# 2002 Annual Report of Inter-Association (IAGA/IASPEI/IAVCEI) Working Group of Electromagnetic Studies on Earthquakes and Volcanoes (EMSEV)

by Seiya Uyeda, Malcolm Johnston and Jacques Zlotnicki

Contents:

**1) Formation of EMSEV**
1a) Hanoi Meeting
1b) Membership
1c) IT Communications
**2) First EMSEV Business Meeting**
2a) Background and history of EMSEV creation
2b) Membership, communication and support
2c) Publications
2d) Meetings
2e) New initiatives and proposals
2f) Free discussion
**3) EMSEV Activity of the Period 2002-2004**
3a) EGS General Assembly, Nice, April, 2002,
3b) Taiwan "International Workshop on Earthquake Precursors 2002"
3c) "16th EM Induction Workshop", Santa Fe, June, 2002
3d) URSI (International Union on Radio Science) General Assembly, Maastrichit, 17-24 August, 2002
3e) 3rd International Workshop on Magnetic, Electric and Electromagnetic Methods in Seismology and Volcanology, Moscow, 3-6 September, 2002
3f) PIERS 2003, Singapore, 7-10 January, 2003
3g) EMSEV Workshop for Initiating Seismic and Volcanic EM Monitoring in Asian Countries. 13-16 January, Manila, 2003
3h) EGS/AGU/EGU General Assembly, Nice, 6-11 April, 2003
3i) IEEE EMC (Electromagnetic Compatibility) conference, Istanbul, 11-16 May, 2003
3j) IUGG General Assembly, Sapporo, June 30-July 11, 2003
3k) IAVCEI General Assembly, Chile, 2004
3l) Possibility of the 4th MEEMSV Workshop in France in 2004.
3m) Invitation of the next EMSEV Workshop from NGRI, Hyderabad, India
**4) Concluding Remarks**

# 1) Formation of EMSEV

## 1a) Hanoi Meeting

Upon the approval of EMSEV creation by the IUGG Executive Committee (August 1, 2001), its formation was started with an informal discussion meeting (August 23, 2001) in Hanoi at IAGA/IASPEI GA. Uyeda described the background history of the WG creation and the terms of reference set forth by IUGG, based on which he indicated that, for its membership, the balance would be important between:

--> Theory (EM, solid state physics, statistics) and Experimental (field, lab.)
--> Solid Earth and Ionosphere (EM waves, satellite)
-->Time Change (tectonic and volcanic activity, co-event changes) and Structure
--> EM and non- EM studies (seismology, geodesy, geochemistry, fluids).

It was agreed by the participants that the WG should encourage projects for

--> Assistance to developing countries
--> Developing International Interdisciplinary cooperation.

**Attendants:** BLECKI Jan (jblecki@cbk.waw.pl), CHIRKOV Yevgeny ( chirkov@uipe-ras.scgis.ru), KOREPANOV Valery ( vakor@isr.lviv.ua), KOSTROV Nikolai ( nikolai@eri.u-tokyo.ac.jp), KUZNETSOVA Tamara(tvkuz@izmiran.rssi.ru), MOGI Toru (tmogi@eos.hokudai.ac.jp), NAGARAJAN Nandini (nandini@satyan.net.in), NIEWIADOMSKI Janusz (janusz@igf.edu.pl), NISHIDA Yasunori (nishida@ares.sci.hokudai.ac.jp), PARROT Michel ( mparrot@cnrs-orleans.fr), ROZLUSKI Cezary (cpr@igf.edu.pl), SASAI Yoichi ( sasai@eri.u-tokyo.ac.jp), SCHWARZ Gerhard (gerhard@sgu.se), STANICA Dumitru ( dstanica@geolin.ro),TAKANO Toshiaki (takano@cute.te.chiba-u.ac.jp), UTADA Hisashi (utada@eri.u-tokyo.ac.jp), UYEDA Seiya (suyeda@st. Rim.or.jp), UYESHIMA Makoto (uyeshima@eri.u-tokyo.ac.jp), ZLOTNICKI Jacques (jacques.zlotnicki@opgc.univ-bpclermont.fr), ARORA B. R. ( bra@iig.iigm.res.in)

## 1b) Membership

The parent Associations assigned liaison scientists as follows: IAGA ( J. Zlotnicki), and IASPEI and IAVCEI (M. Johnston), while at our request, Y. Ogawa was assigned the representative of IAGA WG1.2 (Electromagnetic Induction in the Earth).

