SCOSTEP Annual Report (1/1/05-12/31/05)
Joe H. Allen, Scientific Secretary
2/23/2006

SCOSTEP is a scientific committee of the International Council for Science (ICSU, formerly International Council of Scientific Unions). It is charged with long-term responsibility to promote international interdisciplinary scientific programs in solar-terrestrial physics. In most countries that are members of SCOSTEP, their representation is based in the Academy of Sciences or similar body. Some countries have special committees for SCOSTEP. Often the "Adherent Representative is an internationally-known, active participant in world science. Each member country or region selects its representative and informs SCOSTEP. They also elect to pay an annual "Subscription" to fund SCOSTEP operations. There are several different funding levels and each country selects that level appropriate to their direct interest in Solar-Terrestrial Physics. Voting by Adherents at the SCOSTEP General Meetings is proportionate to the funding level they have selected.

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. A new Bureau member added in 2003 was M. Candidi (SCAR). The SCOSTEP General Council consists of representatives from 30 subscribing Adherents. Brazil was added in June 2001. In 2005, URSI selected Dr. Christian Hanuise (France) and the International Astronomical Union (IAU) selected Dr. Nat Gopalswamy (USA) as their new Bureau representatives, replacing the long-serving Prof. Susan Avery and Dr. Brigitte Schmieder, respectively.

Scientific Discipline Representatives (SDR) to SCOSTEP are also Council members. They are chosen for expertise in disciplines that span solar-terrestrial physics and to achieve balanced national and regional representation. As SDRs, some 47 scientists from 19 countries guide SCOSTEP in the planning of international programs, and convey information about SCOSTEP programs to their colleagues. The usual term of an SDR is 8 years. 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 2005, 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 contains active links to accounts of past SCOSTEP programs (S-RAMP, ISCS, PSMOS, and EPIC), the current CAWSES program, and many STP-related groups.

In 2005, SCOSTEP had only one umbrella international scientific program in progress. It is: **Climate and Weather in the Sun-Earth System** (CAWSES). There are four scientific working groups in CAWSES:

1. **Solar Influence on Climate**, Co-chairs: M. Lockwood (UK) and L. Gray (UK);
2. **Space Weather: Science and Applications,** Co-chairs J. Kozyra (USA) and K. Shibata (Japan);
3. **Atmospheric Coupling Processes**, Co-Chairs F.-J. Luebken (Germany) and J. Alexander (USA); and
4. **Space Climatology**, Co-chairs C. Froehlich (Switzerland) and J. Sojka (USA).

Oversight for a cross-cutting CAWSES topic on **Capacity Building and Education** is under the direct attention of the SCOSTEP President, Vice-President, and Scientific Secretary.

Scientific Meetings 2005

May – In mid-May 2005, the International Symposium on Equatorial Aeronomy (ISEA) held their 11th quadrennial meeting in Taipei, Taiwan with substantial participation by SCOSTEP scientists. The CAWSES (Climate and Weather of the Sun-Earth System) program of SCOSTEP held a 1-day Space Weather Workshop as part of the ISEA meeting. Also the CAWSES group Coupling Processes in Equatorial Aeronomy (CPEA) organized one day of the ISEA-11 meeting.

June – The CAWSES theme group #1 organized a special evaluation and planning meeting on Solar Variability and Planetary Climates at the International Space Science Institute (ISSI) in Bern, Switzerland. Financial costs of the meeting were mainly underwritten by ISSI and the European Union members. Results from the meeting will be published in a report and are guiding the development of programs under theme #1.

July – CAWSES theme group #4 organized a workshop on Solar Irradiance Variability in July during the meeting there on Solar Variability & Earth and Climate in Catone, Italy (near Rome). SCOSTEP partially funded the cost of this workshop.

Also in July there was a joint workshop on ICESTAR-CAWSES campaigns in Santa Fe, New Mexico (concurrent with the NSF's CEDAR-2005 meeting). ICESTAR is a program arising in the ICSU Scientific Committee on Antarctic Research (SCAR) which is represented on the SCOSTEP Bureau by Dr. Maurizio Candidi (Italy).

August - The International Association of Meteorology and Atmospheric Science (IAMAS) held its biennial scientific conference in Beijing. Part of the program was a workshop on Solar Activity and Earth's Weather and Climate. It was organized by theme #1 of CAWSES. SCOSTEP gave funding to support participation by developing-country students and young scientists.

October – The International Union of Radio Science (URSI) held its quadrennial General Assembly in New Delhi, India and many SCOSTEP scientists participated. The Chair of the CAWSES Scientific Program Committee, Prof. Sunanda Basu, gave an invited All-Union lecture (see below).

November – China-Taipei has organized a regional CAWSES office for "Asia, Oceania, and Pacific Region" (AOPR) nations. In November they held an AOPR workshop at National Central University (NCU), Chung-Li, Taiwan. During this workshop a special meeting was held on "Capacity Building" for developing countries in this region.

December – Following the Fall AGU meeting in San Francisco, theme #1 of CAWSES organized a Space Weather Workshop nearby at Stanford University.

