7th Meeting of IASPEI/IAGA/IAVCEI Inter-Association Working Group on Electromagnetic Studies of Earthquakes and Volcanoes (EMSEV)
July 22 , 2005, Congress Center, Toulouse, France

Meeting started at 17:30

Participants:

Zlotnicki, Jacques
Johnston, Malcolm
Nagao, Toshiyasu
Ogawa, Yashuo, Tokyo Institute of Technology, Japan
Spichak, Vjacheslav, Geoelectromagnetic Res. Inst., RAS, Russia
Taylor, P. T., NASA/GSFC, USA
Blecki, Jan, Space Research Center, Warsaw, Poland
Sasai, Yoichi, Tokyo Metropolitan Gov., Japan
Venerai, Dobrica, Inst. of Geodynamics, Romania
Crisan, Demetrescu, Inst. of Geodynamics, Romania
Ingham, Malcom, Victoria University of Wellington, New Zealand
Di Mauro, Domenico, Instituto Nationale di Geofisisa, Rome, Italy
Uyeshima, Makoto, Earthquake Research Institute, the University of Tokyo, Japan
Mogi, Toru, Insti. Seismology and Volcanology, Hokkaido University, Japan
Tanaka, Yoshikazu, Kyoto University Japan
Kanda, Wataru, Kyoto University Japan
Devidze, Marina, Institue of Geophysics, Georgia
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Vaclav Cerv, GFU AS CR, vcv@ig.cas.cz
Korepanov, Valery, Lviv Center of Space Research, Ukraine
Sengor, Tanor, Yildiz Technical University, Turkey
Rahul Kanwar, CNES, Ckermont-Ferrand, France
+ four more who did not provide names and email addresses

Total = 29

[1] Introduction and Background

The meeting was opened by Nagao (Acting Chair due to the absence of EMSEV Chair (Uyeda)). Following a general welcome, the Acting Chair, covered the following topics:

a) The current association support for EMSEV as follows:

IUGG $2,000 (These funds are planned to be used for the Mexico meeting)
IAGA $2,000 ($1300 to be used for Toulouse meeting and $700 for field work on Volcano Taal with PHIVOLCS)
IASPEI $1000 (recently arrived. So held for reserve)
IAVCEI $1,000 (recently arrived. So held for reserve)

b) The EMSEV email list now totals 200 members

c) Nagao proposed that he would apply for an EMSEV domain name such as www.emsev.org for the website. Tokai University would be the host and would cover maintenance costs for at least the next five years. All agreed.

As a comment from the IAGA Liaison, Zlotnicki mentioned that our activities are strongly supported by IAGA, as long as we will focus our field of interest on the transient EM signals related to earthquakes and volcanic activities; the EM imagery is essentially in the scope of the Induction Group

As IAVCEI and IASPEI Liaison, Johnston mentioned discussions with the secretary general of IAVCEI (Steve McNutt) on the need to try to develop independent funding sources for all the different Commissions and Working Groups. Perhaps some of the various foundations and non-profit groups might be approached. This would be particularly important for the EMSEV working group since it is the one of the most active Inter-Association groups in IUGG. Cross-association interaction is an important part of both IASPEI and IAVCEI.

2) Reports on Recent Activity:

[a] Joint Field Observation work on Volcano Taal, Philippines:

A workshop was initially held in January 2003 but it was not until 2004 that agreement on details was finally obtained. Work was started in 2004 but a major field effort was initiated on Jan 6-16, 2005 with a visit by Zlotnicki, Sasai and Harada (Tokai University).

IUGG support for inter-association initiatives ($3,000) was used for this campaign. Zlotnicki obtained about 1200 Euros from the French Consulate.

The first day was used for training and on day 2, 10 people using three boats and two cars started to work on Taal. Felt seismicity on Taal was apparent and the volcanic hazard was high. One magnetic and one Self-potential, (SP) surveys were completed in 5 days and even during this time, changes in total intensity and in the SP were apparent. These surveys were repeated one month later by PHIVOLCS members. Magnetic field changes of 20-40 nT together with SP changes of 30 mV were observed. Since this time activity has decreased and alert levels are approaching zero. There is a plan to return in late 2005 to enlarge the surveys. The 700$ IUGG support will be used to help PHIVOLCS on the field.