The starting WG membership was carefully worked out by Uyeda, Johnston and Zlotnicki, through consultation with a number of scientists taking disciplinary and geographical balance into account. The membership decided in January 2002 is as follows:

**Chairman: UYEDA**, Seiya, Tokai University, Japan, suyeda@st.rim.or.jp
**Secretary: NAGAO**, Toshiyasu, Tokai University, Japan, nagao@scc.u-tokai.ac.jp
**Liaison:**
**IAGA: ZLOTNICKI**, Jacques, Observatoire de Physique du Globe de Clermont-Ferrand, France, Sjacques.zlotnicki@opgc.univ-bpclermont.fr
**IASPEI & IAVCEI: JOHNSTON,** Malcolm, US Geological Survey, USA, mal@theboat.wr.usgs.gov
**IAGA WS1.2: OGAWA**, Yasuo, Tokyo Institute of Technology, Japan, oga@ksvo.titech.ac.jp

**Members:**

**BIAGI, P. F.**, University of Bari, Italy ,biagi@fisica.uniba.it
**FRASER-SMITH**, Anthony, Stanford University, USA, acfs@alpha.stanford.edu
**FUJINAWA**, Yukio, National Research. Inst. for Earth Science and Disaster Prevention (NIED), Japan, fujinawa@bosai.go.jp
**GOHKBERG,** Mikhail B., United Inst. Phys. Earth, RAS., Russia, gmb@uipe-ras.scgis.ru
**HAQ, Zinqi**, China Seismological Bureau, China, hjean@fhnet.cn.net
**HAYAKAWA**, Masashi, Univ. Electro-Communications, Japan. hayakawa@whistler.ee.uec.ac.jp
**KOONS**, Harry, The Aerospace Corporation, USA, Harry.C.Koons@aero.org
**KOPYTENKO**, Yuri A, Inst. Terrestrial Magnetism, Ionosphere and Radiowave Propagation, RAS., Russia, galina@gh5667.spb.edu
**KOREPANOV,** Valery, Lviv Centre, Inst. Space Res., Nat. Acad. Sci. and Nat. Space Agency, Ukraine, vakor@isr.lviv.ua
**LAPENNA**, Vincenzo, University of Basilicata, Italy. lapenna@imaaa.pz.cnr.it, lapenna@unibas.it
**Le MOUEL**, Jean-Louis, Inst. Physique du Globe de Paris, France, lemouel@ipgp.jussieu.fr
**LIU,** Jann-Yenq, National Central University, TAIWAN , jyliu@jupiter.ss.ncu.edu.tw
**MELONI,** Antonio, Inst. Nac. Geof. Volc.(INGV), Italy, meloni@ingv.it
**MOLCHANOV**, Oleg, United Inst. of Physics of the Earth (UIPE), RAS, Russia, Oleg@uipe-ras.scgis.ru
**PARK,** Stephen, University of California, Riverside, USA, magneto@ucrmt.ucr.edu
**PARROT,** Michel, LPCE/CNRS, France, mparrot@cnrs-orleans.fr
**PULINETS**, Sergey A: Instituto de Geofisica, Universidad Nacional Autonoma deMexico, pulse@igeofcu.unam.mx
**RUAN,** Aiguo, China Seismological Bureau, China, ruanag@public.lz.gs.cn
**SASAI**, Yoichi, Tokyo Metropolitan Government, Japan, yosasai@zag.att.ne.jp
**SHAPIRO,** Vsevolod, Inst. of Geophysics, Urals Department of RAS, Russia, seva@maglab.mplik.ru ,
**SINGH,** Birbal, R.B.S. College (Agra University), India, birbal@sancharnet.in
**SPICHAK,** Vjacheslav, Geoelectromagnetic Res. Inst., RAS, Russia, v.spichak@g23.relcom.ru
**STANICA,** Dimitru, Inst. Geodynamics, Romanian Acad., Romania, dstanica@geodin.ro
**TEISSEYRE,** Roman, Inst. Geophysics, Polish Acad. Sci., Poland, rt@igf.edu.pl
**TUNCER,** Mustafa Kemal , Bogazici University, Turkey, tuncer@boun.edu.tr
**VALLIANATOS,** Filippos, Technological Educational Inst. Crete, Greece, fvallian@chania.teiher.gr
**VAROTSOS,** Panayiotis, University of Athens, Greece. pvaro@otenet.gr
**ZENG,** Xiaoping, China Seismological Bureau, China, zengxp@vip.163.com
**ZHAN,** Zhijia, China Seismological Bureau, China, zhoux1029@sina.com

