-RAMP in 1999.

1. The first is the collection, dissemination, and study of information related to STP events during the March-April 1998 Special Study Period selected by the Steering Committee meeting in Taipei in summer 1998. Data displays from this active time have been collected and links to source groups provided by the S-RAMP Student Fellow in Boulder, Colorado (at the Secretariat). Using a wide array of datasets from the International Solar-Terrestrial Physics (ISTP) spacecraft, from ground-based facilities, and from operational satellites, we have found evidence of highly disturbed solar, solar wind, and geomagnetic conditions in late April and early May 1998. The combination of coronal mass ejections, solar flares, and high-speed solar wind streams during this interval led to a powerful sequence of solar wind drivers of magnetospheric processes at the Earth. The result of the compounding solar wind disturbances was to produce a deep, powerful, and long-lasting enhancement of the highly relativistic electron population throughout the outer terrestrial radiation zone. The kinds of disturbances witnessed during this remarkable interval are indicative of the types of events that may commonly occur during the approaching solar maximum. It is most important to determine how well

space systems can stand up to similar multifaceted effects of the space environment over the next several years as we pass through solar maximum.

There was also good evidence that many space weather related spacecraft anomalies occurred during this active interval (see Baker et al., EOS, p. 477, 1998), including the failure of the Galaxy-4 satellite at geostationary orbit which serviced over 45 million telephone pagers in the U.S. S-RAMP has collected and organized large sets of data and images for the April-May interval. These are widely available for analysis and interpretation.

2. The second major S-RAMP program is the Space Weather Month campaign proposed for September 1999 by Dr. Su. Basu, and implemented by the Space Weather Working Group of S-RAMP. The main website for this intense month of coordinated global observations was created by Prof. Janet Kozyra (U. Michigan). A short introductory paper by Prof. Kozyra and D. Webb to describe the "September 1999 Space Weather Month Campaign: What's New and What's Next" is published on-line by SCOSTEP and in a quarterly newsletter (March 2000). The following summary is taken from their paper.

"What is September 1999 Space Weather Month?"

*Space Weather Month, a month-long campaign interval during September 1999, was conceived and coordinated under the auspices of SCOSTEP's S-RAMP program. Its purpose is to study space weather events from their initiation on the Sun to their impacts at the Earth, including effects on space-based and ground-based worldwide assets and assessment of the accuracy of forecasting techniques. Special features of the campaign include: broad international cooperation, complete as possible coverage of the event through worldwide coordinated space and ground-based observations (including maximized coverage by the ISTEP program, the Oersted satellite and other spacecraft), enhanced forecasts by ISES, three scheduled Incoherent Scatter Radar World Days (15-17 September 1999), encouraged by involvement of the user communities, and participation of the forecasting community. A campaign website was set up [http://aoss.engin.umich.edu/intl\\_space\\_weather/sramp/](http://aoss.engin.umich.edu/intl_space_weather/sramp/) to handle the coordination of activities, post lists of participants, display links to campaign data, forecasts, prediction sites, real-time displays and archives. Information to date suggests that there were some 100 scientists from more than 15 countries among the participants in the observational phase of the campaign. The campaign is now moving into the post-event analysis phase.*

3. The First S-RAMP Conference convened by Prof. Y. Kamide (STE Lab, Nagoya U.), and Prof. H. Matsumoto (Kyoto U.) is well on track to be a major component of STP science in 2000. During 1999 the scientific program was completed, tutorial speakers selected, and session leaders and workshop organizers began to solicit invited speakers and contributions. The program comprises some 19 scientific discipline sessions spanning all the STP topics that made up the Solar-Terrestrial Energy Program (STEP) during the period 1990-1997. Also, there are 3 workshops on Space Weather Observation

Techniques, Satellite Anomalies, and the April-May 1998 / Sept 1999 Events. The Conference, scheduled for 2-6 October 2000, in Sapporo, Japan, is described in detail in issues of the "International SCOSTEP Newsletter" and on-line at the website established for the meeting. A 2<sup>nd</sup> Circular was mailed and copies are available from the organizers and the SCOSTEP Secretariat.

