

2004 ANNUAL REPORT

SCIENTIFIC COMMITTEE ON SOLAR-TERRESTRIAL PHYSICS (SCOSTEP)

J. H. Allen, Scientific Secretary

Major research and education activities

SCOSTEP is a scientific committee of the International Council for Science (ICSU, formerly International Council of Scientific Unions). It is charged with the long-term responsibility to promote international interdisciplinary programs in Solar-Terrestrial physics. Members are called "Adherents" and may be a single nation or a regional or institutional body. Usually within a country the adherent body is a part of the Academy of Sciences.

Scientific Meetings 2004

March – International Heliophysical Year US Planning Workshop at National Solar Observatory, Sunspot, New Mexico. Prof. M.A. Geller (President SCOSTEP), Prof. Sunanda Basu (Chair CAWSES SSG), and Prof. Janet Kozyra (CAWSES WG on Space Weather) participated in a 3-day meeting to develop scientific plans for participating in the IHY (2007-2008) on the 50th Anniversary of IGY. They described elements of SCOSTEP's CAWSES program that will coincide during its last two years with IHY. Geller summarized "Earth, Atmosphere and Climate", Sunanda gave details about CAWSES organization and planning, and Janet described results from the first CAWSES Scientific Campaign (see below under "Science").

June – Prof M.A. Geller (President SCOSTEP), Prof. Sunanda Basu (Chair CAWSES SSG), and Joe Allen (SCOSTEP Scientific Secretary) were invited guests of the Japanese CAWSES program for the kickoff meeting of CAWSES-JAPAN at Irigo, Japan. The 3-day meeting spanned all CAWSES scientific theme areas. About 50 oral presentations were given and more than 40 poster papers were included in the meeting. CAWSES-JAPAN is under a major university science initiative grant for "outstanding" science and will be funded for at least three years with eligibility for an extension beyond that time.

June/July - Su. Basu, S. Avery, J. Kozyra, and J. Sojka presented materials related to CAWSES at the 2004 CEDAR Workshop in Santa Fe, New Mexico. A session was devoted to results from the First CAWSES Space Weather Campaign, organized by Janet Kozyra. It included papers arising from observations during the joint observational campaign of CAWSES and CPEA (Coupling Processes in the Equatorial Atmosphere) in March-April 2004.

July – CAWSES first workshop combined members of the CAWSES SSG, SCOSTEP Bureau, and CAWSES Theme (Working Group) leaders at the Royal Astronomical Observatory, Paris, France during the weekend before COSPAR. This 2-day meeting combined scientific papers and planning efforts to direct the remaining years of CAWSES.

At COSPAR, SCOSTEP's President, Vice-President, Scientific Secretary, and many members of CAWSES presented invited and contributed scientific papers. A session organized by Judit Pap (CAWSES WG-4.1) reviewed Solar Influences on Earth Weather. A significant invited review paper was presented by SCOSTEP's C. de Jager.

At the SCAR General Assembly in Bremen the week after COSPAR (in Paris), SCOSTEP Bureau member Dr. Maurizio Candidi convened discussions about CAWSES and invited Prof. F.-J. Luebken (Germany) to present a review of CAWSES.

September – The IAU Symposium in Beijing, China included a session on Space Weather that was organized by CAWSES Theme leaders for that topic, Profs. J. Kozyra and K. Shibata. SCOSTEP contributed funding for a developing country in S. America to attend.

October – S.-T. Wu (Vice-President SCOSTEP) was co-organizer of the “Challenges in modeling the Sun-Earth System” workshop in Huntsville, Alabama. Participants included many scientists from the completed SCOSTEP ISCS program and those currently involved in CAWSES.

Major findings:

SCOSTEP will continue to serve the international community by planning and organizing international programs in the Solar-Terrestrial physics requiring a great deal of coordination. In the U.S., the Board on Atmospheric Sciences and Climate (BASC) oversees US participation in SCOSTEP (formerly the task of the Committee on Solar-Terrestrial Research). It assists in the planning process and organizes U.S. participation in these programs. SCOSTEP scientists present their findings on-line in project websites, at meetings of national, regional, and international scope, and in publications. They report annually to ICSU.

In 2004, SCOSTEP's new comprehensive international scientific program, CAWSES (Climate and Weather of the Sun-Earth System – 2004-2008) began its observational phase. Scientific meetings in which we participated (see above) already have begun to include papers and results arising from this CAWSES campaign and from scientific efforts by CAWSES participants.