[b] Istanbul, Turkey Meeting on Satellite Monitoring in February, 2005

Zlotnicki reported that the topics discussed included EMSEV, QuakeSat, Satellite testing, Satellite temperature measurements, EM measurements in Taiwan, agreements on terms of loan of satellites such as RussianSat, BalkanSat and others. Valery Korepanov added that IZMIRAN (Russia) was presenting their satellite named KOMPAS-2 which will be launched at the end this year and invited everybody to join its data processing. Other Russian team – Institute of Space Research – launched the appeal to Balcan countries to join their planned satellite CHIBIS with financial participation and then to rename it as BALCANSAT. Turkey was interested in operating its own satellite projects.
An Italian group organized inclusion of a search-coil magnetometer in a recent Russian rocket to the International Space Station. However, according to Valery Korepanov, it is unlikely that this magnetometer will be very effective for Seismo-EM measurements because of response limitations and noise – it was operating successfully, but inside ISS is very noisy environment.

Following is the report of the Istanbul Workshop by Sergey Pulinets and Dimitar Ouzounov.

Istanbul Workshop Report

International Workshop on Early Warning Systems for Earthquake Monitoring by Using Space Technology was held in Kandilli Observatory at Istanbul, Turkey on 1-2 February 2005. This workshop was organized with active participation of the EMSEV group members as an answer to Turkish side appeal to consider the possibility of creation of the space based system for the early warning of strong earthquakes in Turkey, especially the

Istanbul area. The main discussion was concentrated on the scientific and technological merit of the proposed satellite system. Together with Turkish scientists the 8 invited scientist from all over the world participated in the discussion. Turkish scientists made 7 of the 15 invited talks. Turkish science community presented the problems of seismic risk for Istanbul area. The ground based system of seismic and geochemical monitoring (radon) in Turkey, and recent results were presented.

Prof. Uyeda (Japan) in his introduction speech presented his understanding and complexity of earthquake prediction. Prof. Rundle (USA) presented the recent progress in the earthquake prediction using the statistical seismology. First results from the dedicated French DEMETER satellite were presented by Dr. Parrot (France). The satellite technologies of detection of the thermal (infrared) and ionospheric short term precursors of the earthquakes were presented by Dr. Ouzounov (USA) and Dr. Pulinets (Mexico/Russia). Prof. Bodo Reinisch (USA) described the topside sounder technology which may be used on dedicated satellite for earthquake warning. Prof. Valerio Tramutoli (Italy) presented interesting results on the thermal anomalies registered by satellite over Turkey for several important earthquakes. Information on the status and results of the complex project using the methods of seismic, electromagnetic, geochemical and other kinds of monitoring at Taiwan (iSTEP project) was presented by Dr. Liu (Taiwan). The series of presentation was finished by the proposal made by Dr. Pulinets of the satellite constellation for the global monitoring of the short-term earthquake precursors in the space plasma. It was the common opinion of the workshop participants that it is appropriate time for such system creation with the support by the ground-based observations.

It should be mentioned that only scientists working in the field of seismo-electromagnetics did not limit the workshop. Turkish seismologists related to the Seismic Hazard in Turkey made 3 of the 15 invited talks. As mentioned above, Prof. John Rundle (USA) presented his technology of the middle-short term earthquake prediction using the methods of statistical seismology. Within the frame of the panel discussion, it was found important to link the ground-based radon measurements in Turkey and formation of thermal and ionospheric anomalies registered by satellites.

The workshop called the great interest in the Turkish mass media.

The workshop results have important practical consequence. In June 2005 Turkey signed with Russia an agreement that Russia will create a satellite system for the short-term earthquake warning system.

[c] IWSE (International Workshop for Seismo-Electromagnetics) Meeting in Chofu

This meeting was organized by Hayakawa on March 15-17, 2005. About 200 people attended this meeting, including about 90 foreign participants from 15 countries. Programme and Abstracts of the IWSE is still available on request. Two special issues including the papers presented in the workshop are under way; (1) Special Issue in Physics and Chemistry of the Earth (probably in the beginning of next year, 2006) and (2) Special Issue in Trans. Institute of Electrical Engineers of Japan (scheduled in April, 2006).

[d] First DEMETER Guest Investigator Workshop, Paris, France, May 2-4, 2005.

Report by Dimitar Ouzonov was as follows. The workshop was attended by 70 scientists from the 24 CNES guest teams. Overall, DEMETER satellite is in a good condition and improving stability and data performance. Michel Parrot acknowledged many problems during the beginning stage of the mission: data lost, slow web data server, moving wells noise into magnetic components and etc. A new reprocessing was started and will be completed in 6 months. The new reprocessing will take care of the major existing problems. However, still some uncertainties exist and it was recommended that guests work close with PI on the validation issue. Current altitude is 710km. Satellite will be moved to the lower orbit around 600km in 2006. Michel Parrot presented first results of pre-earthquake EM signals registered by DEMETER for seven earthquakes in Asia. All major experiment will be published in special issue of Planetary and Space Science at the end of 2005. First science conference of DEMETER mission will be held in Paris, Spring 2006.

