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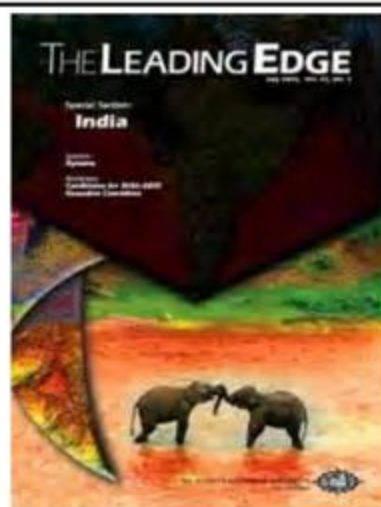
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**GAC Spotlight**

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# Electromagnetic induction to be featured in September workshop

The 18<sup>th</sup> International Workshop on Electromagnetic Induction in the Earth will be in El Vendrell, Spain, 17–23 September 2006.

This workshop, held every other year, will offer a venue in which EM researchers from more than 35 countries exchange results and new developments.

The previous workshop was held at the National Geophysical Research Institute (NGRI) in Hyderabad, India, on 18–23 October 2004. The technical program consisted of 265 presentations—60 oral, 4 invited review articles, and 201 posters. Figure 1 shows the countries represented by more than seven papers.

A three-day preworkshop session, “Magnetotelluric Data Interpretation,” was tailored so that young scientists from developing countries could learn the technique. Special focus was on recent advances in data processing, analysis, numerical modeling, and interpretation. The postworkshop, “Multidisciplinary Studies of the Himalaya,” allowed Indian researchers to interact with scientists from other countries who have worked in the region.

This first-ever EM workshop in India attracted 260 scientists from 35 countries, making it the largest-ever meeting in this series. This was only the second time that Asia was the venue for the workshop (in 1996 it was held in Onuma, Japan). The total duration of the workshop, including pre- and postworkshop sessions, was 12 days. Although this was a very long time frame, all sessions were well attended.

The workshop was supported by the International Union of Geodesy and Geophysics and the U.S. National Science Foundation in addition to the IAGA. Indian research organizations and companies that provided support were the National Geophysical Research Institute (Hyderabad); Council of Scientific and Industrial Research (New Delhi); Indian Institute of Geomagnetism (Navi Mumbai); Oil and Natural Gas Corporation Limited (Dehradun); Department of Science and Technology (New Delhi); Department of Ocean Development (New Delhi); Oil India Limited (Duliajan); Wadia Institute of Himalayan Geology (Dehradun); and Indian National Science Academy (New Delhi).

EM measurements provide a unique view of the earth due to the large range of variations of electrical conductivity encountered in the subsurface. Such variations arise because of the sensitivity of electrical conductivity to various parameters such as temperature, fluids, ore minerals, lithologic variations, etc. It is key methodology for monitoring environmental problems, exploring for energy and minerals, investigating regions of potential natural hazards (seismic and volcanic), and to study the internal structure of the earth.

**Technical program.** The technical papers were grouped into nine sessions: (1) Local/Regional/Seismic/Volcanic Studies; (2) 3D Modeling/Inversion; (3) Oil/Geothermal/Environmental Exploration Studies; (4) Anisotropy Lab and In-situ Studies; (5) Lithosphere/Asthenosphere Deep Structure; (6) Multiparametric Techniques; (7) Continent-Continent Collision; (8) Response Functions; and (9) Ocean and Other Studies. Figure 2 shows that Session 1 attracted the most papers, double the number in Session 3 which had the second highest total.

The sessions were designed to stress new advances in methodology (2, 5, 6, and 8), industrial applications (3), emerging areas of research (4), applications to crustal studies (1), and applications to an ocean environment (9). In recognition of a

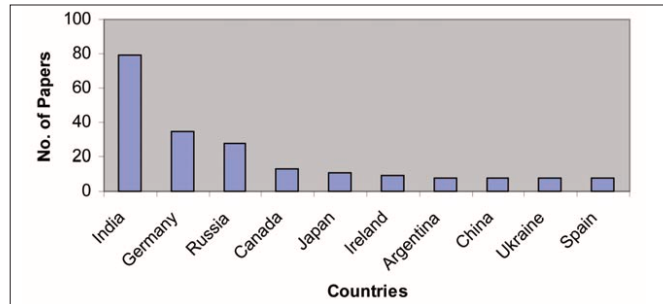


Figure 1. Submitted abstracts (2004) by country of origin.

