

TC4 Newsletter

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Article 1

MST/IS radar detected the first echo from the atmosphere in the Antarctic

Kaoru Sato¹, Masaki Tsutsumi, Toru Sato, Takuji Nakamura, Akinori Saito, Yoshihiro Tomikawa, Koji Nishimura, Hisao Yamagishi and Takashi Yamanouchi
¹Department of Earth and Planetary Science, The University of Tokyo, Tokyo, Japan



Kaoru Sato

The MST (Mesosphere-Stratosphere-Troposphere)/IS (Incoherent Scatter) radar has been constructed at Syowa Station, the first of its kind in the Antarctic. This radar is composed of about 1000 Yagi antennas in a circular area with a diameter of about 160m and capable of observation of the atmosphere in the region from 1km to 500km altitude with an accuracy much higher than con-

ventional observational tools in the Antarctic. We call this radar the PANSY radar after the name of the project "Program of the ANTArctic SYowa MST/IS radar". "PANSY" is a flower name coming from a French word "penser" which means "to think". As one of the main tasks of the 52nd Japanese Antarctic Research Expedition, radar construction started in late December



Figure 1: The PANSY radar installed in the Antarctic.

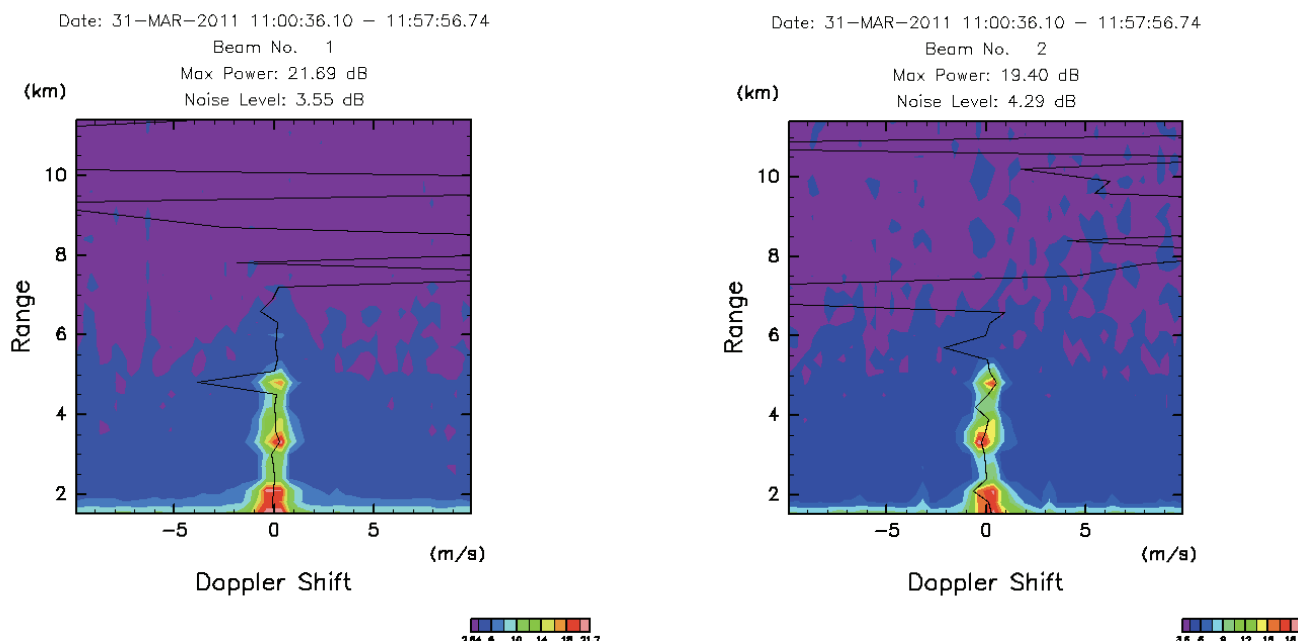


Figure 2. Vertical profiles of scattering echoes observed using a vertical beam and a northward beam with a zenith angle of 10 degrees in one hour from 10:35 on March 31, 2011. The Doppler velocity is taken as positive when blowing away from the ground. The Doppler velocity within ± 1 m/s (i.e., about ± 6 m/s as a horizontal wind) is observed in the northward beam up to an altitude of about 5500 m.

