

**THE SCIENTIFIC COMMITTEE ON SOLAR-TERRESTRIAL PHYSICS (SCOSTEP)
Annual Report (01/01/2009 – 12/31/2009)
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2009 ACTIVITIES

SCOSTEP Sponsored Scientific Meetings and Workshops:

● **The International Radar School**

The school was held on the campus of the University of Western Ontario, Canada, on 12-16 May 2009. About 50 students attended, among them 15 were from Canada, 10 from India, 7 from the USA, 6 from Germany, 3 from China, 2 from Peru, 1 from Belgium, 1 from Ethiopia, and 1 from Costa Rica. The 10-member instructor team of the school came from Germany, Japan, UK, USA, and Canada. The school taught students not only the fundamental physics associated with radar design and scattering mechanisms but also some hand-on experience. It offered traditional courses on atmospheric physics in classroom setting, along with field trips to radar facility to carry out experiments. SCOSTEP/CAWSES provided \$1,500 to financially support the radar school.

● **The IHY-Africa/SCINDA Workshop**

The International Heliophysical Year (IHY) workshop was organized in Livingstone, Zambia on 7-12 June 2009. The purpose of the workshop was to facilitate scientific interaction between space science instrument donors and host institutes and promote space science in Africa, with a strong focus on education and public outreach. Additional aims of the workshop were to bring together African and other international scientists under one roof, facilitate the deployment of new observational infrastructure to study space weather, spark interest in space science education and research, and encourage the next generation of African scientists to become interested in the space sciences. The workshop was also the ideal forum to review and document the ongoing instrument deployment and data retrieval progress during the IHY period. This workshop also marked the end of the IHY period and the beginning of the International Space Weather Initiative (ISWI) which will take over the IHY work. The workshop was aimed at scientists and students from African countries, and those international scientists interested in working with African scientists, who are involved in all aspects of Space Physics, and included four main science sessions, two major poster sessions and four discussion forums. The workshop was held in conjunction with the Scintillation Network Decision Aid (SCINDA) 2009 meeting and sessions of particular interest to SCINDA were held on the first two days of the meeting.

A total of 116 delegates attended the workshop in Zambia. Of these delegates, 79 represented 19 different African countries and 37 traveled from 8 different countries outside of Africa. It is worth mentioning that 24 of the delegates were postgraduate students and 10 were undergraduate students from the University of Zambia. This was

the third and final IHY-Africa workshop. As in the past 2 years, in the spirit of promoting solar-terrestrial research in Africa, SCOSTEP/CAWSES provided funds of \$5,000 to support the 2009 workshop.

- **The 5th UN/ESA/NASA/JAXA Workshop on Basic Space Science**

The Workshop on Basic Space Science and the International Heliophysical Year 2007 was held in Daejeon, Republic of Korea, from 21 to 25 September 2009. It was organized by the United Nations, the European Space Agency (ESA), the National Aeronautics and Space Administration (NASA) of the United States of America and the Japan Aerospace Exploration Agency (JAXA). The Korea Astronomy and Space Science Institute (KASI) hosted the Workshop on behalf of the Government of the Republic of Korea. The main objective of the Workshop was to provide a forum in which participants could comprehensively review achievements and plans for basic space science, the International Heliophysical Year (IHY) 2007, and the International Space Weather Initiative, assess recent scientific and technical results, and report on the status of the implementation of several follow-up projects. The workshop consisted of both plenary and parallel sessions. A total of 201 people attended the workshop, and 159 papers were presented in oral and poster forms.

SCOSTEP/CAWSES provided \$5,000 in financial support to facilitate 11 participants from Africa, Asia, and East Europe attending the workshop.

CAWSES-II Kickoff Workshop:

One of the main activities in 2009 was the official launch of the CAWSES-II program, the second phase of the very successful scientific program during 2003-2008. A kick-off workshop took place during 15-17 April 2009 in Boulder, Colorado, and SCOSTEP Bureau members as well as the co-chairs and Task Group leaders of the CAWSES-II program attended the meeting. During the 3-day workshop participants discussed the preliminary scientific plans for each of the task groups, including the names of potential leaders for each research project. Much of the discussion by the Bureau members focused on the diversity of scientific expertise and geographic balance of the potential project leaders. In accordance with SCOSTEP's Constitution, the final composition of all CAWSES-II project leaders shall be approved by the Bureau. Bureau members also suggested advertising the CAWSES-II program to the broad international community in the coming months. The brochures and the new logo for CAWSES-II were approved and adopted at the workshop, and both are available online on both [SCOSTEP](#) and [CAWSES-II](#) website.