A CAWSES program office at Boston University was established and has its own independent website. Start-up funding for this effort to coordinate scientific research within CAWSES and to promote education and scientific capacity building were provided by a special grant from Dr. M. Leinen (NSF) to support SCOSTEP. Prof. Sunanda Basu recruited Dr. D. Pallamraju ("Raju") to be the coordinating scientist for the CAWSES Office and Ms. Lisa Verkauteren as office secretary. Lisa corresponded with scientists proposed to be members of CAWSES Working Groups and has organized the CAWSES Website: <http://www.bu.edu/cawses/>. They compiled a mailing list from input provided by the SCOSTEP Secretariat and published two newsletters with financial support from SCOSTEP (March and September). Copies of newsletters and information about CAWSES programs, participants, and campaigns are available at the website.

Research and teaching skills and experience the project helped provide to those working on it:

PowerPoint presentations about STP topics including Satellite Anomalies; Planetary and Space Science; Solar Physics; Magnetospheric Physics; and the new international science program CAWSES are available on-line. Lectures were presented at universities of opportunity in developing and industrialized countries.

Outreach activities:

<http://www.ngdc.noaa.gov/stp/SCOSTEP/scostep.html> is the website URL for the site maintained at NOAA's NGDC by the SCOSTEP Secretariat in Boulder, Colorado. It contains text of past newsletters, active links to CAWSES and other timely websites, text and figures relating to satellite anomalies and other responses of technology and humans to solar activity, ionospheric disturbances, and geomagnetic storms.

<http://www.bu.edu/cawses/> is the website URL for the new CAWSES Program Office established at Boston University with support from SCOSTEP and the U.S. National Science Foundation.

SCOSTEP provides information about scientific topics involving Sun and Earth relations in publications and on-line. They also distribute information and presentations to teachers and students on CD-ROM. They provide active links from their website to those of NOAA, NASA, and University programs as well as websites operated by individual SCOSTEP programs. SCOSTEP has provided funding and faculty for the International School of Physics' (Trieste, Italy) School on Equatorial Aeronomy. Courses at this institution are particularly accessible to young scientists and students from Africa.

Publications:

Internet Dissemination: <http://www.ngdc.noaa.gov/stp/SCOSTEP/scostep.html> (see links here)
<http://www.bu.edu/cawses/>

Other: International SCOSTEP Newsletter - The newsletter disseminates information among scientists throughout the world working on or interested in, solar-terrestrial physics.

CAWSES Newsletter - This newsletter (described above) educates and organizes efforts related to CAWSES science.

AGU Monograph # 141: **“Solar Variability and Its Effects on Climate”**, Edited by Judit M. Pap and Peter Fox, AGU Press, 2004, 366 pages. This volume resulted from research conducted in SCOSTEP’s ISCS (International Solar-Cycle Study) program and presented in the Quadrennial STP Symposium # 10, Longmont, Colorado in June 2001.

“Auroral Phenomena and Solar-Terrestrial Relations: Proceedings of the Conference in Memory of Yuri Galperin”, Edited by L.M. Zelenyi, M.A. Geller, and J.H. Allen, CAWSES Handbook-1, Boulder, December 2004, 465 pages. The papers contained in this book were given in a memorial conference in Moscow, Russia (3-7 February 2003). Papers were translated into English in Moscow by IKI and other staff. The SCOSTEP Scientific Secretary edited and assembled the papers in publication format. NASA GSFC paid the printing costs. IKI received 275 copies for distribution to European authors, NASA received 100 copies, and the SCOSTEP Secretariat is distributing 225 copies to SCOSTEP and CAWSES members, including national Adherent Representatives.

Contributions to principal disciplinary field(s) of SCOSTEP projects:

SCOSTEP works within the ICSU framework to encourage cross-disciplinary conferences and to facilitate cross-project cooperation and multi-national research collaboration. SCOSTEP conducts programs with a scientific goal to advance quantitative understanding of coupling mechanisms responsible for the transfer of mass and energy throughout the Solar-Terrestrial system. The practical goal is to improve predictability of the effects of the variable components of solar energy and disturbance on the terrestrial environment. Disturbances range from operational problems with satellite and aircraft communications systems to blackouts of electric power grids.

Organization:

SCOSTEP's Bureau is comprised of a President, Vice-President, Scientific Secretary, and representatives from each ICSU Participating Body (COSPAR, SCAR, IAMAP, IAGA, IAU, IUPAP, and URSI). It directs the SCOSTEP Secretariat, which conducts daily operations. New Bureau member in 2003 is: M. Candidi (SCAR). The SCOSTEP General Council consists of representatives from 30 subscribing Adherents. Brazil was added in June 2001. Scientific Discipline Representatives (SDR) to SCOSTEP also are Council members. They are chosen for expertise in disciplines that span Solar-Terrestrial physics and to achieve balanced national and regional representation. As SDR's, some 47 scientists from 19 countries guide SCOSTEP in the planning of international programs and convey information about SCOSTEP programs to their colleagues. Other council members are Chairs of the program Steering Committees, Working Groups, and Panels, as well as members of the Finance and Awards Committees. There are representatives of three World Data Centers for STP, two Affiliates (IUWDS and WMO), representatives from eight ICSU participating bodies, and an ICSU representative. Twelve correspondent countries are recognized by SCOSTEP, and participate in Council discussions, but are not voting members.

