

# **2006 Annual Report of Inter-Association (IAGA/IASPEI/IAVCEI) Working Group of Electromagnetic Studies on Earthquakes and Volcanoes (EMSEV)**

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## **1) Introduction**

Once again, EMSEV has been very active in 2006. Workshops/Symposia in which EMSEV played major role were held in Taipei, Toulouse, Singapore, Beijing, Agra and San Francisco. Field study on Taal Volcano, Philippines has been continued.

## **2) Membership**

Regular 35 EMSEV members ([list attached](#)) and well over 200 corresponding members are enlisted in EMSEV mailing "<http://www.emsev-iugg.org/emsev/>".

## **3) Activity in 2006**

### **Meetings:**

- **International Workshop iSTEP** (integrated Search for Taiwan Earthquake Precursors), Taipei, Taiwan organized by J-Y Liu, March 2006.
- **First DEMETER Workshop** at Toulouse, France, organized by M. Parrot, June 2006.
- Session "**Seismo-Electromagnetics: Lithosphere – Atmosphere – Ionosphere Coupling**", convened by M. Hayakawa, J.Y. Liu and R. Singh, at AOGS (Asia Oceania Geoscience Society), Singapore, July 2006.
- Session "**Observation, Methodology, and Theory of Electromagnetic Signals Associated With Earthquakes**", convened by Q. Huang, D.

Ouzounov, L. Telesca, and T. Nagao, at WPGM (Western Pacific Geophysics Meeting), Beijing, July 2006.

- **International Workshop on Electromagnetic Studies Related to Earthquakes and Volcanoes (IWEMSEV-2006)**, organized by Birbal Singh, and 2006 EMSEV Business Meeting, Agra, India, Nov., 2006. This was the major activity of the year 2006. It was an extremely well organized and fruitful meeting, where high level of EMSEV business meeting held on Nov. 22 is attached.
- Session “**Observation, Validation, and Theory of Electromagnetic Signals Associated With Earthquakes**”, convened by D. Ouzounov, S. Pulinets, M. Parrot and P. Taylor, at Fall AGU, San Francisco, Dec., 2006.
- Continuation of Taal Volcano Monitoring program by PHIVOLCS team. Participation of foreign teams was postponed to early 2007, because of cyclone hit.

#### **Inter-Association Initiative activity: Volcano Taal investigation:**

This project on Volcano Taal as an IUGG Inter-association Initiative was continued by field studies by the staff of PHIVOLCS (Philippine Institute of Volcanology and Seismology). Preliminary analysis of these measurements indicates signs of shallow magma activity. Although plans were made for French & Japanese teams (led by J. Zlotnicki and Y. Sasai) to visit Philippines for joint field work of repeated magnetic, self-potential, degassing and temperature measurements and installation of monitoring stations on the volcano, hit of severe cyclone hindered the October 2006 visit. The visit is now postponed to January, 2007. The 2006 budget will be used during the next field work to support PHIVOLCS teams on the field. Soundings equipment will be let to PHIVOLCS to carry on their own further investigations before the 2007 campaign.

One paper on magnetic observation was already published (Harada et al., 2005) and a second article on multi parameters observations is under submission (Zlotnicki et al.).

#### **4) Financial Report 2006**

The 2006 IUGG & association support for EMSEV is as follows:

##### **Income:**

IUGG	\$2,000 (for general EMSEV activities);
IAGA	\$2,000
IASPEI	\$500
IAVCEI	\$2,000

Saved funds of 2005 (returned from Mexico meeting by S. Pulinets) \$800

TOTAL = \$7,300

**Outgo:**

EMSEV Agra Meeting \$3,000 (\$2,000 from IAGA + \$500 from IASPEI + \$500 from Pulinets saving) Actually, \$2,977 (\$3,000 – cashing commission \$ 23) was handed over to Birbal Singh on Nov. 20, 2006 in Agra.

Work on Taal Volcano \$2,300 (\$2,000 from IAVCEI + \$300 from Pulinets saving) . Actually, \$2,283 (\$2,300 – cashing commission \$17) was handed over to Sasai in late September in Tokyo. However, this fund is left over to 2007 because the field campaign was postponed due to cyclone in the Philippines.

Reserve for IUGG Meeting in Perugia \$2,000 (Funds from IUGG)

Total = \$7,300

In the year 2006, EMSEV was allocated a total of \$ 6,500 from IUGG and Associations. This was considerably less than \$10,200 of the year 2004, due largely to suspension of the IUGG “Inter-association initiative” funds and to our untimely submission of support requests. But it was slightly over \$6,000 of the year 2005. Considering the tight budget of IUGG and associations, we are grateful to their actions.