General Council Meeting:

SCOSTEP's biannual general council meeting took place on 13 August 2009 in Sopron, Hungary. The meeting was attended by several national representatives, scientific discipline representatives, and Bureau members. Below is the brief summary of national reports presented at the meeting.

- Jan Lastovicka from Czech Republic reported on the severe budget cut to the Academy of Science of Czech Republic. The proposed budget cut will be detrimental to the entire basic research community in Czech Republic. Bob Vincent, representing SCOSTEP, has sent a letter to the Prime Minister of Czech Republic to express our deep concerns about the budget situation as well as our strong support for the Czech STP community.
- William Liu summarized Canadian STP research during the past years. The Canadian SCOSTEP community has been very active during CAWSES-I, with two major research facilities (more than \$20 M total funding each) established or receiving funding. The first was the Polar Environment and Atmospheric Research Laboratory (PEARL) in Eureka, a comprehensive observatory-class facility closest to the geographic North Pole. The suite of close to 20 instruments make crucial measurements on air quality and arctic atmospheric dynamics important to polar climate, and are in the most advantageous location for validating polar-orbiting satellites. The second facility was the Canadian face of the Resolute Incoherent Scatter Radars. The state-of-the-art facility provides unprecedented capability to study atmosphere-ionosphere-magnetosphere coupling in the crucial open-closed magnetic flux boundary. A number of space science missions returned valuable data during the CAWSES-I period, such as OSIRIS, MOPITT, and ACE. Others were being developed (such as e-POP and SWARM/CEFI), and still more are in the planning phase (e.g., ORBITALS). Of particular note is the Polar Communication and Weather (PCW) satellites that are currently in Phase A. The Canadian Space Agency is considering to fly a suite of science instruments as secondary payload to study problems of intimate interest to the Sun-climate relationship. W. Liu also expressed his observation that during CAWSES, the Canadian activities were carried out mainly outside the SCOSTEP envelop, although the scientific thrusts were closely aligned with CAWSES-I. While the success on the project level is impressive, at some point, Canada will run out of human capacity to analyze all the data. It is important that future Canadian activities in Sun-Climate be more coordinated with CAWSES-II on the international scale, so as to maximize the two-way flow of benefits. As Canadian National Representative as well as a Scientific Discipline Representative, W. Liu will consult with the Canadian SCOSTEP community for a better-organized national CAWSES initiative during Phase-II.
- Yihua Yan showed some recent advances in solar-terrestrial physics and space weather activities in China. China has developed a comprehensive medium and long-term plan for 2010-2015, which involves three main research areas concerning space astronomy and solar physics, space physics and solar exploration, and microgravity science and space life science. There are several STP projects currently under development, including the Solar Space Telescope to study the solar atmosphere and corona, the multi-spacecraft KuaFu mission to study solar storms and the near-Earth space environment, the Chinese Mars Orbiter, and the ground-based space weather monitoring project at 120°E meridian.
- S. Gurubaran presented some selected SCOSTEP activities in India. He gave a brief overview of several scientific programs and missions undertaken by India in recent years, particularly the CAWSES-India program. India was heavily involved in the original CAWSES program during the past 5 years. It has now formed a National Scientific Steering Committee for the CAWSES-India Phase-II program. The CAWSES-India program focuses on three themes, namely, solar influence on climate, space weather and climate, and atmospheric coupling processes. Specific projects concerning these themes have been solicited, and will be submitted to Indian funding agencies. The CAWSES-India

program has promoted much better coordination among different research groups and institutions throughout India. The program also includes a strong capacity building and public outreach component.