Some 400 scientists were directly involved in SCOSTEP programs at the end of 2004, and about 4,000 are on the mailing list to receive SCOSTEP and CAWSES publications such as newsletters and technical reports. The updated core membership directory is available at the SCOSTEP site on-line at: <http://www.ngdc.noaa.gov/stp/SCOSTEP/scostep.html/> and the homepage provides active links to accounts of past SCOSTEP programs (S-RAMP, ISCS, PSMOS, and EPIC), the current CAWSES, and related groups.

Contributions to non-STP disciplines:

None

Contributions to human resource development in science, engineering, and technology:

The SCOSTEP homepage contains information for scientists involved in the Solar-Terrestrial field. Materials on the web site describe the progress in improving knowledge of Solar-Terrestrial sciences and can be used as an educational resource for science and technology training.

Contributions to physical, institutional, and information resources for research and education:

National scientific programs in CAWSES and supporting program offices have been organized in Germany, Japan, and India (see CAWSES newsletters on-line for details).

The German DFG (equivalent to US NSF) has established CAWSES-Germany as a Special Program and provided funding that will support some 25 scientists at different institutions in Germany for up to 6 years and pay for their research projects under the program. This was a very competitive process with around 200 applicants from which about 5 were selected for support. The Director of the German CAWSES Program is Prof. F.-J. Luebken (he is also co-leader of CAWSES WG-3 for SCOSTEP).

In Japan, a unified CAWSES program is emerging under leadership of Prof. T. Tsuda (Kyoto), Prof. R. Fujii (Nagoya) and Prof. Y. Kamide (Nagoya-Toyohashi). All are involved in SCOSTEP and CAWSES leadership.

The Brazilian Academy of Sciences invited SCOSTEP to hold its next Quadrennial STP Symposium (# 11) in Rio de Janeiro, in March 2006. The first announcement is on-line and can be linked from the SCOSTEP homepage. The local organizers in Brazil and the SCOSTEP Executive are seeking financial support, especially for invited keynote speakers (including three from the USA), a public lecture speaker (Prof. J.G. Roderer, Alaska), and to support young scientists and students from developing countries.

Contributions to public welfare beyond science and engineering (e.g., by inspiring commercialized technology or informing regulatory policy):

An unusually high level of solar activity (flares and coronal mass ejections) on the declining side of the solar cycle in October-November 2003 gave rise to numerous effects on satellites and ground-based technology as well as threatening the health and safety of astronauts aboard the International Space Station. As solar minimum approaches, an increase is expected in high-energy electrons at satellite altitudes that will impair their operation. The advent of increased activity in the rise to maximum of the next solar cycle is expected to lead to increased interests in the SCOSTEP subject matter. This will bring increased visibility to SCOSTEP and should permit it to have an increasingly important voice in international collaboration in the solar-terrestrial sciences. Sessions on these events have been prominent at scientific meetings such as the American Geophysical Union Fall and Spring meetings. Joe H. Allen, SCOSTEP Scientific Secretary, co-authored a paper published electronically in the AGU's Journal of Space Weather on effects of the 2003 "Halloween Storm" and it was selected to be published in 2004 in the limited quarterly print edition.

Further large solar eruptions in November 2004 (and in January 2005) seriously affected satellites and other technology and astronauts in orbit. SCOSTEP continues to play an active role in identifying problems that occur and conditions possibly playing a causal role. The Scientific Secretary maintains a restricted electronic group "ANOM" to which messages are sent about these phenomena and requests may be made. About 200 names are currently

active. A recent query from a program manager of an aerospace company (in Dulles, VA) about stability of star tracker electronic elements for satellites resulted in positive feedback from 10 or more members of the ANOM group.

Among the participants in ANOM are stockbrokers, aerospace insurance company executives, aerospace engineers and scientists, electric power company executives and support groups, teachers, national security groups, and military. This work, done under SCOSTEP, has wide applicability to a broad array of public activities beyond the immediate scope of scientific research and programs.

Scientists actively working in CAWSES are making progress in identification of long-term trends in interactions between solar activity and Earth's upper atmosphere and possible links to Earth climate.