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December 30, 1968

# REVIEWS

## ELECTRICAL PROPERTIES OF ROCKS; U.S. NAVAL OCEANOGRAPHIC GEOMAGNETIC SURVEYS, INFORMAL REPORT; REPORT ON AEROMAGNETIC SURVEY IN JAPAN

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ELECTRICAL PROPERTIES OF ROCKS, by Eleonora Ivanova Parkhomenko; translated from Russian, edited and supplemented by George V. Keller; *Monographs in Geoscience* series, edited by Rhodes W. Fairbridge. Published by Plenum Press, New York, 1967, xi + 314 p., $19.50

This book is the first devoted specifically to the electrical properties of rocks. While until recently these were studied mainly in connection with the requirements of well logging, their use has now been extended to mining and various types of electrical prospecting for minerals. Therefore where previous use was primarily in the shallow crust and required data essentially at or near atmospheric pressures and room temperature, extension of interest deep into the earth's crust and mantle will need data concerning electrical properties at high pressures (tens of kilobars) and high temperatures (at least 1000°C). Laboratory analysis under these conditions is the only source of such information. She has determined that these electrical properties depend on the chemical and mineral content of the rocks, the genesis and petrographic characteristics, structure, texture, porosity, water content (both percentage and conductivity), etc. and discusses specific electrical properties in terms of each of these factors.

The book is divided into a brief review of petrography and chapters on dielectric properties of rocks, electrical resistivity of rocks (methods used to measure and factors causing variations), and dielectric loss in rocks. Extensive tables of dielectric constants of both minerals (133) and rocks (62) include all of the common ones and many less frequently encountered. Discussion of value ranges, explanations of variations, etc. are sufficient and readily understandable; the writing is easy to follow and sentence struc-

ture simple. This is surely due to the excellent translation abilities of Dr. Keller, for the language does not lend itself to such technical simplification. The translator again proves that he is without peer at his task.

The discussion of electrical resistivity measuring techniques is simply a repeat but it serves to tie the compilation together. However, the tabulations of resistivity measurements of ore minerals (26), very resistant minerals (14), copper pyrite ores (6), zinc ores (5), iron ores (8), various ores (22), etc. and of various rocks (56), coals (6), rocks of variable water content (32), etc. are extremely valuable. Treatment of resistivity-porosity relationships in the sedimentary rocks is sketchy compared to the thoroughness of the various texts on formation evaluation by well logs but the work for jointed rocks, various textures, and anistropy is unusual. Variations of resistivity with temperature, for rocks other than sedimentary, are well illustrated.

The effect of pressure on resistivity is studied, with a discussion of methods and graphs of results; it is apparent that the effect is much less than the variation with temperature. The dielectric loss, which depends on the fraction of electrical energy lost to heat, frequently characterizes a dielectric material better than does its electrical conductivity. This property, together with equipment and methods used in its determination, is given a thorough treatment. Knowledge of the relationships of dielectric constant, dielectric loss, and rock resistivity to the frequency of applied voltages is required in the application of induction and radio-wave electrical prospecting methods so the discussion here is particularly timely . . . whether interest centers in sedimentary, metamorphic, or igneous rocks.

Although Parkhomenko includes a bibliography of 276 entries, most of those listed are Russian. The translator has added a supplement of some thirty-two pages of text and 148 bibliographic entries which are non-Russian to round-out the coverage in terms of research in the United States; this will prove invaluable to scientists working in this field here.

U. S. NAVAL OCEANOGRAPHIC GEOMAGNETIC SURVEYS, INFORMAL REPORT No. 67-52, Naval Oceanographic Office, Washington, D. C., July, 1967, iii + 86 p.

The U. S. Naval Oceanographic Office has conducted geomagnetic surveys over various ocean areas of the world since 1953. This booklet presents information on survey locations, dates, navigational control, track patterns and data format for these surveys. A list of available geomagnetic technical reports, charts, and other publications based on these surveys is included; these represent the unclassified output of Project MAGNET. The surveys have been both airborne and ship-towed. Annual supplements keeping this information current are anticipated; this is simply an index to the data available.

REPORT ON AEROMAGNETIC SURVEY IN JAPAN, planned by WMS Sub-Committee, Special Committee of International Geophysical Cooperation, Science Council of Japan and WMS Committee, Geodetic Council of Japan. Publ. by World Data Center C2 for Geomagnetism, 1967, vii + 242 p.

Composed of a very condensed thirty-four pages of text, ten magnetic charts resulting from the aeromagnetic surveys, and 172 pages of tabulated magnetic survey data, the book is a valuable contribution to the World Magnetic Survey. The charts (equal declination, equal dip, horizontal intensity, vertical intensity, etc.) cover all of the Japanese islands and their neighboring seas. Two different types of airborne magnetometers were designed and constructed by the Hydrographic Office and the Geographical Survey Institute for this project; detailed descriptions of these instruments are given within the text of the report. Incidentally, the magnetometer used over sea areas was of the flux-gate type while that for over land studies utilized proton precession. Techniques of field operation and data reduction methods are treated much less thoroughly.