

19th International Workshop on Electromagnetic Induction in the Earth, Beijing, China, October-November 2009

IAGA working group I.2 is a part of Division-I and is one of the most active groups in the division. The Working Group is devoted to the Electromagnetic Induction studies. It formed during 70's, has been organizing international workshops every two years since then without a break. The workshops were held in different countries - both in developed and underdeveloped countries. As a part of this continuous program, the Electromagnetic Induction (EMI) workshop in 2009 was held in Beijing, China. More details of the working group are provided at www.mtnet.info.

A . Preparation

In October 2004 IAGA Working Group I-2 decided that the 2008 19th Electromagnetic Induction workshop (EMIW) would be held in China. The Geo-electromagnetic Committee of Chinese Geophysical Society headed by Prof. Zhao Guoze (from the Institute of Geology, China Earthquake Administration) organized numerous meetings after this time to coordinate the preparation and organization of the Beijing EMI workshop. The China Earthquake Administration (CEA) united other ministries and/or organizations to establish the Organizing Committee and to call for financial support from domestic agencies.

B. Main Workshop

1. Attendances and abstracts

The main EMI workshop was held from October 23-29th in the Jihua Grand Hotel, Beijing. It was attended by a total of 480 people, including 225 people from abroad and 255 people from China. Participants came 41 different countries and regions.

A total of 387 abstracts for presentations were submitted including 132 extended abstracts and 255 regular abstracts were submitted to the workshop. All abstracts were edited and printed in two volumes of 1000 pages. These volumes were also made available electronically and are available as pdf files at the web site of the EMIW www.19emiw.cn.

2. Scientific sessions

The EMIW consisted of a total of 10 scientific sessions organized by the Program Committee. Details of the sessions are shown in Table 1.

Over the last decade, significant advances have been made in data collection, processing, and modelling techniques for geo-electromagnetic and magnetotelluric (MT) fields. EM methods have been applied increasingly to investigate the Earth's crust and upper mantle structures, to detect hydrocarbon reservoirs and mineral resources, to imagine the near-surface structures for engineering and environmental purposes and to monitor earthquakes and other geo-hazards. The large attendance at the 19th International EMIW and the 387 papers presented attest to growth of the EM community.

The largest of the ten sessions at the Beijing workshop, as at previous workshops, was on "Crustal and mantle studies, including regions with seismic and volcanic activity". EM sounding methods provide information on the Earth's electrical conductivity and this parameter is extremely sensitive to geodynamic processes including temperature increase, partial melting, phase transition and excess pressure. Many papers at the Beijing workshop reported on the conductivity structures of

continent-continent collisions around the Tibet plateau. Recent MT studies have delineated a broad zone of mid-crustal low resistivity that could represent a zone of large scale crustal flow extending from eastern and northeastern Tibet into southeast Asia which may be a combination of partial melts and aqueous fluids. The crustal flow layer is estimated to be involved in uplift and shortening of the Tibet plateau and it may have also played a role in the Wenchuan Earthquake (magnitude 8.0 on Richter scale) on May 12, 2008, in Sichuan Province, China.

Table 1. Scientific sessions at the 19th International Electromagnetic Induction Workshop

	Session	Abstracts	
		Extended	Regular
1	EM and integrated geophysical studies of the Earth		
	Part 1: Near surface applications, including environmental and engineering studies	15	32
	Part 2: Crustal and mantle studies, including regions with seismic and volcanic activity	21	73
2	Laboratory studies of electrical properties of rocks activity	2	3
3	Special session on EM exploration in China	9	14
4	Applied EM methods for hydrocarbon, geothermal and mineral exploration	13	33
5	2D/3D modeling and inversion of EM data, including joint inversion techniques	34	54
6	Marine EM studies	6	10
7	Theoretical aspects of EM exploration, including data processing, response function analysis and distortion analysis	11	18
8	Global induction studies using satellite and ground EM data	10	10
9	Potpourri session: instrument development, natural source field studies, new projects.	10	9

Another large session at the EMIW was “Applied EM methods for hydrocarbon, geothermal and mineral exploration”. Nowadays, EM surveys are often carried out in complex tectonic zones and in regions with rough topography, which are challenges to modeling and interpretation of the EM data.

Recently, tremendous advances have been made in numerical modeling of EM fields. In order to improve the accuracy of numerical methods and to obtain reliable geological models, some new approaches have been presented, e.g., the improved finite-difference and finite-element discretization techniques, 3D small-bin MT acquisition techniques, and integrated interpretation methods combining resistivity and induced polarization and other geophysical parameters.