## 1c) IT communications

Two mailing lists are installed to facilitate communications. One, created in February 2002, is for WG members ( emsev_wg@eqibm18.iord.u-tokai.ac.jp) and the other is for wider community of more than 200 listed members created in May 2002 (emsev@sml-z3.infoseek.co.jp).
It is intended that information on most of EMSEV activity and scientific discussions are run through the latter mailing list, while something we need to deliberate among WG members through the former.

A WEBSITE of EMSEV has also been created (http://yochi.iord.u-tokai.ac.jp/emsev). This WEBSITE is linked to IUGG Homepage. It is hoped that S. Gs. of the sponsoring Associations see it linked to their Homepages.

# 2) 1st EMSEV Business Meeting

First EMSEV Meeting was held Sept. 6, 2002, "President Hall" of RAS, Moscow

**Participants:**

**EMSEV members:,**

J. Hao, D. Stanica, Y. Kopitenko, Y. Sasai, J. Zlotnicki, M. Johnston, V. Spichak, M. Gokhberg, J. Y. Liu, M. Parrot, F. Vallianatos, O. Molchanov, F. Biagi, T. Nagao, S. Uyeda, A. Meloni, V. Lapenna,

**Non EMSEV members**

Crisan Demetrescu (Romania), Saurabh K. Verma (India), Minakshi Devi (India), Fan Xing (China), Toru Mogi (Japan), Igor Rokityansky (Ukraine), Adele Manzella (Italy), Pavel Alexandrov (Russia), Valentin Maksymchuk (Ukraine), Matisahivili Tamaz (Italy), Vitali Morgounov (Russia), Guoze Zhao (China), V. Hegai (Russia), V. Kim (Russia), H. Tanaka (Japan), K. Hattori (Japan), Valerio Tramutoli (Italy), D. Di Mauro (Italy), John Bishop (Australia).

## 2a) Background and history of EMSEV creation.

Uyeda (Chair) and Johnston (IASPEI/IAVCEI liaison member) reported on the writing of the initial proposal at the Birmingham 1999 IUGG meeting and the Terms of Reference set up by IUGG in accepting this proposal. The need for cross-interaction between different disciplines was identified as a fundamental purpose of the working group since researchers in EM studies have very diverse backgrounds. Spichak remarked that similar need for EM studies on volcanic environment had been discussed at IAGA/IAVCEI level prior to our proposal. The process of EMSEV creation appeared of particular importance to several participants who were interested in the mechanics of creation, what such a working group could, or could not try to do, what is its political power (none) and what is its purpose (mostly to promote cooperation and collaboration).

## 2b) Membership, Communication and Support.

We now have 33 members representing 14 countries as listed in **1b)**.

The EMSEV mailing list (**1c)**) with over 200 members is open to everybody who sends a request to Nagao (Secretary) for inclusion. Uyeda outlined the level of support obtained so far: $1000 (IASPEI for 3rd MEEMSV), $2000 (IAGA) and $1000 (IAVCEI) for 2002. The latter two may be used for a local workshop in Manila (see **3g)**). Some similar amount of support may be expected from these associations in 2003, but not much more.

## 2c) Publications.

Recent publications related to the activity of EMSEV members include:

”Seismo Electromagnetics- Lithosphere-Atmosphere-Ionosphere Coupling” (Edited by M. Hayakawa and O. Molchanov), TERRAPUB., 477pp, 2002

"Recent Investigations of Electromagnetic Variations Related to Earthquakes" ( Edited by S.

