

# **13th Business Meeting of IASPEI/IAGA/IAVCEI Inter-Association Working Group on Electromagnetic Studies of Earthquakes and Volcanoes (EMSEV)**

**October 6, 2010, Chapman University, California, USA**

## **1) Participants**

**Jacques Zlotnicki (Chairperson, CNRS, France)**  
**Malcolm Johnston (Vice Chairperson, USGS, USA)**  
**Toshiyasu Nagao (Secretary, Tokai Univ., Japan)**  
**Yoichi Sasai (IAVCEI liaison member, Tokai Univ., Japan)**  
**Ramesh Shingh (Chair of Santa Ana meeting, Chapman Univ., USA)**  
**Jan Blecki (Poland)**  
**Jacob Bortnik (Quakefiner, USA)**  
**Minakshi Devi (India)**  
**Jun Izutsu (Chubu Univ., Japan)**  
**A. Depueva (Russia)**  
**Menas Kafatos (Chapman Univ., USA)**  
**Qinzhong Ma (Earthq. Admin. Shanghai Municipality, China)**  
**Antonio Meloni (INGV, Italy)**  
**Tohru Mogi (Hokkaido Univ., Japan)**  
**Dimitar Ouzounov (Chapman Univ. USA)**  
**Michel Parrot (LPCE/CNRS, France)**  
**Wolfgang Plastino (USA)**  
**Igor Rokityansky (Ukraine)**  
**Dumitru Stanica (Romanian Acad., Romania)**  
**Dragos Stanica (IGAR, Romania)**  
**Joseph Wang (LBNL, Berkeley, USA)**

## **2) Opening Remarks: Zlotnicki : Chair**

Jacques Zlotnicki welcomed the participants and warmly thanks Professor Ramesh Singh for the high quality of the EMSEV meeting held in Santa Ana (USA). He recalled the numerous activities led by EMSEV members during the last two years, as well as the large contributions of EMSEV at 2010 international meetings (EMSEV-PHIVOLCS, EGU, CoV6, AOGS, AP-RASC, AGU ...).

Discussions with IUGG and Mother Associations (IAGA, IAVCEI, and IASPEI) show that EMSEV is considered as very active in promoting good research in spite of a medium size community. Since 2004, EMSEV has made a huge effort in developing electromagnetic and other geophysical methods on Taal volcano, in association with the Philippines Institute of Volcanology and Seismology (PHIVOLCS). Now, a new activity can start in the domain of the physics of earthquakes, and cooperation with Kyrgyzstan will be proposed to EMSEV community.

## **3) Reports from liaison officers: Johnston (IASPEI), Sasai (IAVCEI)**

### **Report from IAVCEI : Yoichi Sasai**

COV6 (Cities on Volcanoes 6) was successfully held in Tenerife, Canary Island, Spain, from May 31st to June 4, 2010. EMSEV convened a session on EM and other combined methods on active volcano monitoring, where about 60 audiences joined. At the closing ceremony was announced that the next COV7 will be held in Colima City, Mexico in November, 2012. At the IAVCEI business meeting, it was also decided that the next IAVCEI GA will be held in Kagoshima City, Japan, in July, 2013.

### **Report from IASPEI : Malcolm Johnston**

Following the very successful EMSEV meeting in Orange, California, efforts for the next joint meeting involving IASPEI/EMSEV are being focused on the IUGG to be held in Melbourne, Australia in 2011. Four joint sessions (see below) on various aspects of electromagnetic studies of earthquakes and volcanoes are proposed and have been accepted. Equipment for joint studies of electromagnetic, seismic and deformation of Taal volcano near Manila in the Philippines has been partly supported by IASPEI.

#### **4) State of EMSEV and communication between members : Toshi Nagao (Secretary)**

EMSEV is one of the 12<sup>th</sup> Inter Associations and current status can be found at <http://iugg.org/associations/inter-associations.php>.

EMSEV web site is regularly updated and information on activities and meetings can be obtained at <http://www.emsev-iugg.org/emsev/>.

Basically, the communication among the EMSEV corresponding members is done through the mailing list (emsev\_ml@emsev-iugg.org). An email should not exceed 50Kb in size. Larger size of the email should be sent to the secretary (T. Nagao: nagao@scc.u-tokai.ac.jp)

Now the numbers of EMSEV corresponding member is 264.