3) Information on near future EMSEV-related meetings.

[a] International workshop on the earthquakes and tsunami is planned to be in Padang on the western coast of Sumatra, Indonesia. August 23-25, 2005. Contact person: Djedi S. Widarto, Indonesian Institute of Sciences (LIPI)
E-mail: <mailto:widarto@geotek.lipi.go.id>

[b] IASPEI General Assembly in Santiago de Chile, 2-8 October 2005:
While there is a session on earthquake source mechanics, no formal session on EM with earthquakes are planned for this meeting. For details: www.iaspei.org

[c] URSI (International Union on Radio Science), 27th GA (General Assembly), October 23-29, 2005, New Delhi, India:

There will be a joint session (EGH) session entitled, "Seismo Electromagnetics: Lithosphere-Atmosphere-Ionosphere Coupling" (organized by M. Hayakawa, S. Pulinets, M. Parrot and O. A. Molchanov), and there will be presented about 50 papers (many papers from India).

[d] EMSEV Workshop “Recent Progress in Understanding the Problems of Seismo-electromagnetics and Lithosphere-Atmosphere-Ionosphere Physical Coupling Mechanisms” in Mexico on Nov. 3 and 4, 2005:

This will be the major annual activity of EMSEV 2005. The activity will be held as a part of the Annual Meeting of UGM (Mexican Geophysical Union) to be held during 30 Oct- 4 Nov 2005 at Puerto Vallarta, Mexico. Sergey Pulinets is in charge of the local organizing committee.

Web site: http://www.geofisica.unam.mx/ionosferico/EMSEV/index.html

Original research results are welcome on the following topics:

- Combined satellite and ground-based EM studies of earthquakes and eruptions
- Integrated EM monitoring of active faults and volcanoes
- Multi-parametric approaches of seismic and volcanic activities
- Near ground electromagnetic processes and emissions in all frequency bands associated with earthquakes and volcanic activity
- Geochemical and thermal processes associated with seismo-electromagnetic phenomena
- Space plasma variations associated with the seismic and volcanic activity
- Modelling of EM phenomena

The papers dealing with the earthquakes and volcanoes in Mexico are particularly welcomed.

Abstract Submission

There will be oral and poster sessions. The abstracts should be submitted electronically at the following address: emsev_2005@geofisica.unam.mx. The length of abstract is 1 page of 12 pt Times New Roman, including preference for oral or poster presentation, author’s affiliation, postal and electronic addresses. The deadline of abstract submission is September 15, 2005.

Venue

The workshop will be held within the timeframe of the yearly session of the Mexican Geophysical Union (UGM – Union Geofisica Mexicana http://www.ugm.org.mx/) which is scheduled on October 30 – November 4, 2005.

All events of UGM activity will take place in Fiesta Americana Hotel (http://www.mexicotravelnet.com/puertovallarta/hotels/fiestaamericana.htm).

[e] AGU Fall Meeting 2005, December 5-9. Session T28: "Progress in understanding the electromagnetic phenomena caused by earthquakes "– Conveners: Ouzounov, Uyeda, Parrot, Pulinets. Abstract Due Date July 26 for paper submissions and September 8 for electronic submissions. www.agu.org for details.
Description: Recent earthquakes have provided and have renewed interest in question of the existence of Electromagnetic (EM) signals related to strong earthquakes. Latest observations from the DEMETER satellite provide evidence of VLF electrical and magnetic signals prior to the some earthquakes. A further question that is still widely debated is whether such signals precede the majority of earthquakes and to what extent they can be detected by ground-based or satellite sensors. One of reasons for a cautious assessment of this field by the science community is the lack of physical understanding of the link between seismic-tectonic processes in the solid Earth and surface/ atmospheric/ ionospheric precursory events. This session will consider the causes and observations of EM phenomena related to earthquake activity. Topics include: a. EM signals caused by stress changes in the Earth's crust; b. theory relating tectonic stress changes to electrical, electro-chemical and thermodynamic processes; c. thermal infrared (TIR) emission phenomena; d. case studies, reanalysis and new facts; and e. ground and space-based methods for EM, VLF, and TIR observation, validation and data mining. Contributions are solicited on all potential EM earthquake related phenomena.