2010 and the first stage was completed in the middle of February 2011, despite record-worst weather condition at Syowa Station. The first echo from the Antarctic atmosphere was detected successfully in late March 2011.

Although the Antarctic region is located far from human activity, unique atmospheric phenomena such as polar mesospheric clouds at an altitude of around 85 km and the ozone hole of around 17 km form as a result of human activity. Nevertheless, ground observations in the Antarctic have lagged behind lower latitude regions because of the harsh natural environment. Scientific targets of the PANSY radar are morphology and climatology of various atmospheric phenomena and their inherent dynamics by continuous observation with the fine vertical and horizontal resolutions (e.g., polar lows causing severe snow storms, tropospheric circulation associated with katabatic winds, fine structure of the tropopause, stratopause and mesopause, sudden stratospheric warming, polar vortex break-up, medium-scale Rossby waves trapped at the edge of the polar vortex, dynamics of polar stratospheric clouds (PSC) and PMC, atmospheric turbulence, and atmospheric gravity waves). The response of the neutral atmosphere to the injection of high energy particles from the magnetosphere is also an important topic of the PANSY project.

Collaborative observations with the radars at the other Antarctic stations such as the ST radar at Davis station

(Australia) are important to examine the locality of wave characteristics. The comparison of PMC and atmospheric wave characteristics in the Antarctic and Arctic should be also interesting. First, it is known that the polar mesospheric summer echoes (PMSE) which are closely related to PMC are much weaker in the Antarctic than in the Arctic. In addition, recent studies have shown a possible link between the two hemispheres. Current global models for weather prediction and climate projection with relatively low resolution still have a cold bias in the winter polar stratosphere, probably in part because of unrealistic gravity wave parameterizations. This bias significantly degrades the predictions of the Antarctic ozone hole and its recovery because stratospheric temperature affects PSC volume. Combination with recent data from satellites, ground observation networks, and global models with high resolutions will be important for quantitative understanding of polar atmospheric dynamics and the role of polar atmosphere on the Earth climate. The improvement of climate models through such studies will increase accuracy of estimation of solar impacts on the climate.

This project is a collaboration of 11 universities and eight institutes around the core of the University of Tokyo and National Institute of Polar Research. See the PANSY programme website for details: <http://pansy.eps.s.u-tokyo.ac.jp>

Article 2

Activities related to climate and weather of the sun-earth systems CAWSES in Nigeria

Babatunde Rabi^{1,2}

¹ National Space Research and Development Agency, Abuja, Nigeria.

² Space Physics Lab., Federal University of Technology, Akure, Nigeria

Email: tunderabiu@yahoo.com



Babatunde Rabi

Research and studies of relevance to the objectives of CAWSES have always been carried out in Nigeria and some other African countries. Nigeria is a country located within geographical latitudes 4°N and 14°N, and longitudes 2°E and 15°E. It is strategically located such that the dip equator passes through the centre of the country - a great opportunity for studying ionospheric processes in equatorial area. Nigeria is found right within the equatorial anomaly region (See Figure 1). It covers a land area of about 9.24×10^5 km² and has estimated population of about 150 million people - a quarter of entire African population.



Figure 1. Location of Nigeria in Africa

History of ionospheric research in Nigeria dated back to mid 1950s when International Geophysical Year IGY was being set up. Scientists who were mainly lecturing at the Department of Physics, at the University of Ibadan established in 1948, got involved in observational and theoretical studies. Ionosondes, magnetometers and some other facilities were installed at the Campus of the University of Ibadan to take measurements during the IGY. Today, records taken during the IGY and its cooperation are archived at the University of Ibadan and some are available at the World Data Center WDC, Kyoto web page. Unfortunately those facilities used during the IGY have since packed up.

Today, Nigeria has about a hundred Universities and several research institutes. Of these many Universities, a few are involved in CAWSES related activities. University like ours, Federal University of Technology, Akure run Space Physics program at all levels. Key topics in our Masters' syllabus are Physics of Geomagnetic Phenomena, Ionospheric Physics, Space weather and planetary atmospheres. We have critical mass of scientists capable of sustaining ionospheric research. The United Nations - endorsed International Heliophysical Year IHY programme opened a new dispensation for ionospheric research in Nigeria as well as some other African countries. IHY enabled instruments to be loaned to

ready hosts in developing nations. Nigeria resumed active participation in observational studies of relevance to CAWSES during the IHY (www.ihy2007.org). In Nigeria today the following observational facilities are available at the respective universities listed against them:

1. Digital Ionosondes (Project of the US Air Force and Boston College, USA): University of Ilorin, Ilorin.
2. GPS receiver monitoring TEC and ionospheric scintillations (Project of the US Air Force and Boston College, USA): Federal University of Technology, Akure; University of Ilorin, Ilorin; University of Lagos, Lagos; Obafemi Awolowo University, Ile-Ife; University of Nigeria, Nsukka.
3. Magnetometer (Project of the Space Environment Research Center, Kyushu University, Japan): University of Ilorin, Ilorin; Redeemers University, Mowe; National Space Research and Development Agency, Abuja. See Figure 2.
4. AWESOME (Project of Stanford University): Federal University of Technology, Akure
5. SID monitors (Project of Stanford University): University of Lagos, Lagos; Obafemi Awolowo University, Ile-Ife; University of Nigeria, Nsukka; University



Figure 2. Ionospheric observatory at the University of Ilorin. (Left panel: construction of sensor hut for MAGDAS magnetometer. Right panel: The building that accommodate the monitor and indoor facilities, Professor K. Yumoto is seen climbing the roof top during MAGDAS installation in August 2006)

of Ilorin, Ilorin; Redeemers University, Mowe
Space weather, TEC variability, impact of space weather on tropospheric weather, equatorial electrojet and ionospheric variability are examples of research

topics being investigated in Nigeria at both observational and modelling levels. One outstanding fact is that the CAWSES related research and studies in Nigeria has international support as the major anchor.

Article 3

CAWSES II TG 4 LONET (Longitudinal Network) Campaign Report

Hisao Takahashi¹, Jonathan J. Makela²

¹University of Illinois at Urbana-Champaign, USA,

²Instituto Nacional de Pesquisas Espaciais, Brazil

A coordinated measurement campaign to investigate longitudinal variability of upward coupling and the development of equatorial irregularities (plasma bubbles) has been carried out from September 1 to November 15, 2010. In total, 24 ionosondes and 42 magnetometers participated in the campaign. The figure below indicates the ionosonde sites. We thank the participants for their special efforts.

The campaign meta-data sheets are in preparation (May 2011). Preparation of a digital data bank is under consideration. As a first step, we plan to produce the data sheets of ionospheric parameters: foF2, hmF2, h'F, Spread F start and end time, and Sporadic E start and end time. Time resolution of 15 minutes is preferable, although we will accept any resolution available from the observation sites. Digital data of magnetometer will also be included in the data bank.

In order to accelerate data bank construction, several scientists volunteered their time to reduce and organize the data. Ionogram reading started at INPE (Inez Batista) (Brazil) in May 2011. NICT (T. Nagatsuma) (Japan) is coordinating the reduction of their data from Thailand. Some colleagues of IIGM (Geeta Vichare)



Hisao Takahashi Jonathan Makela

(India) kindly offered their time to work with magnetometer data. Dr. Lourivaldo Lima and colleagues (UEPB, Brazil) will also reduce some of the magnetometer data. Any group interested in assisting to create the data bank is welcome and would be acknowledged. Our goal is to finish the construction of the data bank by September-October 2011.

A comprehensive and fair data distribution policy is an important issue to be finalized to facilitate data requests between the participants. As we presented in our campaign manual, TG 4 participants are free to access the campaign data under agreement with the scientists responsible for the data and will properly acknowledge the responsible scientist in any publication or presentation. We hope that the data will be useful to many groups around the world.

Contact person: Hisao Takahashi: <hisaotak@gmail.com>
Jonathan Makela: <jmakela@illinois.edu>