- Nicole Vilmer gave a national report on French research activities in solar-terrestrial physics. There has been a lot of progress in STP research in France, including maps of vector magnetic fields on the solar surface, discovery of magnetic link between the solar surface, corona, and interplanetary medium, and observations of ionospheric signatures of magnetic reconnection at Earth's magnetopause. The French satellite mission DEMETER is very successful, revealing interesting ionospheric observations of electric and magnetic fluctuations as well as ionospheric plasma properties and energetic particles. A new satellite mission PICARD to be launched in 2010 is designed to investigate the influence of the solar activity on the climate of the Earth, a central theme of the SCOSTEP's CAWSES program.
- Andras Ludmany reported on Hungarian SCOSTEP activity. There are a number of research institutes in Hungary that are actively involved in various aspects of solar-terrestrial research, ranging from geomagnetism and atmospheric/ionospheric processes to solar physics. Hungarian scientists are also heavily involved in research and data analysis using observations from several European Space Agency (ESA) satellite missions, including Cluster and SOHO. A note-worthy project named Solar-Terrestrial Investigations and Archives has recently been undertaken by the Heliophysical Observatory of Hungarian Academy of Sciences with a goal to create a wide synergy in the fields of solar-terrestrial and geophysics among different research centers in several European countries to provide high-level accessibility of data and models.
- Nikolai Østgaard gave a brief summary of some STP activity in Norway. He pointed out that Norway is actively involved in IPY. The IPY-ICESTAR project conducts conjugate studies of auroral and ionospheric dynamics, and it will make continuous operation of the EISCAT Svalbard radar to provide unprecedented a year-long time series of incoherent scatter radar data. The so-called "Space Suitcase" program is specifically designed for high school education, consisting of advanced scientific instruments such as GPS receivers, geiger-muellers, telescopes for detecting solar flares, wide-angle cameras, magnetometers, laptops, along with detailed operating manuals. Norwegian scientists are also actively involved in many international space research programs in Europe, North America, and Japan. The EISCAT 3D initiative is currently under way, which is a program to study the fundamental plasma physics processes that mediate energy flow in the solar-terrestrial system and the ways in which these processes couple together. Østgaard also mentioned that Space Science is now being integrated into polar research at University Svalbard.
- Barbara Popielawska talked about recent activities at the Space Research Center of the Polish Academy of Sciences. She pointed out that the main research interests of the center are on space physics, planetary geodesy, and remote sensing. In terms of space research, its activity covers a wide range of topics from modeling and observations of ionospheric disturbance, MHD simulations of the heliosphere, studies of solar wind dynamics and turbulence, as well as studies of solar flares and coronal mass ejections. Polish scientists are also participated in several spacecraft missions in collaboration with ESA and Russian Space Agency.

- Galina Kotova and Vladimir Kuznetsov jointly gave a comprehensive report on recent activities in Russia. Scientists in Russia are continuing making impressive achievements in solar-terrestrial research. Among the recent achievements is the development of a comprehensive database of synoptic solar observations from 60 years of continuous measurements by Kislovodsk Solar Mountain Station of the Pukovo Observatory. The Center for Analysis of Multiwave Solar Observatory in St. Petersburg also makes continuous solar observations and disseminates the data through internet. In addition, the Russian space science includes several satellite missions, such as the series of CORONAS satellites. The CORONAS-PHOTON mission was launched in January 2009, measuring the solar irradiance associated with solar flares as well as from the quiet Sun. It has made the first ever X-ray spectrum of the extremely quiet corona.

Bureau Meeting:

The SCOSTEP Bureau meeting was held in Sopron, Hungary, on 13 August 2009, following the general council meeting on the same day. Some of the main agenda items are summarized below:

1. Updates on CAWSES II

Susan Avery and Alan Rodger (Co-Chairs of the CAWSES program) updated the Bureau on the status of CAWSES-II. The CAWSES-II website is now up and running, and its URL address is <http://www.cawses.org/>. The website is multi-lingual, currently in French, Dutch, Russian, as well as English. The website also provides the wiki access for each of the task groups. All four task groups are now in place. Some of the task group leaders have been very active in organizing scientific projects and coordinating research efforts in the international SCOSTEP community.

Bureau members thanked Avery and Rodger for their leadership in the CAWSES-II program, and acknowledged that CAWSES-II, while with a slow-start, is now in full swing. The Bureau suggested that we should make the best effort to promote CAWSES-II in international arenas. As part of that effort, Alan Rodger will propose a special SCOSTEP/CAWSES session at the IUGG general assembly to be held in Melbourne, Australia, in 2011. A possible topic for the special session may be on virtual conference or virtual institute for STP. Christian Hanuise will also propose a CAWSES-II session for the URSI General Assembly in Istanbul in August 2011.

2. Updates on STP-12 Preparation

Franz-Josef Lübken, Chair of the local organization committee (LOC), gave an updated report on the preparation of STP-12. Lübken pointed out that the science program for STP-12 has taken shape, and the lecture, keynote and invited speakers are being identified and notified. Most of them have accepted the invitations. All logistical issues concerning the meeting facilitate, costs, and finance have been settled. Lübken reassured that SCOSTEP will not be liable for any financial risks regarding STP-12.

The Bureau was very pleased with Lübken's report, and thanked the LOC (and Lübken in particular) for doing a superb job in preparing for STP-12. The bureau also suggested widely advertising STP-12, including sending the meeting announcement and flyer to all major STP news letters as well as SCOSTEP and CAWSES colleagues.