[f] The 42nd Annual Convention and Meeting on "Earth system processes related to Earthquakes, Tsunamis and Volcanic Eruptions" organised by the INDIAN GEOPHYSICAL UNION to be held at Barkatullah University, Bhopal, India from 7-9 December, 2005. Website.The URL about the meeting is:- www.igu.in CONVENER: Prof.Ashok Kumar Gwal, Barkatullah University, E.mail: splakg@sancharnet.in

[g] The third International Symposium "Geodynamics and Environmental Problems of High-Mountain Regions in XXI Century" in Bishkek (convenor Dr Rybin; http://tiger.gdirc.ru/sveta/irc/english/sympos_circ2005.html) was originally planned in June 2005. However due to political problems, the meeting was postponed to October 24-30, 2005. The meeting was organized under IASPEI and will concern Active Monitoring, Active EM Methods, MHD induced seismicity, etc.

[h] EM Sounding meeting in Moscow (EMS-05) is actually the second Russian seminar-school on EM sounding of the Earth organized by Spichak on November, 28-December, 2, 2005. One of the sessions will be devoted to EM

studies of the volcanoes and seismically active areas. However, this meeting is not presently international and the official language will be Russian.

[i] 2006 EMSEV meeting in Agra, India
It was decided some time ago that the next annual EMSEV meeting will be in Agra, India in 2006, provided the invitation by Birbal Singh still holds. This appears to be the case. We confirmed in Toulouse that next EMSEV meeting will be held in Agra, India with Birbal Singh as the main convenor and T. Harinayayana as the co-convenor. The dates for the meeting will be decided soon (probably season in December).

[j] Demeter Meeting, June 2006, Parrot reported that a meeting of internal and external investigators will be held.

[4] Symposium proposal(s) for IUGG 2007 Perugia.

The following sessions have been proposed from EMSEV for the IUGG in Perugia. They will be discussed at IUGG Scientific Committee in September.

Session 1: " VOLCANIC STRUCTURE AND ACTIVITIES"
Convenor : Viacheslav V. Spichak;
Co-convenors: Jacques Zlotnicki, Yoichi. Sasai, Domenico Patella and Ciro Del Negro

Magnetic, electric and electromagnetic methods are intensively applied to imaging volcanic structures and monitoring volcanic activity. The knowledge of volcanoes' interior is crucially important for understanding the dynamics of the feeder as well as for proper interpretation of EM signals. Both aspects lead to a more complete description of the time varying EM phenomena related to on-going volcanic processes.
The contributions along the following lines are encouraged:
1) EM methods to study the volcanic structures, the associated geothermal fields and hydrothermal systems;
2) Joint interpretation of EM, seismic, gravimetric and other geophysical/geological data;
3) Land-based and satellite EM monitoring of active volcanoes, geothermal fields and hydrothermal systems:
4) Space and time changes of EM signals related to volcanic activity;
5) Modeling of EM manifestations of volcanic processes.

Session 2: "ELECTORMAGNETIC FIELDS ASSOCIATED WITH EARTHQUAKES AND ACTIVE FAULTING"
Convenor: Malcolm Johnston;

Co-convenors: Naoto Oshiman, and Antonio.Meloni

Electromagnetic fields are both expected and observed during seismic and aseismic fault rupture. Furthermore, as a consequence of this rupture, secondary fields are generated by coupling of ground motion into the atmosphere and ionosphere. These phenomena relate directly and indirectly to source processes driving these tectonic events and may reflect the roles of fluids in active faulting. Unfortunately, not all aspects of these measurements, or theories proposed to explain them, are well understood. This session will focus on the following areas of investigation:
1) Measurements of electric and magnetic fields near and during active faulting;
2) Heterogeneity in electromagnetic structure around seismic and aseismic rupture region including lower crust;
3) Controlled laboratory observations and observations from natural laboratories such as dam loading/filling, and crustal loading/failure;
4) Theoretical considerations regarding source generation mechanisms;
5) Measurement resolution, data quality, identification, separation and removal of spurious signal sources;
6) Multi-parameter measurements (strain, tilt, pore pressure, displacement, etc) together with EM measurements that can place better constraints on the physics of source processes before, during and after earthquakes.