Uyeda and S. Park), Special Issue, Journal of Geodynamics, 33, 4-5, 2002.
"A Multi-Disciplinary Study of Volcanoes" (Edited by. V. Spichak, T. Dixon and A. L. Martin), Special Issue, J. Volcanology and Geotherm. Res., 113, N 1, 2002.
Special Issue on Seismo Electromagnetics (M. Hayakawa, Guest editor), J. Atmos. Electr., vol. 22, No.3, p.111-300 2002.
"Inverse Geophysical Problems", (V. N. Troyan and M. Hayakawa, Eds.), TERRAPUB, Tokyo, pp.289, 2002.

**2d) Meetings.**

For meetings, recently held or proposed for near future, related to EMSEV with varied degrees, see section **3)**.

**2e) New Initiatives and Proposals**

2e-1) IGOS Geohazards initiative.

V. Tramutoli outlined a new UNESCO initiative for investigation of geohazards (earthquakes, eruptions, landslides, ground motion, etc) using a broad range of investigative techniques. The role of EMSEV appears limited in such an initiative as its only role can be to provide a forum for discussion of results, not collection of them.

2e-2) Center for EM Studies.

V. Spichak offered to create an international center for EM modeling and interpretation of the data measured in volcanic areas (first, free of charge) in his institute (GEMRI) and asked EMSEV to approve this activity in order to get internal funding. Discussion of this proposal followed the lines that the initiative of GEMRI was welcome but it seemed outside the primary purpose of EMSEV to take on a role of raising funds.

2e-3) Sub-Working Group on Short-Term Precursors. O. A. Molchanov proposed forming a sub-group for analysis of multi-parameter data that might indicate precursive behavior. However, it seemed unnecessary at this stage to make such an organizational structure in EMSEV, which might, contrary to its intention, result in disciplinary separation rather than close interdisciplinary collaboration. Such work could better be achieved with the current simple structure.

2e-4) New Journal devoted to EM phenomena.

Some authors of papers on earthquake related EM studies are having difficulty getting published in current international journals and in some cases have papers rejected by editors before being sent out for review. Molchanov proposed creation of a new journal devoted to EM phenomena associated with earthquakes and volcanoes. Discussion of this proposal took the direction that, although poor understanding of this field by some editors and reviewers in some geophysical journals is a problem, a

new journal would probably not be a good idea since it could isolate the field and make integration with other geophysical data more difficult.

**2f) Free discussion**

Zlotnicki (IAGA-liaison member) emphasized the importance of multi-disciplinarily measurements and multi-team approaches to generate better cross-correlation of results, better evaluation of noise and ultimately more convincing EM signals. In this research field, work consists of two parts; the first focuses on obtaining knowledge of the EM structure through 3D EM imaging, and the second focuses on temporal changes to this structure using continuous monitoring with multi-disciplinary techniques in a wide spectrum of frequency. This includes ground-based techniques and satellite based techniques such as may soon be obtained from EM satellite platforms, such as DEMETER.

Others pointed out that careful processing of long term data together with convincing signal to noise analysis is needed to convince the scientific community at large that abnormal variations are or are not associated with earthquakes or eruptions. During the 3rd MEEMSV meeting in Moscow, several presentations focused on processing of combined EM and deformation data.

Identification of the physics of EM phenomena is crucial. A consensus of participants agreed that further laboratory experiments should be promoted. At present there are relatively few; only one presentation on laboratory measurements (J. Hao) was made during the 3rd MEEMSV meeting. The role of fluids in the rupture and eruption processes is of fundamental importance.

There were suggestions that we should 1) focus on international, multi-disciplinary experiments at a few selected sites, where all the skills of different teams to perform 3D tomography, data acquisition and analysis, relevant laboratory experiments, physics analysis, and modeling can be applied, and 2) make efforts to enlist the cooperation of other geophysical disciplines (i.e. seismology, ground deformation, geochemistry, hydrology ..).