Working group members are now 44 members from 16 countries (China, France, Greece, India, Indonesia, Italy, Japan, Kyrgyz, Philippines, Poland, Romania, Russia, Taiwan, Turkey, Ukraine, and USA).

#### **5) Report of EMSEV activities : Toshi Nagao (Secretary)**

##### **a) 2009 activities (After Sopron IAGA GA)**

##### ***AGU in San Francisco, San Francisco, 14-18 December 2009***

Two sessions were held in the EM field.

NH11: Terrestrial and Satellite Observation Related to Abruzzo M6.3 Earthquake of April 6, 2009

Conveners: Pier Francesco Biagi, Vincenzo Lapenna, Dimitar Ouzounov, Valerio Tramutoli

NH12: Multidisciplinary Approach for Earthquake Precursors Validation

Conveners: Dimitar Ouzounov, Michel Parrot, J Y Liu, Katsumi Hattori

##### **2010 activities**

##### ***EMSEV-PHIVOLCS 2010 meeting in Manila, Quezon City, 25-27 February 2010***

An international meeting was held at PHIVOLCS (Quezon City, Philippines) on 'Monitoring active volcanoes by electromagnetic and other geophysical methods –Application to Asian volcanoes'

About 50 participants attended the meeting and a 10 days joint EMSEV-PHIVOLCS field campaign on Taal volcano followed the workshop.

***EGU, Vienna, 2-7 May 2010.***

Two sessions were held based on EMSEV members.

- ‘Passive satellite techniques and ground-based potential field investigations of volcanic activity’

Convener: N. Pergola, Co-Conveners: V. Tramutoli, F. Prata, J. Zlotnicki, V. Lapenna, C. Del Negro

- ‘Deformation processes and accompanying mechanical and electromagnetic phenomena, for rocks and other materials, from the laboratory to the geophysical scale’

Convener: Konstantinos Eftaxias, Co-Conveners: Costantin Nomicos, Qinghua Huang

***COV6 (Cities on Volcanoes 6), Tenerife Island, Spain, May 31-June 4, 2010.***

One session was organized by EMSEV:

‘Electromagnetic and other geophysical methods for monitoring and predicting volcanic eruptions’

Conveners: Y. Sasai, J. Zlotnicki

***AOGS, Hyderabad, India, 5-9 July 2010***

There was one session concerning earthquakes precursory phenomena

‘ST08 Earthquake Precursor Studies - Current and Future’

Conveners: K. Oyama, B. Reddy, M. Hayakawa, S. Saromoko, Dr. B. Zhao

***Induction Workshop, Egypt 18-24, September, 2010***

***AP-RASC (Asia-Pacific Radio Science Conf.), Toyama, Japan 22-24 September, 2010***

The following session was held during the meeting:

‘Electromagnetic phenomena related with earthquake and volcanic activities’

Conveners: K. Hattori and J.Y. Liu

***AGU, San Fransisco, USA, 13–17 December 2010***

Two sessions are related to our EM activities:

- NH06: Multidisciplinary Research for Validation of Earthquake Precursors: Case Studies and Statistics

Conveners: D. Ouzounov, S. Pulinetz, M. Parrot, J.-Y. Liu, K. Hattori

- NG10: Multiplicity of Scales, Dynamics and Extremes in Geophysics: Theory, Validation, and Applications

Conveners: V. Kossobokov, D. Ouzounov, M. Parrot, J.-Y. Liu, I. Main

**b) 2011 planned meetings**

EMSEV will be involved in several international meetings, but the highest contribution will be done during IUGG 2011 General assembly in Melbourne (Australia, June 27 to July 8, 2011)

***EGU, Vienna, 3-8 April, 2011***

- NH4.1/SM5.8: Seismo electro-magnetic phenomena and earthquakes precursors

Convener: P. F. Biagi ;Co-Conveners: M. Hayakawa, O. Molchanov, T. Maggipinto

- NH4.2: Deformation processes and accompanying mechanical and electromagnetic phenomena, for rocks and other materials, from the laboratory to the geophysical scale

Convener: K. Eftaxias; Co-Conveners: C. Nomicos , Q. Huang

- NH4.3/SM5.1: Seismic hazard evaluation, precursory phenomena and reliability of prediction  
Convener: M. E. Contadakis; Co-Conveners: J. Zschau, T. Xenos , P. F. Biagi

