

THE COLLECTIVE REVIEW PAPERS PRESENTED AT THE 4TH IAGA WORKSHOP ON ELECTROMAGNETIC INDUCTION IN THE EARTH AND MOON

PREFACE AND DEDICATION TO PROFESSOR A.T. PRICE

The 4th Workshop on Electromagnetic Induction in the Earth and Moon was held in Murnau, Federal Republic of Germany, September 7–13, 1978. The meeting was sponsored by the International Association of Geomagnetism and Aeronomy and was supported by the International Union of Geodesy and Geophysics, International Council of Scientific Unions, Committee on Science and Technology in Developing Countries, Deutsche Forschungsgemeinschaft, Bayerisches Staatsministerium für Unterricht und Kultur, Institut für Geophysik der Universität Göttingen and Institut für Allgemeine und Angewandte Geophysik der Ludwig-Maximilian-Universität München.

The Workshop series was initiated in Edinburgh, U.K., in 1972, and since then meetings have been held every two years. At each meeting selected authors are invited to review a number of chosen topics in induction. Publication of the collected review papers is seen as an important function of the Workshop as it represents the current state of knowledge and is used as a basis for following Workshop meetings. Professor A.T. Price opened the first Workshop in Edinburgh and the ensuing review publications was dedicated to him. Although he did not attend subsequent meetings, the participants at each communicated their good wishes to him. Professor Price died on December 13, 1978 and it seems fitting that the review publication from this 4th Workshop be dedicated to his memory as one who has inspired us all.

A total of 121 participants from 22 countries attended the 4th Workshop and presented 100 papers. Of these, 11 were invited reviews on interrelated topics and are published in this special issue of *Geophysical Surveys*. The subject matter concerns electromagnetic induction, the phenomenon by which varying magnetic fields induce electric currents in conducting matter, as applied to the furtherance of knowledge of the physical state of the Earth (and also of the Moon). The electric currents so induced will depend on conductivity (globally, locally or both) and will give rise to induced magnetic fields measurable at the Earth's surface. We may define, in a variety of ways, the relation between these induced magnetic fields and the corresponding inducing fields, and we call such a relation the response of the Earth. From the response of the Earth we hope to find its conductivity. From conductivity we hope to find temperature and also an indication of composition and structure. Even this simplistic a view raises many general and specific questions and to answer these, detailed experimental, theoretical and computational problems have to be addressed. The reviews contained here present our current answers to these general and specific questions.

In the first review, Vozoff raises a number of the issues in connection with applied research and in particular discusses data acquisition with new instruments and techniques. He also emphasises the importance of laboratory measurements of conductivity if our

field results are to be interpretable. The following two reviews by Waff and *Ádám* examine this latter contentious subject in detail, and investigate constraints placed by conductivity values on physical conditions existing within the asthenosphere. The remaining reviews (except for that on induction in the Moon) concern the steps between data acquisition and this physical interpretation stage. Singh reviews methods of analysing Geomagnetic Deep Sounding (GDS) array studies and presents results for anomalies thereby found, whilst Fournier treats the Magnetotelluric (MT) case and indicates that some caution is needed in interpretation. Both methods assume the Earth's response to varying magnetic fields to be time independent. Niblett and Honkura discuss time dependence of various responses and critically examine evidence for an association with tectonic activity. The above reviews indicate the wealth of data available on the Earth's response. Having obtained such data, the analysis and interpretation stage must be supported by appropriate theory. Zhdanov shows a unified approach to the problem of separating inducing and induced fields, normal and anomalous fields and surface and deep inhomogeneities. One surface inhomogeneity of much importance is that of the oceans. Cox investigates the interpretation of measurements made on the sea floor, whilst Fainberg examines the global problem of induction by a large scale field in the world's oceans. Finally, the techniques used to investigate the Earth's conductivity may also be applied, with some interesting modifications, to other planetary bodies. Vanyan discusses the Moon and some new methods of interpretation. The review papers show the important contribution offered by the study of geomagnetic and geoelectric fields and reveal the interdisciplinary nature of the subject.

The invited reviews were used as introductions to seven Workshop sessions. For papers contributed to these sessions, the Workshop broke with tradition in that some were introduced by a short presentation and were followed by detailed group discussions. The scientific sessions took place in the Kurgastehaus, Murnau, Oberbayern, an excellent conference centre. From there a one-day excursion commenced which included a two-hour mountain hike, the inevitable schnapps, chair lifts and splendid Bavarian scenery and villages. Our thanks are again expressed here to the Bavarian people for their hospitality and to the local organising committee for their months of hard work which ensured the scientific and social success of the meeting. The 5th Workshop on Electromagnetic Induction in the Earth and Moon is to be held at the University of Istanbul, Turkey, August 17–24, 1980.

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