

Book Review

"Geomagnetism" by Masaru Kono (Ed), Treatise on Geophysics, vol. 5, Elsevier, 2009;
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This volume is one of ten volumes comprising the "Treatise on Geophysics", edited by Professor Gerald Schubert of University of California Los Angeles. The treatise, having the "Treatise on Geochemistry" as a model to emulate, has been designed as an integrated series covering the physics of the Earth, each volume containing up-to-date descriptions of each area of geophysics, from the basics to the frontiers of science. Each book of the series was edited by the leading personalities in geophysics, "Geomagnetism" having been edited by Dr Masaru Kono of Okayama University, a top-class scientist in the field of geomagnetism. He was able to gather a strong group of outstanding authors, providing us with an impressive volume of extraordinary quality. Albert Einstein used to say that a mystery of nature of geomagnetic field is the one of fundamental problems in physics. The volume of Masaru Kono is an important step toward assembly of this puzzle.

The book contains 14 chapters, co-authored by 28 top-class researchers of 11 countries. Chapter 1, written by Kono himself, provides a general introduction into the subject of geomagnetism. The chapter describes an early recognition of magnetic properties of iron and its first applications for navigation, subsequent development in observation of the geomagnetic field behavior, first discoveries in paleomagnetism and its role in the origin of the plate tectonics concept, present-day knowledge on geomagnetic field and its generation in the Earth's core, observational constraints and, finally, the magnetic

fields of other planets and their satellites. Chapter 2, by Hulot, Sabaka and Olsen, concerns the present day geomagnetic field. It includes discussion on magnetic field data used in modeling, global models of the geomagnetic field and presentation of the main field. Chapter 3, by Baumjohann and Nakamura, treats on magnetospheric contributions to the terrestrial magnetic fields. The reader is acquainted with the matters of geophysical plasmas and their dynamics, ionospheric currents at different latitudes and geomagnetic pulsations. Chapter 4, by Turner, Rasson and Reeves, deals with the observation and measurement techniques, used in geomagnetic and paleomagnetic studies, with applications to magnetic surveys for geological exploration. Geomagnetic secular variations from years to centuries and their applications to the better understanding of physical processes occurring at the core surface are the subject of chapter 5 by Jackson and Finlay.

In turn, Purucker and Whaler are the authors of chapter 6 on crustal magnetism. This chapter discusses the relation between rocks and their magnetic properties, explains the nature of continental and oceanic magnetic anomalies, global magnetization models and techniques for extracting true images of the crustal field. Chapter 7 by S. Constable presents geomagnetic induction studies, and includes parts on geomagnetic sounding, methods of modeling and interpretation of geomagnetic depth sounding and magnetotelluric data, electrical properties of rocks, ending with the global conductivity structure. Chapter 8 by Dunlop and Ozdemir concerns magnetization in rocks and minerals. The authors explain magnetization process in solids, magnetic minerals and their properties, nature of induced and remanent

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magnetization, natural remanent magnetization and its stability in geological time domain, as well as remanent magnetization processes in nature. Chapter 9 by C. Constable overlaps in certain degree with chapter 5, but treats geomagnetic field variations in a scale of centuries to millennia. The primary focus of chapter 9 is on archeomagnetic records preserved in manmade objects, paleomagnetic data from young volcanic rocks and rapidly deposited lake and marine sediments. Paleointensity studies are also discussed.

Geomagnetic excursions since the middle Cretaceous, their duration and field geometry during excursions are explained in chapter 10 by Laj and Channel. Chapter 11 by Johnson and McFadden is focused on time-averaged field and paleosecular variations. The chapter is based on paleomagnetic data, based on regional compilations and the Time-Averaged Field Investigations (TAFI) project. Chapter 12 by Gee and Kent explains the source of oceanic magnetic anomalies and their relation to geomagnetic field inversions, which provide the basis for geomagnetic polarity timescales. Chapter 13 by Tauxe and Yamazaki comprehensively treats on paleointensity determination. The authors present the theory and experimental methods and practices on different types of rocks, aiming at reliable extraction of the primary record of the geomagnetic field intensity and its variation in geological past. The last

chapter 14 by Raub, Kirschvink and Evans explores the nature of the true polar wander (TPW), one of the topics of the hottest debate during the past decade. Hypotheses on slow/prolonged (type I) and fast/multiple/oscillatory TPWs are presented, with potential geodynamic and geologic effects, which should be recorded in rock sequences.

In general, the book is logically organized, although the editorial work on chapter arrangement was certainly not a trivial task, since some of them demonstrate applicability of geomagnetism to geodynamics and geology, while other chapters are focused on the better understanding of the nature of geomagnetic field, and its current influence on the planet Earth. All chapters feature color figures of excellent resolution and legibility, very detailed maps of the geomagnetic field components, and relevant websites. The book is a valuable source of data usually dispersed in different publications, and it will be an obligatory reference for researchers and graduate students in the fields of geophysics and geology.

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