Session 3: "CRUSTAL INSTABILITIES AND EARTHQUAKE PRECURSORS"
Convenor: Pier Francesco Biagi;
Co-convenors: Masashi Hayakawa, Jann-Yenq Liu, Toshiyasu. Nagao

Tectonic activity produces permanent and/or temporal alterations of geophysical, geodetic, geochemical and hydrological state of the earth crust. These alterations, earthquakes being the most typical, reflect the crustal instabilities at critical state. It has been reported that often even the atmosphere/ionosphere is affected by such instabilities - the phenomenon now called the lithosphere-atmosphere-ionosphere (LAI) coupling. Different methods of geosciences are in operation to monitor the crustal instabilities. The earthquake precursors, in particular the electromagnetic precursory phenomena, constitute one of the important targets of crustal instablitiy research. The crucial point here is that all these phenomena are inter-related and to understand them, we have to treat the earth's crust as a system. The scope of this session includes:

1) All kinds of evidence of crustal instabilities, involving seismicity, magmatism, strain anomalies, active faulting, fault creep and underground fluid perturbations, in addition to EM anomalies, and their inter-relationships;
2) All empirical and statistical variations of crustal phenomena, preceding or coming with earthquakes and their inter-connections. Instrumentation, measurement techniques and methods of data analysis for pre-co-post crustal instabilities;
3) Theoretical models to explain the physical mechanisms behind instabilities and their precursors.

Session 4: "SEISMO- ELECTROMAGNETIC STUDIES USING SPACE TECHNOLOGY"

Convenor: Ramesh Singh ;
Co-convenors: Sergey Pulinets, Michael Parrot, Dimitar Ouzounov, and Valerio Tramutoli

During the last decade, the possibilities have been shown that large events in the solid earth and oceans, such as earthquakes, volcanic activity and tsunamis, may affect the atmosphere and ionosphere through yet unresolved process – the lithosphere-atmosphere-lithosphere (LAI) coupling. LAI coupling was postulated from ground-based observations associated with earthquakes. The recent investigations using multi satellite sensors have been actively pursued. Significant changes in total electron concentration (TEC) in the ionosphere, ground surface temperature anomaly by thermal infrared (TIR) emission and/or cloud cover associated with several large earthquakes have been observed over the epicentral region. Latest observations from the DEMETER satellite seem to provide evidence of Very Low Frequency (VLF) electrical and magnetic signals prior to some earthquakes. However, convincing results are still insufficient and the physical understanding of the link between the solid earth processes and surface/atmospheric/ionospheric precursory events is largely unclear.
Topics to be discussed in this session include:
1) Case studies of satellite observation related to seismo-electromagnetic observations comparison with ground-based observations;
2) Theory on the physical mechanism of the connection between the process in the earth crust and atmospheric-ionospheric phenomena prior to main earthquakes;
3) Thermal infrared (TIR) emission phenomena, cloud cover and TEC anomalies, possibly related to major earthquakes, and volcanic/geothermal activities and their comparisons with ground-based relevant data, such as meteorological, radon emission and ionosonde data;
4) Possible usefulness of space technology in tsunami early warning.

[5] Tsunami Response

Novik initiated this problem. He claimed that to monitor Tsunamis, the EM method has a big advantage from a theoretical point of view. Because EM techniques can measure not only the movement of seawater but also ocean floor movement produced by the seismic source. Korepanov informed that there are already good papers presented by Russian authors (Moskovchenko and Belokon) devoted to electromagnetic precursors and by French ones (Arthru and Longonnez) about signatures of tsunami observed in TEC.

[6] Special Reports and Proposals

There was some discussion about a new EMSEV focus on earthquakes and active faulting. Various regions were proposed on the basis of possibly providing quick scientific return. These regions include

a) Koyna Fault in India where the probability of a large earthquake is high. Possible experiments could include continuous EM monitoring, repeat measurements of resistivity, etc. this would require a 3-4 year program. Quite a bit of background work has been done. T. Harinayayana can provide reprints.
b) Turkey – Near Izmet earthquak
c) Tien Shan – facilities available
d) Indonesia
e) Phillipines
f) Columbia
g) Others

[7] Publications

A number of new publications are available or soon to be available. These include:
a) Proceeding of the La Londe MEEMSEV meeting. A. Meloni – Editor
Ann. Geophysics.
b) Special Issue of J. App. Physics, 2005 "Electrical and electromagnetic studies in geothermally active regions" , Editors, Harinayayana and Zlotnicki – Proc. of a symposium held at IUGG General Assembly, Sapporo, 2003.,
c) Proc. IWSE Meeting, M. Hayakawa – editor, J. Phys. Chem. Earth.
d) A monograph "The Physics of Seismic Electric Signals", 338 pp, Terrapub, Tokyo, 2005. by P. A. Varotsos.

The meeting adjourned at 19:00.