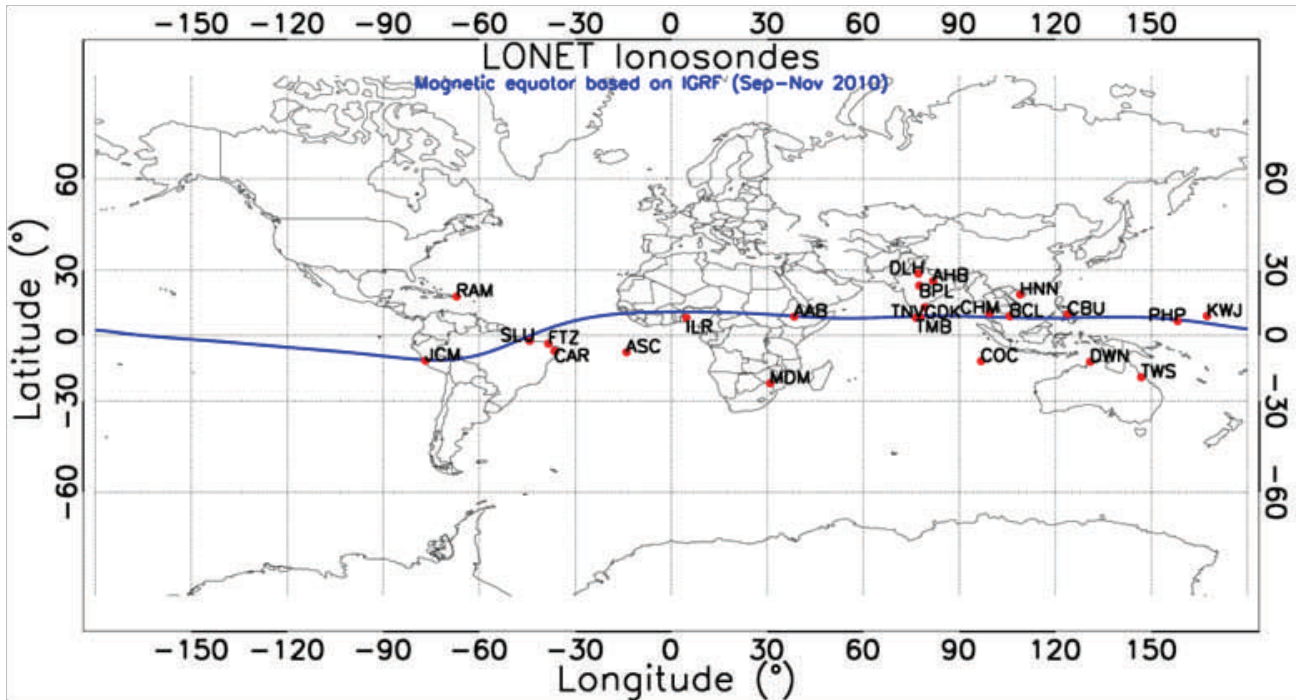


Figure 1. LONET Campaign 2010 Ionosonde sites

Article 4

Report on the CAWSES-II/ISWI Session : JpGU 2011

Nat Gopalswamy
NASA Goddard Space Flight Center
(SCOSTEP Bureau member)



Nat Gopalswamy

The CAWSES-II/ISWI Session was organized by one of the Task Group leaders, Dr. Kazuo Shiokawa during the Japan Geoscience Union meeting held in Makuhari, Japan, during May 23 - 27, 2011. The session had two sittings on May 25, 2011 with oral presentations. There was also a poster session on May 26, 2011, which had 10 poster contributions. The first sitting (10:45 - 12:45) concentrated on the Japanese contribution to CAWSES-II and ISWI. T. Ogino and K. Yumoto gave invited talks on CAWSES-II and ISWI, respectively. B. Rabiou, also an invited speaker, described the continuation of IHY into ISWI activities, in particular on the instruments deployed in Africa. There were four other contributed talks in the sitting, including a talk on the coupling between lithosphere and the ionosphere pointing out a possible precursor to Earth quakes seen as electron density depletion in the ionosphere (K. Hattori).

The second sitting (14:15 - 18:30) started with the invited talk by N. Gopalswamy on the global cooperation in space weather science. He pointed out the complementary role played by SCOSTEP's CAWSES-II program, the International Space Weather Initiative (ISWI), and the International Living with a Star (ILWS) program. In particular he explained that ILWS deals with global cooperation in space instrumentation, whereas ISWI focuses on small-scale ground-based instruments for space measurements. On the other hand, CAWSES -II focuses on the science of sun-Earth connection both on long and short terms. There were also two contributed talks on the CAWSES Task Groups III (K. Shibata) and IV (K. Shiokawa) explaining the organization, projects, and activities of these groups. H. Takahashi gave an invited presentation, explaining the Longitudinal Network Campaign for the



investigation of atmosphere - ionosphere dynamical coupling. The rest of the session had contributed papers detailing the CAWSES-II related capacity building activities in Japan.