RESULTS -

Summaries of results from these scientific meetings have been published in issues of the "CAWSES Newsletter" in 2005. In addition, invited talks about SCOSTEP/CAWSES science results and program plans were presented by:

- SCOSTEP President M.A. Geller – Meeting at ICSU in October 2005
- CAWSES Office Chief Scientist Dr. D. Pallamraju - "CAWSES Science and its relation to I*Y programs" at the CEDAR-2005 Workshop in Santa Fe, NM.
- Prof. Sunanda Basu – "CAWSES Science", the IAGA Association Lecture during the meeting in Toulouse, France.
- Prof. Sunanda Basu – "Impacts of Extreme Solar Disturbances on the Earth's Near-Space Environment", URSI General Lecture in October in New Delhi, India.

OUTREACH EFFORTS –

Prof. Y. Kamide (Solar-Terrestrial Environment Laboratory, Nagoya University) has led in the preparation of colorful, informative and factual "comic books" on scientific topics. Collectively they comprise the "What Is …" series of publications. In 2005, SCOSTEP Scientific Secretary Joe H. Allen collaborated with Y. Kamide to edit two new comics in this series:

- "What is the Ozone Hole?!" and
- "What is the Solar Wind?!".

SCOSTEP paid some of the author and translator costs to render these comics into English. They also paid the supplemental printing costs to obtain a supply of them for mailing to SCOSTEP and CAWSES participants and others who may be interested in educational efforts for elementary-age school children. The comics tell, in graphic detail, the efforts of a young Japanese girl "Mol" and her robot-dog "Mirubo" to learn about timely STP topics such as ozone and solar wind (earlier books covered "Aurora" and "Geomagnetism"). The author of the series is "Hayanon", as writer and cartoonist who has contributed serials in popular magazines based on her strong background in physics and computer games (graduate of Ryukyu University). Costs of preparation of the books also were supported by "Kodomo no Kagaku" (Science for Children), a science magazine for juniors that has been published since 1924. The comics open and close with factual illustrated scientific information about the topic, and colleagues have noted that a lead character in all issues (the "Sensei") to whom Mol and Mirubo go with their questions and worries bears a striking resemblance to my close friend Prof. Yohsuke Kamide.

Copies of these comics were mailed late in 2005 to some 100 individuals and institutions by the SCOSTEP Secretariat. In the cover letter to international Adherent Representatives to SCOSTEP, the possibility was raised that international copyright to the contents could be made available if organizations in member nations wanted to have the figures and text to translate into their own languages.

CAPACITY BUILDING SUPPORT -

Internet Dissemination: http://www.ngdc.noaa.gov/stp/SCOSTEP/scostep.html (see links here)

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

Articles by SCOSTEP members are published regularly in refereed journals and in other mass publications.

Financial support from SCOSTEP and its CAWSES' budget were used for graduate students from developing countries to help them attend the ISEA-11 meeting in Taipei. Funds sent to the workshop in Catone, Italy were used to support scientists from developing countries. SCOSTEP co-sponsored scientific sessions at IAGA in Toulouse and paid some expenses for participation by scientists from developing countries. Finally, SCOSTEP agreed to use significant CAWSES funds to support the International Advanced School on Space Weather at ICTP in Trieste, Italy in May 2006. The first funds were transferred in 2005 ($5K).

ACTIVITIES -

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.

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

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, who is co-leader of CAWSES WG-3 for SCOSTEP.

In Japan, a unified CAWSES program is emerging under leadership of Prof. T. Tsuda (Kyoto) and Prof. Y. Kamide (Nagoya-Toyohashi). Both 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 second announcement is on-line with the current scientific program and can be linked from the SCOSTEP homepage. Side meetings are being planned in Rio by international groups affiliated with SCOSTEP and other ICSU programs. The program for STP-11 was roughed-out at the May Bureau meeting in Taipei and has been the object of much work by the President and Scientific Secretary. We look forward to a very successful meeting, although availability of international financial support for meetings has been very restricted. The Local Organizing Committee in Brazil has had success in raising most of the support for STP-11 beside that provided by SCOSTEP and CAWSES.

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.

Although the Sunspot Minimum is approaching (probably to occur in 2007), there have been significant bursts of solar activity in 2005 that impacted telecommunications, power distribution systems, and satellite operations. Also, between the episodic outbursts of solar activity, there have been extended periods of high levels of high-energy electrons (> 2MeV) at geostationary satellite altitude that have impacted GEO satellite operations.

Large solar eruptions in January, March and April 2005 have seriously affected satellites and other technology and astronauts in orbit. The “Martin Luther King, Jr. Day” storm in January and its consequences became material for on-line data compilations and special sessions at Spring and Fall AGU. The event in March affected International Space Station (ISS) operations.

SCOSTEP continues to play an active role in identifying problems that occur and solar or geomagnetic conditions possibly playing a causal role. The Scientific Secretary maintains a restricted electronic group “ANOM” to which messages are sent about these phenomena, members share information and requests are made for additional input. 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 stock brokers, 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.

FUTURE OUTLOOK –

In May at the Bureau meeting in Taipei, the Scientific Secretary (Joe H. Allen) asked the Bureau to begin a formal search for his successor. This was made an action for the President and Scientific Secretary. Also, Prof. Sunanda Basu asked the Bureau to assist in finding a new Chair for the CAWSES Science Steering Group (SSG). Health and family issues were involved in both requests.

Meetings were held in June/July 2005 to work on these goals and results will be presented to the SCOSTEP Bureau at the STP-11 meeting site in March 2006 for their further action.

CAWSES campaigns continue to proliferate and the several national programs seem to be very healthy. All the Theme Groups have been working on a number of projects and their results are in evidence as reported in the CAWSES Newsletters and from presentations at scientific meetings.