Meeting adjourned with a final remark of Uyeda that the Meeting was useful in clarifying the purpose of EMSEV and in deliberating its future activity. Next EMSEV business meeting will be held in Sapporo

## 3) Activity of the Period 2002-2004.

Scientific meetings held or planned in 2002-2004, with EMSEV involvement at different levels, visible to EMSEV chair are as follows:

**3a) EGS General Assembly, April, 2002 in Nice.**
The International Working Group II of EGS sponsored the Symposium “Seismic Hazard Evaluation, Precursory Phenomena and Reliability of the Prediction”, convened by M. Contadakis, P. Biagi and J. Zschau. With about 80 oral and poster presentations, this Symposium succeeded in updating the researches in different disciplines. The Proceedings of the Symposium are ready for the publication on the Journal “Natural Hazard and Earth System Sciences”; 50% of the accepted papers are in the field of the seismo-electromagnetism. There were also Symposia “Methodology of the Geophysical Data Interpretation”, convened by Spichak, and “Electromagnetic and Acoustic Sounding Techniques in Various Media”, convened by V. Korepanov. EMSEV members at the General assembly included P.F. Biagi, Y.A. Kopytenko, V. Korepanov, V. Lapenna, O.A. Molchanov, M. Parrot, S.A. Pulinets, V. V. Spichak, F. Vallianatos

**3b) Taiwan "International Workshop on Earthquake Precursors 2002"**
June 5 - 8, 2002, there was a two-day Workshop with the above title at the National Central University, with a two-day field trip to the Chi Chi earthquake area. http://www.ss.ncu.edu.tw/~istep/.
The project entitled "Research on Seismo-Electromagnetic Precursors of Earthquakes (iSTEP)" has been granted for next four years to the National Central University, Taiwan. The event was held as its kick-off meeting. The meeting was extremely vivid, attended by 13 participants from abroad, including several members of EMSEV (Uyeda, Nagao, Fujinawa, Hayakawa, Pulinets) as well as 95 Taiwanese scientists, including JY Liu, EMSEV member and the key driving person of the whole project.

**3c) "16th EM Induction Workshop", Santa Fe, June, 2002**
The IAGA working group 1.2 , "16th EM Induction Workshop" at Santa Fe, USA was attended by Y. Ogawa, our liaison member. www.whoi.edu/emworkshop

**3d) URSI (International Union on Radio Science) General Assembly, Maastrichit, 17-24 August, 2002.**
During the GA there was a session jointly organized by Commissions E, G and H convened by M.Hayakawa, S.Pulinet, M.Parrot and O.A.Molchanov. There were 8

invited papers and 17 posters. We had many attendants working on the ionosphere, including EMSEV members (Parrot, Nagao, Hayakawa). Inter-commission Working Group entitled, EGH Seismo Electromagnetics (Lithosphere-atmosphere-ionosphere coupling) was approved in the Union for the coming three years. Its conveners are Hayakawa, Pulinets, Parrot and Molchanov.

**3e) 3rd International Workshop on Magnetic, Electric and Electromagnetic Methods in Seismology and Volcanology, Moscow, 3-6 September, 2002** www.igemi.troitsk.ru/MEEMSV-2002/eng**.**

This is the meeting where the major contribution was played by EMSEV members in 2002. The Workshop was organized by Geoelectromagnetic Research Institute. (GEMRI) of Russian Academy of Sciences (LOC Chairman – V. Spichak) in collaboration with several other institutions. More than 130 researchers from 15 countries (including Japan, China, Australia, USA, Italy, Greece, France, India, etc.) participated in the meeting. The scope of the Workshop was extended in comparison with two previous meetings in order to include the EMSEV objectives also, i. e., electromagnetic studies of the earthquakes and volcanoes.

Scientific program of MEEMSV-02 included 7 sections:

- electromagnetic investigations in seismic and volcanic areas;
- electromagnetic images of active zones;
- Earth's crust structure and physical properties of rocks;
- studies of seismo-electric and seismo-magnetic effects;
- electric, magnetic and electromagnetic monitoring of seismic and volcanic activity;
- ionosphere – lithosphere EM coupling;
- data processing and instrumentation.

Many EMSEV members including all the section chairmen (Zlotnicki, Spichak, Lapenna, Uyeda, Johnston, Gokhberg, Tramutoli and Vallianatos) and Hao, Kopytenko, Korepanov, Liu, Meloni, Molchanov, Parrot, Sasai, Shapiro, Stanica, and Tuncer participated. Among the major points raised at the last panel discussion, those with particular importance from EMSEV points of view may be summarized:

1. A good knowledge of the tomography of the geological objects, for which monitoring systems are developed, should be a basic primary necessary step.
2. Study indicates the presence in the crust of low velocity and low resistivity layers with a similar geometry. The effects of gases and fluids are important.
3. Theoretical and experimental studies on the electrical properties are to be much more advanced.
4. Joint application of several techniques, multi-parametric approaches, combination of different techniques of data processing as well as the well integrated international cooperation on selected test sites will be extremely useful.
5. The discrimination of anomalous behavior suggested to be earthquake precursors from other phenomena continues to be a very important problem.