A new sub-discipline of geophysics called “biogeophysics” was one of the hot topics at the Beijing workshop. A review paper titled “Geophysical Signatures of Microbial Activity” by Estella Atekwana provided an overview of this new field. Subsurface microbes are able to alter physical properties of geologic media through mineral dissolution and precipitation as well as through biofilm formation and the interaction with host media. Such microbially-induced changes in physical properties of geological media may be detected by using geophysical methods. Examples of studies that investigated biosignatures in geophysical data were reported.

One review paper at the EMIW summarized the most recent advances on the laboratory electrical conductivity measurement on mantle minerals. The electrical conductivity signature of several mantle phase transformations, with the most important ones at 410 km (olivine to wadsleyite), 520 km (wadsleyite to ringwoodite), 660 km (ringwoodite to perovskite and ferropericline) and D” (perovskite to post-perovskite) have implications for electromagnetic induction studies. The review also showed that the high conductive layer at the top of the asthenosphere (60~100 km depth) can be explained by the presence of partial melting.

3. Opening ceremony

The opening ceremony of the workshop was held on October 24th. Professor Liu Yuchen (chair of organizing committee and deputy director of CEA) gave an address of welcome. Professor Andreas Junge, Chair of Working Group I-2, gave the opening speech. Professor T. Harinarayana, member of the Executive Committee of IAGA, made a speech on behalf of IAGA. The ceremony was chaired by Professor Zhao Guoze.

4. Oral presentations

Oral presentations were held in the 500-seat auditorium of Jiuhua Grand Hotel. A total of 55 persons gave oral presentations including six invited review presentations. The oral presentations took place over four and half days. The invited review presentations at the workshop provided excellent summaries of recent advances in the field of EM induction in the Earth and elucidated links with related fields. The presentations were as follows:

- 1) Estella Atekwana (USA), Biogeochemical signatures of microbial activity.
- 2) Martyn Unsworth (Canada), EM studies of collision zones, focussed on Tibet.
- 3) Zhang Peizhen (China), Neotectonics and deformation in Tibet and the surrounding region.
- 4) Ralf Uwe Boerner (Germany), Numerical Modelling.
- 5) He Zhanxiang (China), Hydrocarbon exploration using EM methods.
- 6) Takashi Yoshino (Japan), Laboratory EC measurement of mantle minerals.

5. Poster presentations

The Working Group considers poster presentations to be an extremely important aspect of the EMIW and allocates a significant amount of time for poster sessions. There were approximately 350 poster presentations at the workshop. The poster presentations were in a 600 m² room enabling each poster to be displayed for the whole period of the workshop.

6. Exhibition

A total of 34 international and domestic agencies, organization, enterprises and universities displayed their research results and products in exhibition room of 600 m².

7. Financial support

A total amount of \$USD46,000 was available for allocation by the Financial Support Committee. Applications for support were received from 146 people and a total of 74 people were allocated support. The majority of those supported were students or postdocs/junior scientists. The funding enabled support to be provided to participants from 22 different countries.

In total about 40 agencies, companies, and organizations have contributed to the financial support for the workshop, including the support allocated by the Financial Support Committee. The logos of these organizations appear at the web page of workshop www.19emiw.cn. The Working Group is very grateful for the continued financial support from IAGA.

8. Events

Business meetings

There were two business meetings of the full membership of the Working Group I-2, and there were three business meetings of the Working Group Committee.

- (1) Table 2 shows the committee members and structure. This membership was approved at the

working group business meeting by the full membership of the working group.

Table 2. Working group I-2 Committee

Name	Position	Country	Term	Email
Yasuo Ogawa	Chair	Japan	2008 – 2012	oga@ksvo.titech.ac.jp
Ian Ferguson	Co-Chair	Canada	2008 – 2012	ij_ferguson@umanitoba.ca
Denghai Bai		China	2004 – 2012	dhbai@mail.igcas.ac.cn
Gad El Qady		Egypt	2008 – 2016	gadosan@yahoo.com
Graham Heinson		Australia	2008 - 2016	graham.heinson@adelaide.edu.au
Gary Egbert	Funding Coordinator	U.S.A.	2008 - 2016	egbert@coas.oregonstate.edu
Juanjo Ledo		Spain	2004 - 2012	jledo@ub.edu
Nick Palshin	Publications Coordinator	Russia	2004 - 2012	palshin@ocean.ru
Claudia Sainato		Argentina	2002 - 2010	csainato@agro.uba.ar
Vladimir Semenov		Poland	2002 - 2010	sem@igf.edu.pl
Ute Weckmann	Treasurer	Germany	2008 - 2016	uweck@gfz-potsdam.de
K. Veeraswamy		India	2008 - 2016	kv.swamy@gmail.com
Observers				
Andreas Junge	Past Chair	Germany	2008 - 2012	junge@geophysik.uni-frankfurt.de
Guoze Zhao	Chair, LOC past workshop (2008)	China	1999 - 2010	zhaogz@ies.ac.cn
El Said Ahmed	Chair, LOC next workshop (2010)	Egypt	2006 - 2012	saidragab2001@yahoo.com
George Jiracek	Funding Co-coordinator	U.S.A.	2008 - 2010	jiracek@moho.sdsu.edu
T. Harinarayana	IAGA EC liaison	India	2008 - 2012	tharinarayana@hotmail.com