3. Future SCOSTEP science programs

The Bureau discussed briefly on future SCOSTEP science programs after CAWSES-II, which is our main science program for 2009-2013. Bob Vincent reported on the preliminary discussion with IAGA about a possible joint project on scientific assessment of solar-terrestrial impact on Earth's climate. It has been suggested that SCOSTEP leads a full and balanced assessment of outstanding issues and questions concerning solar influence on global climate. Such an assessment should be completed by 2012 in order to be fully considered by IPCC before the next installment of the IPCC report.

Bureau members voiced their opinions on the subject. It is recognized by the Bureau that the climate issue is so large that no single science group is fully capable of doing it alone. The assessment of Sun-Climate relationship is certainly a part of responsibility that SCOSTEP should take on. However, the climate issue is also complicated both scientifically and politically. Caution should be exercised when SCOSTEP takes upon such a responsibility.

No formal resolutions were made at the Bureau meeting. Bob Vincent urged Bureau members to go back to their respective associations to think about other possible new projects after CAWSES-II. A longer discussion on future projects will be carried out at the next Bureau meeting.

Education/training activities:

As a continued collaborative effort with the Solar-Terrestrial Environment Laboratory at Nagoya University in Japan, a total of 9 educational comic books have been published to date. They are entitled "What is the Aurora?!", "What is the Geomagnetic Field?!", "What is the Solar Wind?", "What is the Ozone Hole?", "What are the Cosmic Rays?", "What is Global Warming?", "What is the Upper Atmosphere?!", "What are the Polar Regions?!", and "What is the Sun-Climate Relationship?". These comic books are available online at the SCOSTEP website <http://www.scostep.ucar.edu> and can be freely downloaded. The subjects of these comic books are representative of the SCOSTEP scientific topics. Although the books are designed specifically for K-12 education, they are informative to research scientists and general public alike.

The comic books are published in English and Japanese. In addition, a blank "balloon" version of these books is available for translation into other languages. We have received requests to translate comic books into 22 languages besides English and Japanese: Chinese, Czech, Danish, German, Greenlandic, French, Finnish, Hebrew, Italian, Korean, Polish, Russian, Spanish, Swedish, Thai, Turkish, 2 Indian languages (Hindi and Marathi), and 4 Nigeria (Hausa, Igbo, Yorba, and Pidgin). So far selected comic books have been translated into German, Hindi, French, Italian, Spanish, and Korean. Selected comic books in Italian and French are also available on SCOSTEP [website](#).

Publications:

SCOSTEP distributes its programs and current STP events through electronic newsletters and on Internet. Minutes from official meetings, national reports, and other related information

are made available on SCOSTEP [website](#). Educational materials such as the comic books mentioned above are also publicly available online at <http://www.scostep.ucar.edu>. In addition, a conference proceedings of selected papers from the International CAWSES Symposium in Kyoto, Japan, in October 2007 was published as the Second CAWSES Book in 2009. It was edited by Toshitaka Tsuda, Ryoichi Fujii, Kazunari Shibata, and Marvin Geller. The electronic version of the book is now available online and can be downloaded freely at <http://www.terrapub.co.jp/onlineproceedings/ste/CAWSES2007> or through SCOSTEP website at <http://www.scostep.ucar.edu/archives/publications.html>.

Future Plan:

The CAWSES-II program is now in full swing, and it will remain as the main scientific program of SCOSTEP for the next 5 years. The program consists of four task groups to address the four scientific questions: (1) What are the solar influences on Earth's climate? (2) How will geospace respond to an altered climate? (3) How does short-term solar variability affect the geospace environment? and (4) What is the geospace response to variable waves from the lower atmosphere? Each task group has further identified and formed a number of projects. As in the past CAWSES program, these projects are truly grass roots, consisting of scientists around world. In addition to the four task groups, CAWSES II also establishes a Virtual Institute in order to most effectively coordinate international collaborations among scientists around the world, particularly those from developing countries as well as early career scientists and students. The Virtual Institute will take advantage of cyber-infrastructure technology and develop necessary software into facilitating cross-disciplinary research, and data and resource management. It will establish digital libraries and host virtual scientific conferences, which will benefit greatly young scientists. Public education and capacity building will continue to be a core part of CAWSES II. In addition to developing new educational comic books, the CAWSES Virtual Institute will provide easier access to data and research tools by scientists from developing nations and will build an international network of graduate students and early-career scientists.

SCOSTEP is dedicated to fulfill its long-term responsibility to promote international interdisciplinary programs in solar-terrestrial physics. SCOSTEP will continue to work within the ICSU framework to encourage cross-disciplinary conferences and to facilitate cross-project cooperation and multi-national research collaboration. SCOSTEP will continue conducting programs with the scientific goal of advancing 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. These disturbances range from interference with satellite and aircraft communications systems, to blackouts of electric power grids.