***IUGG GA, 27 June – 8 July 2011, Melbourne, Australia***

Four sessions are under EMSEV responsibility and one session is organized by one EMSEV member:

- J-S09: Electromagnetic Studies of Earthquakes, Active Faulting and Tsunamis  
Lead Convenors: M. Johnston (United States of America), T. Harinarayana (India)
- J-S10: Electromagnetic studies of active processes using space technology  
Lead Convenors: M. Parrot (France), Y. Hobara (Japan)
- J-S11: Imaging and monitoring active volcanoes and geothermal fields by ElectroMagnetic (EM) and other geophysical techniques  
Lead Convenor: J. Zlotnicki (France), Co-convenors: Y. Sasai (Japan), V. Spichak (Russia)
- J-S12 : Towards short-term earthquake prediction - Electromagnetic and other possible precursors and their generation mechanisms  
Lead Convenor: T. Nagao (Japan), Co-convenors: K. Eftaxias (Greece), F. Freund (USA)
- J-A04 : Electromagnetic oscillations from space to Earth: Celebrating 150 years and recent developments in ultra-low frequency wave research  
Convener: Brian J Fraser (Australia), Co-conveners: Malcolm Johnston (United States of America).

***DEMETER meeting***

DEMETER mission will be stopped at the end of 2010, in spite of the good functioning of the satellite. An international workshop is planned to be held in Paris in October 10-12, 2011. C. Contact: Michel Parrot : [mparrot@cnrs-orleans.fr](mailto:mparrot@cnrs-orleans.fr)

***AGU, San Francisco, USA, December 2011***

NH24A: Multidisciplinary Research for Validation of Earthquake Precursors: Case Studies and Statistics I (joint with A, NH, S, SM, T, G), *Presiding: K Hattori, Chiba University; J G Liu, National Central University; D P Ouzounov, NASA/GSFC; S A Pulinets, Institute of Applied Geophysics; M Parrot, LPC2E/CNRS*

**6) IUGG Grants Program 2008-2010 : Taal project**

EMSEV started to cooperate with PHIVOLCS (<http://www.phivolcs.dost.gov.ph/>) on Taal volcano in November 2004. The objectives were to get a better knowledge of the volcano structure and tectonic setting, to develop an EM community in the Philippines, and to monitor the awake of the volcano. About twice a year, joint EMSEV-PHIVOLCS field works are organized. IUGG granted EMSEV in 2008 on a two years project. Therefore, bathymetry, magnetic, electric, resistivity, and temperatures mappings on the Crater Lake and/or on land were achieved. And a huge effort was made for developing a multi-parametric real time monitoring network including electric, magnetic, ground temperature and gradient, seismic noise, deformation and Rn emission. At present, the international cooperation involves teams from Japan, France, USA, Greece, Italy, and Belgium. An International workshop was held in February 2010 during which about 50 participants evaluated the state of activity and the

volcanic risks on the volcano. A seismo-volcanic crisis has occurred between April and August 2010 during which EM signals and ground deformations were observed. During this crisis, EMSEV was able to process the data from the real-time network and to send two reports on the on-going activity to PHIVOLCS.

## **7) EMSEV budget**

### **2009 Budget**

Incomes:

IAGA: 1 000 \$ (755 €)

IUGG: 2 000 \$ (1424 €)

Outcomes:

Support to VESTO: 950 €

Support to EMSEV-PHIVOLCS meeting: 1 000 €

### **2010 Budget**

Incomes:

IAGA: 1 500 \$ (1188 €)

IUGG: 2 000 \$ (1609 €)

IASPEI: 1 000 \$ (M.J.S. Johnston, support to developing countries)

Outcomes:

Support to CoV6: 150 €

Support to EMSEV meeting: 2 200 €

Remaining for further activities:

2 600 € (coming from previous years, cancelled supports). This budget will be used for new EMSEV activities (Kyrgystan, IUGG, and specific supports)

## **8) General discussion on next EMSEV meeting (2012)**

EMSEV received three proposals from EMSEV members for organizing next EMSEV meeting which will be held in 2012. The first application was made during 2009 IAGA meeting at Sopron (Hungary) by Japanese colleagues. During the last weeks preceding Santa Ana meeting, some offers were made by Chinese colleagues from different Institutes in different cities, but only one formal proposal with an organization guideline was issued by Lanzhou Institute which belongs to Chinese Earthquake Administration. Finally, during the meeting Jan Blecki from Poland intended to organize the meeting.