### **ISCS (International Solar Cycle Study)**

Co-Chairmen: Prof. S.T. Wu (U. Alabama) and Dr. V. Obridko (IZMIRAN)  
<http://cspar.uah.edu/iscs>

Details about the organization of ISCS (e.g., Steering Committees, projects), meetings, campaigns, results, etc. are available on-line at the website. Members of ISCS include project scientists on currently active satellites aimed at the Sun: Yohkoh and SOHO. The program (successor to SOLERS-22 in STEP) has 3 Working Groups with several Panels, sub-groups and campaign groups.

WG-1: Solar Energy Flux Study: From the Interior to the Outer Layer

Panel 1: Variations in Total and Spectral Irradiance from IR to UV-200 nm.

Panel 2: Variations in Far UV, EUV, X-ray and Particle Fluxes

Panel 3: Solar Indices, Cosmogenic Isotopes, Solar-Stellar Relations.

WG-2: Solar Magnetic Field Variability Study: From the Lower Atmosphere through the Inner Corona

WG-3: Solar Emissions: Origins and Transport through the Heliosphere

SG-1: Dynamic solar emissions in the increasing and maximum portion of solar cycle 23

SG-2: Propagation in the interplanetary medium (coronal mass ejections, interplanetary shocks, and energetic particles)

SG-3: Interaction of coronal mass ejections and solar wind streams with Earth's magnetosphere.

At the December 1999 ISCS Steering Committee meeting at the Fall AGU in San Francisco, the following actions were taken:

- ISCS will appropriate \$3,500 from its annual budget to provide registration fees for some East European and Russian scientists to attend the COSPAR meeting in Warsaw. This is in lieu of holding a more formal symposium in a nearby venue during a week adjacent to the COSPAR.
- ISCS appropriated \$1200 to buy the "Proceedings of the Nagoya workshop" to be published as a special issue of *Advances in Space Research*, 2000.
- Appropriated \$500 to support two participants to attend the Western Pacific American Geophysical Meeting at Tokyo in June 2000. Dr. T. Watanabe (ISCS) has organized 2 sessions there about ISCS activities.
- WG-1 Chairs (J. Pap and C. Frohlich) agreed to serve as Co-chairs of the 2001 ISCS Workshop Organizing Committee for the meeting to be held at

Boulder, Colorado in conjunction with the 10<sup>th</sup> STP Symposium. They also will serve as editors of the workshop proceedings.

ISCS sponsored a special session "The Solar Atmosphere: Multi-instrument campaigns to study solar coronal mass ejection onsets and developments", at the European Geophysical Society General Assembly, in April 1999 in the Netherlands.

ISCS members helped organize and participated in the SHINE-99 Workshop in Boulder, Colorado during June 1999.

ISCS also sponsored two special IAGA sessions in Birmingham, U.K. during the XXII<sup>nd</sup> IUGG General Assembly in July 1999. The topics were: Solar Variability and Climate; and CMEs, Prominence Eruptions and Flares: Onsets and Relationships.

### **EPIC (Equatorial Processes Including Coupling)**

Co-chairmen: Prof. S. Fukao (Kyoto U.), Prof. J. Forbes (U. Colorado-Boulder), and Prof. R.A. Vincent (U. Adelaide)

<http://www.kurasc.kyoto-u.ac.jp/~epic>

The EPIC Steering Committee met in Hawaii during March 1999 and held an open meeting for all interested scientists at the 22<sup>nd</sup> IUGG in Birmingham, U.K. during July 1999. At both, discussions centered on various meetings ahead, events of opportunity, and possible experimental campaigns. The main points are:

1. EPIC partially supported two international conferences held in 1999. Possible venues for future EPIC symposia are during the SCOSTEP 10<sup>th</sup> International STP Symposium (Boulder, June 2001) and at ISEA (May 2000). K. Hamilton and J. Forbes proposed holding a 2-week school on "Physics of the Equatorial Atmosphere and Ionosphere" at the International Center for Theoretical Physics (ICTP) in Trieste, Italy, in the spring of 2001. This would be particularly attractive to and accessible for young scientists from developing countries.
2. A major EPIC campaign should be held in November 2001 in conjunction and collaboration with the proposed ETCE (Effects of Tropical Convection Experiment) campaign in Northern Australia (if approved) and concentrate on the effects of convectively-generated gravity waves on the structure, dynamics, chemistry, emissions and plasma physics of the equatorial atmosphere/ionosphere system in all longitude sectors.
3. A second major campaign focus for EPIC will be planned to be conducted using joint ground-based and satellite-based measurements. April and November are months of enhanced Kelvin wave activity in the upper mesosphere, and thus may serve as "core" periods for this campaign focus.