There were also Space Weather Science sessions on May 26 and 27, 2011 on all aspects of the Sun-Earth system from coronal mass ejections to their impact on

geospace. In addition, there was a session on Global Data systems that had talks on ICSU world data system (T. Watanabe, Y. Murayama), SPASE project (T. King), and WMO information system (E. Toyoda). T. Watanabe announced the organization of the first ICSU World Data System (WDS) Conference on "Global Data for Global Science" to be held during September 3 - 6, 2011 in Kyoto. The conference website is at <http://wds-kyoto-2011.org>.

Highlights on Young Scientists

New sodium lidar at Tromsø, Norway

Takuo Tsuda

Solar Terrestrial Environment Laboratory, Nagoya University, Japan



Takuo Tsuda

In 2009, as a postdoctoral fellow, I joined a new sodium temperature lidar project promoted by Nagoya Univ., when the fundamental specification of the lidar had been mostly determined. The lidar system consists of three parts: the pulsed sodium D2 laser by RIKEN; the high-speed frequency switchable seeder by Shinsyu Univ.; and the high-speed receiver by Nagoya Univ.. My main activity has been on supports for the development of the three parts and the integration of the whole system. Based on collaboration with Univ. of Tromsø, installation site of the lidar is the EISCAT radar Tromsø site, Norway (69.6°N, 19.2°E), which has a long tradition in investigating the polar upper and middle atmosphere as well as auroral phenomena using radars and optical instruments. There was a lack of neutral temperature observation at the Tromsø site, and this lack often limited our understanding on observed various phenomena.

In order to advance our knowledge on the coupling between the neutral atmosphere and the ionosphere greatly, it is essential to measure relevant neutral and ionospheric physical parameters simultaneously. Temperature observations by the new sodium lidar started in 2010 (Figure 1), and thus now is the time to have more comprehensive observations at the Tromsø site, which is one of the state-of-art observatories, with further collaborations between atmospheric and ionospheric researchers in this CAWSES-II project.



Figure 1. First observation with the new sodium lidar.

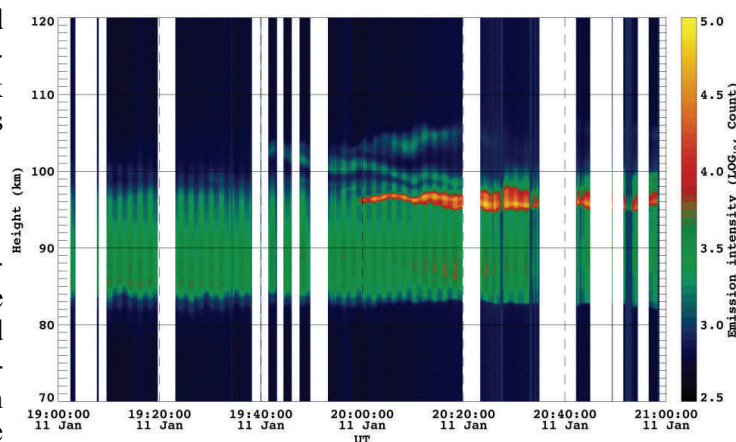


Figure 2. Sporadic sodium layer observed in nighttime on 11 January 2011 above Tromsø. The new sodium lidar measurement with time resolution of 5-sec reveals short-period wavelike structure in the sporadic sodium layer. (Note: The emission intensity includes an artificial variation due to changing of the laser frequency at every 1-min, i.e. two frequency measurement for deriving temperature data.)

Short News 1

Announcement**-TG4 Business meeting at IUGG****Kazuo Shiokawa¹, Jens Oberheide²**¹Solar-Terrestrial Environmental Laboratory,
Nagoya University, Japan.²Clemson University, South Carolina, USA

This is the third year of the 5-year CAWSES-II (2009-2013) program. Several campaign observations and new instrument construction have been carried out under the CAWSES-II TG4. Thus we would like to have a TG4 business meeting during the IAGA/IUGG conference as follows.

meeting title: SCOSTEP CAWSES-II TG4

date/time: 6 July 2011, 18:10-20:10

(We try to finish by 19:20 for attendees
of the IAGA dinner)room: MR106 at Melbourne Convention
and Exhibition Centre

Reports on new campaign/instrumentation plan and outstanding results related to TG4 are very welcome. Please let us know if any topic you would like to present at this meeting. Possible agenda will be

1. General business: update of TG4 activities since the 2010 business meeting: newsletter, financial support, wiki (we encourage to update the wiki page)
2. Summary of the SCOSTEP meeting during IUGG
3. Project Status and Plans - from project leaders
4. New Business

Some catering (Australian Tea/Biscuits) will be arranged.