- (2) Progress towards the 20th induction workshop in Egypt 2010 was reported by Gad El Qady.
- (3) There was one proposal for hosting the 21st induction workshop from Australia. Graham Heinson presented the proposal and it was accepted. The 21st induction workshop will be held in Darwin, Australia in 2012.
- (4) Two special issues were proposed for the workshop. One is “Surveys in Geophysics” for invited review papers and the other is “Chinese Journal of Geophysics” for the contributed papers.

Ice-breaker reception

An ice-breaker reception was held in the evening of October 23rd.

Sightseeing and entertainment

On October 26th all workshop delegates joined a sightseeing tour to Great Wall or Forbidden City. A professional artists' group from the Art College of Yangtze University in Hubei Province presented a dance performance for the workshop on an evening of October 27th for all delegates. In order to encourage interactions between the delegates the above activities were free. A ping-pong (table tennis) friendship match was held between international group and Chinese group on October 28th.

Banquet

The China Earthquake Administration and Institute of Geology CEA held a welcome banquet for all delegates following the sightseeing tour in the evening of October 26th.

C. Pre-Workshop on Magnetotelluric Data Interpretation

One of the important aspects of the semi-annual EMIW are pre-workshop and post-workshop conferences organized to provide tutorial and in-depth examinations of focused EMI topics and to develop links with associated fields of research. For the 19th EMIW a pre-workshop on magnetotelluric data interpretation was held from October 20th-23rd in Longge hotel near the Institute of Geology, Chinese Earthquake Administration. For this pre-workshop a total of five scientists gave the lectures on data processing and modeling and their applications. About 80 persons including 32 persons from abroad attended the pre-workshop.

D. Post-workshop on Deep Structures and Dynamics of Himalaya-Tibet and the Wenchuan Strong Earthquake

The 19th EMIW was followed by a post-workshop from October 31st to November 3rd on the subjects of the deep structures and dynamics of Himalaya-Tibet and the Wenchuan strong earthquake. The post-workshop was held in Chengdu University of Technology in Sichuan province. About 50 persons attended the meeting. A number of the post-workshop participants joined a trip to Wenchuan earthquake area.

E. Other Points

1. Entry visas

Because 2008 was an Olympic year in China all delegates from abroad had to go through a special process to apply for their entry visa. Formal application tables were filled in advance and sent to the relative Chinese embassies or consulate by the Local Organizing Committee.

2. Publications

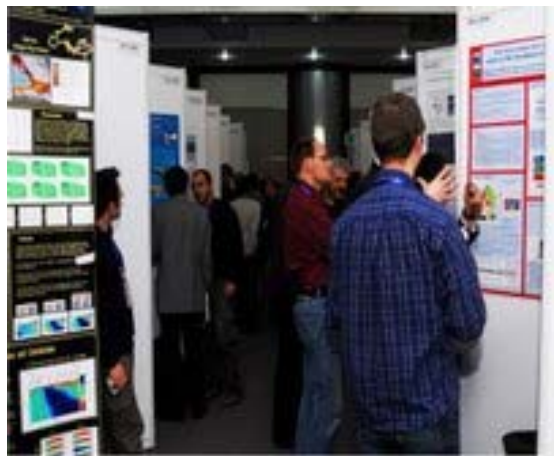
Papers of the review presentations will be published in *Surveys in Geophysics* with guest editors Toivo Korja and Zhao Guoze. Another special issue will be published in *Chinese Journal of Geophysics* with guest editors Zhao Guoze, Nikolay Palshin and Huang Qinghua. This issue will contain about 30 papers.

Prof. Zhao Guoze (Institute of Geology, CEA)
Chair, Local Organizing Committee

Appendix. Photographs of the 19th EMIW



All the participants



Poster sessions



Workshop location



Excursion to the Great Wall