4. A third major campaign focus for EPIC will focus on analyses of archived data such as radio scintillation data with an index for deep convective activity (i.e., OLR data) to see if spatial/temporal relationships exist.
5. It was agreed that magnetically conjugate E-region measurements be incorporated into future EPIC campaigns. Measurements, theory and modeling pertaining to E-field vertical penetration due to thunderstorms and their Ionospheric effects are also to be integrated into the EPIC science agenda and campaign planning. EPIC continues to coordinate with ongoing projects WESTPAC (Tsunoda, USA) and PREASA (Igarashi, Japan).
6. A Japanese project to establish an observatory with a wind profiling radar called Equatorial Atmosphere Radar (EAR) in Indonesia was funded. It is expected to be a regional center for equatorial atmosphere research in Southeast Asian countries.

### **PSMOS (Planetary Scale Mesosphere Observing System)**

Co-chairmen: Prof. G. Shepherd (U. Toronto), Dr. M. Hagan (UCAR)

<http://www.hao.ucar.edu/psmos/home.html>

PSMOS was represented in May 1999, at the AGU meeting of the S-RAMP Steering Committee by M. Hagan, who discussed opportunities for joint cooperative projects involving magnetospheric satellite data and middle atmosphere data from new, low-altitude satellites.

G. Shepherd attended the Bureau meeting in July 1999 at Cosenor's House, Abingdon, U.K. and reported on PSMOS activities (to be published in the 1999/2000 STP Newsletter. The Bureau noted with pleasure the involvement of scientists from smaller countries, particularly those in equatorial regions.

During the XXII IUGG in Birmingham, the PSMOS Steering Committee met in July 1999. They reviewed progress of PSMOS, the initial working groups formed (see website for details), and the present "science definition phase" arising from the DYSMER Symposium in Kyoto in March 1998. Six projects are developing. Results will be presented at the PSMOS 2000 Workshop to be held in Toronto in May 2000. For 2001, PSMOS will meet at the STP Symposium in Boulder rather than with IAGA or IAMAS. The Steering Committee preferred the latter option. For the 2002 meeting, the final one in the first PSMOS period, the group will probably meet separately again. H. Takahashi proposed Brazil at a meeting site, although Europe is also possible.

After the session JSM-01 at IUGG, where a number of PSMOS scientific papers were given, there was a PSMOS General Meeting in Birmingham. After a brief overview, there was discussion about the announcement of campaigns and how they were organized. This is important, because the incoherent radar facilities make up their schedules far in advance (see above in re Space Weather Month). Working Groups made presentations: (1) Optical winds and temperatures.

(2) Radar Winds; (3) Optical emissions and imaging; (4) Planetary scale description; (5) Modeling; and (6) Satellite coordination.

Six project reports were given:

1. Global scale tidal variability
2. Long-period airglow variability
3. Experimental and numerical studies of longitudinal variability in the global structures of prevailing winds and tides
4. Day-to-day variations in relation to planetary scale processes
5. Gravity wave parameterization
6. Comparison of optical and radar tidal phase.

Brief national reports were given by K. Shiokawa on the Japan PSMOS program; and Gurubranan on the Indian PSMOS program. Discussion was held about the high latitude measurement of PMSE in the Arctic and Antarctic, about the MST Workshops (held since 1980). The 9<sup>th</sup> MST Workshop was in India in 1997 and the next will be in March 2000 in Toulouse. PSMOS agreed to provide some financial support.

PSMOS is gaining momentum and growing in complexity. As individuals take on more responsibility for various activities, it is more important to make regular use of the worldwide web for share timely information with all participants. It is time to consider what should follow 2002, the end of the first PSMOS period. It will be unfortunate if the global community built up for this type of study does not continue in some form, perhaps with re-directed objectives depending on the program focus into which it is integrated.

“STP Newsletter” Publication for 1997/98”.

