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EDITORIAL FOREWORD

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The Fifth All-Russia Workshop on the electromagnetic sounding of the Earth was held on May 16–21, 2011 in Petrodvorets, St. Petersburg. By its scope and structure, this scientific and educational event continued the traditions of the All-Union workshops on electromagnetic induction in the Earth, which were laid in the Soviet times by the Professors M.N. Berdichevsky, L.L. Vanyan, and V.I. Dmitriev. According to the unanimous opinion of the participants of the workshop, it was decided to name the All-Russia workshops on electromagnetic sounding of the Earth in honor of M.N. Berdichevsky and L.L. Vanyan.

The Fifth All-Russia Workshop on the EM soundings of the Earth was organized by the St. Petersburg Branch of the Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation, St. Petersburg State University, Geoelectromagnetic Research Centre of the Institute of Physics of the Earth of the Russian Academy of Sciences, and the St. Petersburg Branch of the Eurasian Geophysical Society.

The particular feature of this workshop was centering the focus of the lectures on the controlled-source electromagnetic (CSEM) soundings. This marked the Centennial of electric prospecting, which dates back to the first DC experiments carried out by the Schlumberger brothers. Alongside with the CSEM methods, also the soundings with natural EM fields and the studies devoted to the combined sounding techniques with different sources were extensively discussed in the workshop.

The scope of the sections of the workshop covered a broad range of the problems associated with the deep, regional, and exploration-mapping studies, as well as the EM monitoring of the dynamics in the electrical properties of the geological medium, including seismically active zones. Particular attention was paid to the solution of the forward and inverse problems of geoelectrics and data processing. The theoretical and practical dimensions of the workshop were addressed in three sections devoted to petroleum, mining, and engineering electric prospecting. For the first time, the topics concerning the geoecological electric prospecting and georadiolocation were discussed. An important novelty was holding an exhibition and field presentations of the equipment and modern EM sounding technologies for electric prospecting. This

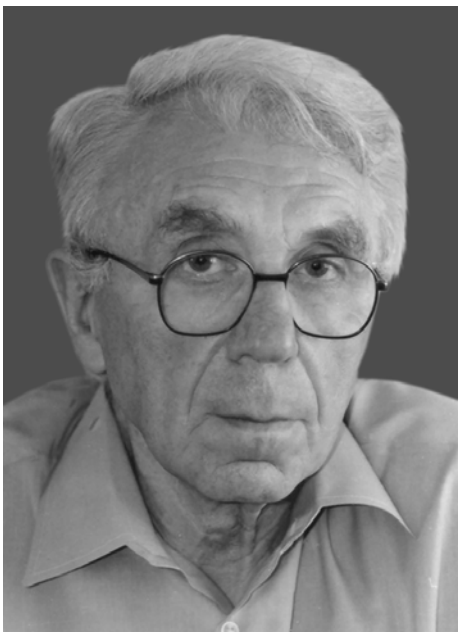

Photo 1. Mark Naumovich Berdichevsky (1923–2009)

Photo 2. Leonid L'vovich Vanyan (1932–2001)

provided the participants with a unique opportunity to gain an idea of the state-of-the-art Russian and foreign instruments applied for the EM field generation and measurements in the studies of the Earth's interior and to compare the possibilities offered by the different products.

Vital assistance in arranging the workshop was provided by the financial support from state enterprises (Earth Science Division and Physical Science Division of the Russian Academy of Sciences, the Russian Foundation for Basic Research, and St. Petersburg State University) and private electric prospecting companies, both Russian and foreign.

Overall, 258 geophysicists from the leading research and production geophysical organizations of Russia, the former Soviet republics, and abroad, including about a hundred post-graduate students majoring in the EM studies of the Earth, mineral prospecting, and exploration took part in the workshop. Specialists from the scientific, educational, and production organizations of Russia, Ukraine, Belorussia, Kyrgyzstan, Uzbekistan, Canada, Poland, Israel, Republic of South Africa, Egypt, Finland, France, Sweden, Germany, and the United States presented the results of their research.

The authors focused on the diverse challenges associated with the further development of the theory for deep EM soundings on land and in the oceans. Many presentations addressed the problems of methodical, instrumental, and software support of the geophysical observations. As well, practical applications of the EM methods in the regional-scale and detailed geophysical studies were extensively covered.

Based on the presented results and the related discussions, the participants of the workshop noted the following points.

(1) The EM soundings with natural and controlled sources present a very important means for solving the problems of large-depth geology, prospecting for the deep ore-controlling objects, structural mapping within the continents and oceans, as well as the problems of shallow geophysics and monitoring the geodynamical and geoecological processes.

(2) Via simultaneous observations, the high-level integration of the magnetotelluric and magnetovariational methods is achieved.

(3) The role of the EM soundings with controlled sources has significantly increased.

(4) The methods of the multi-electrode electric sounding, which provide the basis for electric tomography aimed at solving the problems of prospecting and exploration for mineral deposits and geothermal resources, engineering geology, geoecology, archaeology, geothermal studies, etc., have been extensively developed.

(5) Due to the novel advances in the Russian and foreign instrumentation, it has become possible to carry out efficient measurements yielding high-quality data, to study the low-contrasting geoelectrical media, and to address the challenges associated with geodynamical and geoecological monitoring.

(6) Considerable progress is achieved in the methods of numerical processing, modeling, and inversion of the EM fields in heterogeneous media.

The participants of the workshop made the decision to publish the most prominent scientific contributions presented at the workshop in the leading scholarly journals.

In this special issue, we present the papers addressing the MT sounding methods in the conventional deep and the novel mining (orebody-targeted) applications, important advances in solving the forward and inverse problems of geoelectrics, and the significant results of the deep MT studies of the lithosphere in a number of regions, including the seismically active zones of Ukraine and Kyrgyzstan.

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