Short News 2

**Workshop on the Spread F Experiment-2
(SpreadFEx-2) Measurements, Modeling,
and Collaborative Analyses
(10 – 11 August 2011)**
Dave Fritts

Colorado Research Associates, Boulder, USA

The SpreadFEx-2 measurement, analysis, and modeling program was initiated to explore the conditions contributing to initiation of equatorial plasma bubbles (EPBs) extending to high altitudes in the equatorial ionosphere. It followed the 2005 SpreadFEx campaign with an increased focus on new measurements in the F layer, including FPI F-layer winds at multiple longitudes and tomographic definition of EPB structures using multiple airglow imagers and CERTO beacon receivers. Radar, digisonde, and GPS measurements of plasma structures provide additional data enabling more comprehensive studies of these dynamics than possible previously.

This workshop is being convened to bring together SpreadFEx-2 and other CAWSES II TG 4 participants who would benefit from joint discussions of SpreadFEx-2 and collaborative measurements. Specific workshop foci will include the following: (1) discussion of results and analyses from the two previous SpreadFEx-2 campaigns in 2009 and 2010, (2) discussion of related data on F-layer winds and plasma structures, and neutral dynamics at lower altitudes, (3) planning for anticipated SpreadFEx-2 measurements to occur from September to December 2011, and (4) coordination and joint analyses of SpreadFEx-2 and related satellite and ground-based measurements.

The workshop will be held on the INPE campus in Sao José dos Campos, Brazil on 10 and 11 August 2011. Those interested in attending are asked to notify the conveners no later than **15 July 2011**. This workshop is being sponsored by CAWSES-II; www.cawses.org as part of Task 4, Project 2. Limited travel support is expected to be available for participants requiring assistance by contacting the conveners no later than **15 July 2011**.

For further information, interested parties may contact any of the following conveners:

Dave Fritts (dave@cora.nwra.com),Jonathan Makela (jmakela@illinois.edu),Hisao Takahashi (hisaotak@gmail.com).



Upcoming meetings related to CAWSES-II TG4

Conference	Date	Location	Contact Information
2011 Joint CEDAR-GEM Workshop	Jun.26-Jul.1, 2011	Santa Fe, New Mexico, USA	http://cedarweb.hao.ucar.edu/wiki/index.php/2011_Workshop:Main
IUGG General Assembly	Jun.28-Jul.7, 2011	Melbourne, Australia	http://www.iugg2011.com/
AOGS2011	Aug. 8-12, 2011	Taipei, Taiwan	http://www.asiaoceania.org/
Workshop on SpreadFEx-2	Aug. 10-11, 2011	Sao José dos Campos, Brazil	
URSI General Assembly	Aug. 13-20, 2011	Istanbul, Turkey	http://www.ursigass2011.org/
ISEA-13	Mar. 12-17, 2012	Paracas, Peru	http://jro.igp.gob.pe/isea13/
39th COSPAR Scientific Assembly	July 14-22, 2012	Mysore, India	http://www.cospar-assembly.org/



The purpose of this newsletter is to make more communications among scientists related to the CAWSES-II Task Group 4 (particularly between those of the atmosphere and the ionosphere). **The editors would like to invite you to submit the following articles to the TG4 newsletter.**

Our newsletter has four categories of the articles:

1. Articles— ~500 words and four figures (maximum)
on campaign, ground observations, satellite observations, modeling, workshop/conference/symposium report, etc
2. Highlights on young scientists— ~200 words and two figures
on the young scientist's own work related to CAWSES-TG4
3. Short news— ~100 words
announcements of campaign, workshop, etc
4. List of planned workshop

Category 2 (Highlights on young scientists) helps both young scientists and TG4 members to know each other. Please contact the editors for recommendation of young scientists who are willing to write an article on this category.

Editors: Michi Nishioka (nishioka_at_stelab.nagoya-u.ac.jp)
Kazuo Shiokawa (shiokawa_at_stelab.nagoya-u.ac.jp)
Solar-Terrestrial Environment Laboratory, Nagoya University
Tel +81-52-747-6418, Fax +81-52-747-6323
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