The “STP Newsletter” was started in 1976, in support of the International Magnetospheric Study (IMS). From 1976-1979 it was a monthly hard-copy newsletter mailed directly to up to 4,000 persons worldwide. From 1980, it became an annual publication printed and distributed for SCOSTEP by World Data Center-A for Solar-Terrestrial Physics at the end of each year. In 1995, the first full year for the Secretariat to operate from Boulder, Colorado, and under a new Scientific Secretary, it was not possible to maintain publication of the “STP NL” and begin publication of a quarterly “International STEP Newsletter.” The series was slipped to a biennial publication on a schedule that covers the most recent General Meeting with reports from national Adherent Representatives. This series has value to individuals and for libraries and Adherent offices because it is the official record of minutes of Bureau and General Council meetings, and for meetings of program Steering Committees. Although the most recent volume was printed in December 1998, distribution was not completed until January 1999.



## HONORS TO SCOSTEP Members:

- Prof. C.-H. Liu, immediate past-President of SCOSTEP was elected a member of the Academia Sinica-Taipei. Prof. Liu continues to serve as President of the National Central University (Chung Li, Taiwan). He is the first space scientist elected to this Academy.
- Prof. H. Oya (Sendai University) received a special honor on 3 November 1999: the "Purple Medal", given by Japan to acknowledge remarkable and extraordinary achievement in fields of Science or Arts. This government award is given with the Emperor's authority, and usually is given to only one person in a specific field every 10 years. Prof. Oya is immediate past Vice-President of SCOSTEP.
- Dr. Tuija I. Pulkkinen (Finnish Meteorological Institute) won the 1998 Macelwane Medal of the American Geophysical Union and was selected in 1999 for a significant award in Finland. Dr. Pulkkinen received the City of Helsinki Science Award. In past years, this award was given to senior scientists and educators, so the selection of a younger research scientist is a bit of a departure. At the presentation ceremony in May 1999, she gave a speech summarizing her work on solar-terrestrial physics and its potential effects on human technological systems.
- Prof. Y. Kamide succeeded Prof. S. Kokubun as Director of the Solar-Terrestrial Environment Laboratory (STEL) of Nagoya University. Prof. Kamide organized the Lake Hamana meeting ISC-4 in March 1998, the COSPAR Assembly at Nagoya in July 1998, and is co-organizer of the First S-RAMP Conference at Sapporo, Japan in October 2001. He is a member of SCOSTEP's S-RAMP Steering Committee.

## 17. CONCLUSION AND FUTURE PLANS:

SCOSTEP is fully involved with the new Post-STEP programs listed above. S-RAMP is planning a comprehensive Conference to be held in Sapporo, Japan on 2-6 October 2000. The annual Bureau meeting will be at this Conference. PSMOS will hold a separate scientific meeting in 1999 but is also participating in the Sapporo meeting.

The new President (Geller) and Vice-President (Vincent) are already active in directing a dynamic, growing SCOSTEP. Particular emphasis is being placed on the Long-Range Planning Committee (LRPC) chaired by Dr. Brigitte Schmieder (France). The LRPC was filled-out by the Bureau in 1999, and members now are: Su. Basu, W. Baumjohann, J. Lean, T. Ono, and R.A. Vincent. They will meet early in 2000 with M.A. Geller, D.J. Williams, and other invited persons to work on a draft of a Long-Range Plan to submit to SCOSTEP. In 1999, the Bureau received a proposal that SCOSTEP approach IAGA, IAMAS, IUGG, and other ICSU bodies about a program to follow 50 years after the International Geophysical Year (IGY: 1957/58). Initiatives are being pursued to integrate SCOSTEP LRPC plans with some "IGY+50" activity.

The ICSU-related body SPARC (Stratospheric Processes and their Role in Climate) approached SCOSTEP about working jointly to explore Long-Term Trends and Solar Effects. SCOSTEP responded favorably and expects to begin a new effort in 2000. M. Geller will raise this topic at the WCRP Joint Steering Committee meeting in early 2000, in Japan. Probably SCOSTEP will join with SPARC in a project to **Assess Long-Term Trends in the Upper Atmosphere**, and with WCRP to **Assess Proposed Solar-Climate Relations (including mechanisms)**. The latter program would include changes in UV radiation impacting the upper atmosphere and effects of cosmic rays on clouds (joint with GEWEX). There appears to be opportunity for a more active interaction in 2000 and beyond between SCOSTEP, WCRP and IGBP.