The three proposals are very interesting and they show the increasing interest in Electromagnetic studies related to earthquakes and volcanic eruptions. But, from the general discussion, it has appeared that the Japanese candidature is the oldest and the most advanced proposal. Japanese colleagues have also greatly worked for the benefit of EMSEV since its conception in 2009. Under these considerations, next EMSEV meeting should be held in Japan. Nevertheless, other candidatures should be more accurately defined in order to discuss them during 2011 IUGG meeting.

## **9) New EMSEV activities**

EMSEV activity on Taal volcano (Philippines) made in cooperation with PHIVOLCS has shown its effectiveness and power when an international community is involved. Now, the

EMSEV community is now ready to start a new research effort. We propose to develop cooperation with Kyrgystan. The reasons are the following:

First, in 2009, S. Uyeda, T. Nagao visited at the Bishkek Research Station in Kyrgyz where Kyrgyz scientists use a powerful current system injecting an electric current which can be detected tens of kilometers away from the station. Based on this system, information on electric channeling, current distortion, tectonic structure and active faults systems can be obtained.

During the last few months, EMSEV has been in contact with Anatly Rybin from Bishkek station in order to organize a new research agreement. This proposed agreement is included below.

During this XIIIth business meeting T. Nagao presented some new results and the envisioned studies. The assembly warmly accepted this new activity and asked the EMSEV bureau to go further in this direction.

In the next few months, a further visit will be made by S. Uyeda, T. Nagao, and M. Komagawa. In June 2011, a meeting on MODERN PROBLEMS OF GEODYNAMICS AND GEOECOLOGY OF INTRACONTINENTAL OROGENS will be organized.

We will tentatively organized a more specific workshop in Bishkek after summer 2011, in which all EMSEV members interested in a cooperative work will be welcome.

### **Proposal between EMSEV and Bishkek Institute (SEPTEMBER 2010)**

#### **PROPOSAL FOR COOPERATIVE STUDIES BETWEEN THE BISHKEK INSTITUTE AND THE INTER-ASSOCIATION ON ELECTROMAGNETIC STUDIES OF EARTHQUAKES AND VOLCANOES (EMSEV, [HTTP://WWW.EMSEV-IUGG.ORG/EMSEV/](http://www.emsev-iugg.org/emsev/))**

**Title:** Understanding changes in electric conductivity structure associated with seismic activity using the Bishkek experiment system in central Asia

Background: The Russian Academy of Sciences (RAS), has conducted active monitoring of underground electrical conductivity for over thirty years at the Bishkek Research Station in Kyrgyz (Director Anatoly Rybin, EMSEV member). Their experiment involves injecting large 800-amp electrical currents through 4.5-km long dipoles. This is literally one of the world's largest scale electric/electromagnetic prospecting experiments. In its early stages (1983-1990), high power current pulses from the MHD generator were used. But now, more easily detected square wave pulses are injected several times every day (dipole moment = 4500 m x 800 amp). EMSEV members (SU, TN) with others have visited the Research Station a couple of times and were much impressed and agreed to a need for close international cooperation for further work.

Important results obtained at Bishkek so far include: observations of changes in electrical conductivity of as much as several percent before moderate earthquakes and sharp increases in triggered local seismicity that results from the operation of the injection experiment. Furthermore, the receiving stations in Kyrgyz are extremely remote and are relatively free of artificial noise sources. This provides an ideal environment for checking high-resolution monitoring experiments such as SES proposed by the VAN group in Greece.

Proposal: The following target experiments are suggested for cooperative studies with the Research Station in Kyrgyz:

- 3D modeling of the source region(s) where electrical conductivity changes are occurring,
- Detailed investigation of correlation between electrical conductivity changes and seismicity,
- Electromagnetic triggering processes and their implications,
- Distortion of electrical signals by regional tectonics and faults systems,
- Independent checking of VAN'S SES observations outside Greece,
- Physical mechanisms of EM signals generated by the MHD-generator.

We propose to organize an international cooperation agreement between the Bishkek Institute and the EMSEV working group. Within the framework of this agreement, EMSEV members would visit and conduct joint experiments with the Bishkek Institute.

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