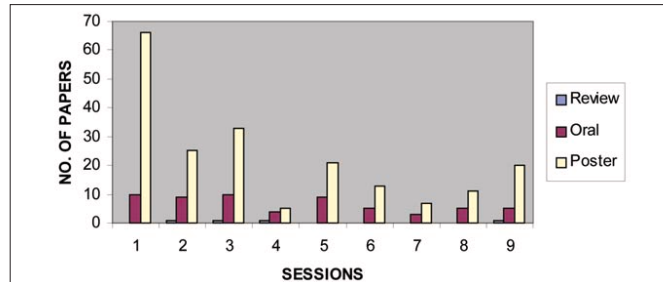


Figure 2. Paper submissions (2004) for each of the nine sessions.

major focus of India’s earth science community, a special session (7) was organized on Continent-Continent Collision. Invited review talks were part of sessions 2, 3, 4, and 9. These reviews were published in *Surveys in Geophysics* in 2005.

The two-day postworkshop session on “Multidisciplinary Studies in Himalaya” had 24 oral presentations by scientists from all over the world.

**Session 1:** The 10 oral presentations and 66 posters described regions in Argentina; Australia; Brazil; Canada; China; Ethiopia; Germany; Slovenia, Austria, and Hungary; India; Ireland; Japan; Romania; Russia; South Africa; Spain; Switzerland; Turkey; and the United States. The application of induction methods in these areas showed the usefulness of the method for different geologic problems.

**Session 2:** During recent years, the development of new equipment and the progress in numerical methods for interpretation has resulted in an increase in the application of the magnetotelluric method. 3D EM inversion is now used regularly to solve problems relating to shallow depths of few meters to deeper regions of lithosphere. The session started with a review talk by Dmitry Avdeev and continued with nine oral and 25 poster presentations. Most authors used 3D modeling and inversion using numerical schemes to explain their data.

**Session 3:** This session opened with a review talk by Nigel Edwards on “Marine Controlled-Source Electromagnetics: Principles, Methodologies, Future Commercial Applications” which was followed by 10 oral and 33 poster presentations. A paper on petroleum exploration described work in logistically difficult and geologically complex frontier areas.

There was significant interest in exploration for ground water, reflecting increasing need for this resource in many places around the world. Other papers described exploration for hydrocarbon layers, coal, gold, and diamonds.

**Session 4:** This session had one invited review paper, with four oral and five poster presentations. The review talk was “Anisotropy versus heterogeneity in continental solid earth electromagnetic studies: Fundamental response characteristics and implications for physicochemical state” by Philip E.

Wannamaker.

*Session 5:* The objective was to bring together recent theoretical, observational, and experimental studies on deep crust and mantle studies at various active and passive regions of the continents and oceans. The 30 papers included nine oral and 21 posters. A special issue of *Tectonophysics* will be based on the papers in this session.

*Session 6:* In this session, the disturbance associated with earthquakes was discussed. Several mechanisms have been proposed for the generation of electromagnetic emission in the ULF/ELF/VLF range before and after earthquakes. Other interesting topics were the generalized series expansion (GSE) algorithm, inversion of VES and TEM data, rotational invariance, proton magnetic resonance (PMR) modeling and interpretation, and controlled-source radio magnetotelluric (CSRMT) data to constrain magnetic interpretation. There were five oral and 13 poster presentations.

*Session 7:* The three oral and seven posters covered areas in China, India, the United States, and Finland. One fascinating paper discussed the high temperatures faced by engineers during excavation of a tunnel. The results presented in this paper are useful in devising suitable safety measures during construction of the tunnel (associated with a hydroelectric power project). Another interesting paper was "The past ice stream network in the Himalayas and the Tibetan ice sheet during the last glacial period."

*Session 8:* The major topics of the five oral and 11 poster presentations were galvanic distortion analysis using phase tensor, impedance tensor in the presence of shallow conductors, MT static shift effect using geostatistical methods, decomposition of tensor elements, and rotational invariants of the magnetotelluric tensor.

*Session 9:* This session started with a review talk by Kiyoshi

Baba on "Electrical structure in marine tectonic settings" and included five oral presentations and 20 posters.

*Postworkshop session:* In recent years, several areas in the Himalayas have been the focus of many multidisciplinary studies. Integration of multiparametric data from these sectors will help evolve a unified model on evolution of the Himalaya. The 40 presentations covered central Himalaya, northwest Himalaya, and eastern Himalayan regions. The 24 solicited presentations covered magnetotelluric, seismic tomography and reflection, geology, structure and tectonics, geochemistry, etc.

**Other highlights.** On 20 October, a field trip to Nagarjunasagar, about 150 km from Hyderabad, combined exploration of the rock structure and the cultural heritage of the northern part of Andhra Pradesh. The objective of this excursion was to glimpse the Precambrian geology of the eastern Dharwar craton, experience the environs of the Nagarjunasagar reservoir, and behold the unique archaeological and cultural heritage sites. Some relics have been carefully preserved in a museum on a picturesque island called Nagarjuna Konda and located in the center of a man-made lake.

A science program for secondary-school children was conducted to give the coming generation a chance to show their work. Many schools showed keen interest, but only 15 schools were selected. The students exhibited and explained their earth-science models to the national and international scientists. The top three models received prizes.

For more information on the upcoming workshop, visit [www.ub.edu/18emiw](http://www.ub.edu/18emiw).

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