On workshop completion its participants were invited to the post-workshop field seminar in Alexandrovka training camp, where the “Electroprospecting” stuff demonstrated the Russian made EM instruments, while GEMRI RAS experts lectured on the latest achievements in the analysis and interpretation of EM data in seismic and volcano active regions.

**3f) PIERS 2003, 7-10 January, Singapore, 2003**

Parrot and Hayakawa organized a session entitled "Electromagnetic precursors of earthquakes," where seven papers were presented. Korepanov was present.

**3g) EMSEV Workshop for Initiating Seismic and Volcanic EM Monitoring in Asian Countries. 13-16 January, Manila, 2003**

This WS was another highlight of the EMSEV activity in 2002-2003 period. The aim of the WS was to introduce the recent progress in Seismic/Volcanic EM studies to Asian scientists and to discuss the feasibility and possible usefulness of initiating EM monitoring in their countries. The scientific program was worked out by EMSEV Secretariat and LOC chaired by B. Bautista at the Philippine Institute of Volcanology and Seismology (PHIVOLCS).

Following the reports on EMSEV (S. Uyeda) and PHIVOLCS activities (Leonila Bautista, J. Sabit), extensive reviews and reports on EM investigation on volcanoes (J. Zlotnicki, Y. Sasai), seismo-electric phenomena in DC-ULF-VLF range (T. Nagao, X. Zeng, K. Hattori, V. Korepanov), anomalous transmission of VLF EM waves (K. Hattori), the Kushida effect in VHF anomalies (S. Uyeda) and ionospheric anomaly (J. Liu) over focal regions, theoretical and experimental investigation on the generation/transmission of EM anomalies possibly related to seismic/volcanic phenomena (Y. Sasai, Q. Huang, M. Kamogawa) were presented with ample time for discussion. Reports from participants on related issues (Q. Huang, T. Harinarayana, B. Singh, D. Widarto, K. Sayanagi) and a video show of the Pinatubo event were also presented.

Lively discussion was made as to what methods may be most effective to meet the specific scientific targets of each countries and some concrete ideas emerged regarding possible monitoring: e. g., for monitoring Taal and Mayon volcanoes, which are the most urgent targets of PHIVOLCS. The structure of these volcanoes should be investigated by EM methods in order to develop efficient monitoring networks based on proton magnetometers as well as electric and EM stations. Another target is the seismicity in the Metro Manila region. For harnessing possible precursory changes of it, a few stations with highly sensitive 3-component magnetometers would be recommendable (Hattori, Nagao and Korepanov) and ionospheric observation by revitalizing the existing ionosonde system would be very cost effective (Liu). EM phenomena before seismic/volcanic events being not yet recognized widely, it was suggested that the investigation may provide a unique opportunity for the Philippines to achieve pioneering contributions.

On the third day, field excursions were made to Taal Vocano and Makban geothermal power plant in two parties, both being highly enlightening. Regarding Taal volcano, Zlotnicki, Sasai and PHILVOLCS teams have discussed the potential researches and monitoring systems to develop to initiate EM studies on this edifice.

Funds from IUGG ($3000), IAGA ($2000), and IAVCEI ($1000) were used for LOC activity and air-fare of 6 foreign participants (EMSEV members: X. Zeng, J. Liu, B. Singh, Non-members: D. S. Widarto, T. Harinayarana, K. Sayanagi) and local expenses of participants in need. Hard work of LOC, in particular J. Punongbayan, and the free accommodation for all visitors at PHIVOLCS building were most highly appreciated.

**3h) EGS/AGU/EGU General Assembly, Nice, 6-11 April, 2003**

There will be two sessions closely associated with EMSEV activity.

NH4.01 "Seismic hazard evaluation, precursory phenomena and reliability of prediction" chaired by Biagi et al.

NH4.02 "Seismo Electromagnetics and Related Phenomena" chaired by Hayakawa, Molchanov, Parrot and Vallianatos.

