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Early Earth Systems – a geochemical approach, by Hugh Rollinson, 2007. Blackwell Publishing Ltd, 9600 Garsington Road, Oxford, OX4 2DQ United Kingdom. Paperback, 285 pages, 120 illustrations. Price GBP 34.99; USD 79.95. ISBN 978-1-4051-2255-9.



Over the last decade, the way we think about the Earth has undergone a major change. It is now realized that exploring the linkages between different parts of the modern “Earth System” is vital for a proper understanding of the surface and internal processes of the Earth. Obviously, we must have adequate knowledge of the interactions that take place between the present-day crust and mantle of the Earth; between its hydrosphere and atmosphere; and between the non-biological Earth and life.

Exploring what the Earth was like in its earliest history, in particular during the Archaean, is equally vital, as this provides valuable insight into the evolution of the Earth until it reached its present physical, chemical and biological states. Hugh Rollinson, has attempted to explore the conditions of the Earth during the “first 2 billion years of its 4.6 billion year life” from a geochemical viewpoint.

The contents of the book are presented in six chapters. The first chapter begins with an excellent introduction to Earth System Science and its application to the early Earth. This is followed by a brief and comprehensive discussion on the nature of the Archaean geological record, with examples from Zimbabwe, Greenland, Canada and Australia. The origin and differentiation of the early Earth is discussed in the context of the origin and early history of the Universe and the solar system in the second chapter. This is followed by an extensive and very informative account (Chapter 3) on the evolution of the Earth’s mantle. Various mantle models are critically discussed from geochemical and experimental-petrological viewpoints. The Earth’s earliest mantle is examined on the basis of information derived from samples of the Archaean mantle preserved in the Earth’s oldest rocks. The continental crust, which was progressively extracted from the mantle over the last 4.0 billion years, represents only 0.6% of the mass of the silicate earth although it contains up to 70% of the Earth’s budget of highly incompatible elements. For obvious reasons, the fourth chapter is entirely devoted to the origin and evolution of the continental crust. An in-depth overview of the models and mechanisms of crust formation is provided. This is followed by an excellent discussion on crustal growth during the Archaean and constraints on the origin of Archaean TTG’s (Tonalite–Trondhjemite–Granodiorite) based on insights from recent experimental-petrological, geochemical and thermal modeling (pages 156-162). This is logically followed by two chapters (Chapters 5 and 6) on the origin of the Earth’s atmosphere and oceans, and on the origin of life, respectively.

This book is not like traditional text books, and the approach/methodology followed differs significantly from those in other books available in this field. I fully agree with the author that “Segmenting the Earth Sciences into fields such as “igneous petrology” and “carbonate sedimentology” with firm boundaries demarcating these subdisciplines provides inadequate answers to whole Earth problems.” Earth scientists now should think beyond the traditional “boxes” of their specializations, and of course, try to understand the connecting links between these “boxes.”

The book is well written, with many highly relevant photographic and graphic illustrations. References are, in general, up to date. The author's vast experience motivated him to undertake such an ambitious project. It is true, indeed, that there is no new synthesis in it. Nor is a new model of the early earth developed. The book rather highlights the way we should think of our planet following the Earth Systems approach. I sincerely believe that Hugh Rollinson's approach will be successful. The book will definitely motivate interested earth scientists to adapt the systems approach in Earth Science teaching and research alike. I strongly recommend this book for the libraries of both universities and research institutes.

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