**5) Activity for 2007-2008**

2007:

French and Japanese teams (led by J. Zlotnicki and Y. Sasai) will visit Philippines for further field survey and installing monitoring stations on Volcano Taal, probably as early as in January. \$2,300 from 2006 funds will be used for the field campaign. After this first joint campaign, PHIVOLCS teams will make detailed surveys by themselves with a French resistivity equipment. After a second joint field work scheduled for a few months later, this equipment will be send back to France.

We may join the Workshop of Indonesia-Japan project either in Japan or Indonesia:  
see attached

The main EMSEV activity in 2007 will be at:

XXIV IUGG General Assembly, July 2-13, Perugia, Italy.

Integrated EMSEV Symposia "PROGRESS IN ELECTROMAGNETIC STUDIES ON EARTHQUAKES AND VOLCANOES" consisting of four sessions:

**Session 1: "VOLCANIC STRUCTURE AND ACTIVITIES"**

Convenor: Viacheslav V. Spichak;

Co-convenors: Jacques Zlotnicki, Yoichi. Sasai, Domenico Patella and Ciro Del Negro

**Session 2: "ELECTROMAGNETIC FIELDS ASSOCIATED WITH EARTHQUAKES AND ACTIVE FAULTING"**

Convenor: Malcolm Johnston;

Co-convenors: Naoto Oshiman, and Antonio.Meloni

**Session 3: "CRUSTAL INSTABILITIES AND EARTHQUAKE PRECURSORS"**

Convenor: Pier Francesco Biagi;

Co-convenors: Masashi Hayakawa, Jann-Yenq Liu, Toshiyasu. Nagao

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

Convenor: Ramesh Singh;

Co-convenors: Sergey Pulinet, Michael Parrot, Dimitar Ouzounov, and Valerio Tramutoli

Budget outlook for 2007.

We have \$2,300 for Taal field campaign as it was not used in 2006.

We also have saved \$2,000 (IUGG support for 2006) for Perugia.

\$2,500 from IUGG (Including additional \$500 for Indonesian project meeting.)

\$1,500 from IAGA (Notice from IAGA SG on Dec. 14, 2007).

Support from other associations (IASPEI and IAVCEI) has not been decided yet. We would like to request additional \$1,000 for Indonesian project meeting.

2008:

Major activity will be Workshop and Business Meeting in Romania (IWEMSEV-2008). This meeting could be held between September 7 and 10. We will need \$2,000 for this meeting as seed money.

Second DEMETER workshop is also planned in 2008, preferably with schedules in June or October and later in order not to be in conflict with the Romanian activity.

**6) Conclusive Remarks:**

EMSEV has continued to be the major player in the international and interdisciplinary research activity in the physics of pre-, co- and post-event EM phenomena related to earthquakes and volcanic eruptions. Through our

investigations, some new aspects of the physics of fault failure and volcanic activity, particularly the role of fluids, friction, electrical charge generation during seismic and volcanic processes, are becoming clearer. Further integration of EM data with seismic, geodetic, hydrologic, geochemical and thermal data will improve our understanding of these processes. On active volcanoes (e. g., Miyake and Taal) electric, magnetic, thermal and SP-potential measurements have shown clear changes possibly associated with initial intrusions, final explosive eruptions and post-eruptive activity that reflect the physical processes within the volcanoes. On active faulting (e. g., San Andreas fault), observed co-seismic magnetic effects have been shown to scale with moment/magnitude deduced from source theory.

Pre- and co-seismic EM signals in DC to VLF band have also been the target of intensive research not only in Greece and Japan, but also in countries including Russia, Taiwan, Mexico, India and China. In even higher frequency bands (VLF to VHF), pre-seismic transmission anomalies of EM waves have been kept reported by scientists from many countries, including Japan, Russia, Taiwan and Armenia. Although some of reported anomalies were likely noise, some others were considered to strengthen the argument that pre-seismic disturbances in the regions of atmosphere/ionosphere and magnetosphere cause observed anomalies. Monitoring of these regions with land based ionosondes, total electron concentration (TEC) derived from GPS data, and from satellites (notably DEMETER), has made substantial new results. Even some physical models have been put forward to explain these phenomena, collectively called Lithosphere-Atmosphere-Ionosphere (LAI) coupling. Although the geophysical community at large has not yet been fully convinced of these new aspects of EM phenomena, we are definitely making significant progress.

This science covers a wide variety of disciplines beyond conventional geophysics/seismology/volcanology. To name a few, we are conglomerate numbers of experts in electrical engineering, radio science, space physics, solid state physics, physics of complex systems and critical state. Since they still tend to speak in different languages, it remains most important to continue to further develop mutual understanding among them.