A special issue of Phys. Chem. Earth is planned for the second session.

http://www.copernicus.org/egsagueug/index.html

**3i) IEEE EMC (Electromagnetic Compatibility) conference, Istanbul, 11-16 May, 2003**

The conference will have a session entitled "Terrestrial electromagnetic noise environment" organized by F. Merzer and M. Hayakawa. In view of the high seismic activity in Turkey, a large number of seismo-electromagnetic papers is expected in this session.

**3j) IUGG General Assembly, Sapporo, June 30-July 11, 2003**

S. Uyeda serves Chair of the LOC.

There will be the next EMSEV Business Meetings (possibly evenings of July 1 and 7). We have some financial support to assist EMSEV activity from the Tokyo Club Foundation. Sapporo IUGG GA will be another highlight of EMSEV activity of the year.

Several EMSEV and mailing list members are conveners or invited speakers.
of several symposia of our interest.

U4 Geophysical Risk and Sustainability on a Crowded Planet (S. Uyeda: invited)

JSS01 Hagiwara Symp. Monitoring and modeling of earthquake and volcanic processes for prediction (T, Nagao: invited)

JSS03 Long-term in-situ Ocean Observatories and Observations (Convenor: H. Utada)

JSA 06 Seismo-, Volcano- and Tectono EM effects (conveners: M. Johnston, Y. Sasai, J.

Zlotnicki)
JSA07 Regional crustal models based on seismic, EM, potential field, and geothermal studies (Co-convener: F. Freund)
JSA 10 EM imaging and monitoring of volcanoes and active faults (Conveners: V. Spichak and T. Mogi)
JWS01 Is short-term earthquake prediction possible? (Conveners: T. Nagao, S. Park, E. Gordeev, S. Yoshida)
GAI.09 Electrical and EM studies in geothermally active regions (Convener: T. Harinarayana)
HYPERLINK "http://www.jamstec.go.jp/jamstec-e/iugg/index.html"

**3k) IAVCEI General Assembly, Chile, 2004**

At the request of the organizing committee and IAVCEI President, EMSEV proposed the following sessions.

Session "Integrated Electromagnetic monitoring of volcanic activity"
*Convenor :* J. Zlotnicki ; *Co-convenors:* Y. Sasai & Ciro del Negro
Session "Electromagnetic tomography of volcanoes"
*Convenor*: V. V. Spichak ; *Co-convenors*: S. Pulinets & J. Zlotnicki

On January 13, 2003, Dr. Jorge Clavero, President, Scientific Committee, IAVCEI GA 2004 invited J. Zlotnicki to convene the symposium/thematic session: "Integrated Electromagnetic monitoring and Electromagnetic tomography of volcanoes" (session 8e). Zlotnicki accepted this invitation.

**3l)** There is a possibility of having the 4th MEEMSV Workshop in France in 2004, according to Zlotnicki.

**3m)** There is an invitation of the next EMSEV Workshop from T. Harinarayana, NGRI, Hyderabad, India.. The main reasons for this are:

1. NGRI has carried out many MT studies in earthquake and geothermal active regions.
2. NGRI is proposing a project to monitor the MT signals in the Koyna region.
3. Hyderabad will be the venue for the next EM workshop.

## 4) Concludng Remarks

The scientific objectives of EMSEV concern the physics of pre-event, co-event and post-event EM phenomena related to earthquakes and volcanic eruptions. This physics may contain unconventional elements. Even the existence of EM phenomena with some aspects of earthquake and volcanic events is often far from being universally accepted. We need to establish unambiguous correspondence between EM phenomena and the mechanics of earthquake and volcanic processes. This can be done by integration of EM data and theory with seismological and deformation, hydrologic, geophysical, geochemical and other data monitoring the same processes. Considering that many researchers in the EM field come from a wide variety of

disciplines, including radio engineering, space physics, and solid state physics, bringing together these groups and demonstrating and integrating the data and ideas with those obtained in other related fields will be a daunting task. It will take demonstration of consistent and repeatable data from these different fields, clear determination of noise limitations and it must be backed by solid theoretical analysis. Nevertheless, to meet these goals, thanks to the cooperation of members and non-members, EMSEV appears to have taken off successfully.