

PALEOGEOGRAPHY AND GEOLOGICAL HISTORY OF GREATER
ANTILLES — K. M. Khudoley and A. A. Meyerhoff

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Paleogeography and Geological History
of
Greater Antilles

K. M. KHUDOLEY

*All-Union Institute of Geological Researches (VSEGEI),
Leningrad, USSR*

AND

A. A. MEYERHOFF

*The American Association of Petroleum Geologists,
Tulsa, Oklahoma, USA*



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This book is dedicated to the following
Pioneers of Greater Antilles
Geology

CHARLES SCHUCHERT
JORGE BRODERMANN
CHARLES P. BERKEY
W. P. WOODRING
V. A. ZANS
L. J. CHUBB
HOWARD A. MEYERHOFF
H. H. HESS

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Foreword

One of the writers (Meyerhoff) worked in Cuba during 1952, and again in 1956–1959, for the Standard Oil Company of California organization. After he left Cuba, the other writer (Khudoley) worked on the island from 1961 to 1965. In 1962, a new 1:1,000,000-scale geological map of Cuba was published by Núñez-Jiménez and others. One of the “others” is K. M. Khudoley (C. M. Judoley in the Spanish transliteration of the Cyrillic alphabet). Meyerhoff took strong exception to several parts of the map and wrote a critical review of it (A. A. Meyerhoff, 1964b). Khudoley disagreed completely with some of Meyerhoff’s viewpoints; he then published in Cuba a Spanish translation of Meyerhoff’s adverse review (A. A. Meyerhoff, 1964c), together with his own outspoken rebuttal (Judoley, 1964, 1966).

This frank exchange led to extensive correspondence, mutual respect, a friendship, and the present manuscript.

Acknowledgments

A speech version of this paper was presented by Howard A. Meyerhoff at the Fifth Caribbean Geological Conference, Virgin Islands, July 3, 1968. The other papers presented at that Conference are being edited by Dr. Thomas W. Donnelly, Department of Geology, State University of New York, Binghamton, and will be published as a separate *Memoir* of The Geological Society of America. The present paper is not included with the others, because we already had prepared the paper as a *Memoir* for the Society, and its length prohibited its inclusion with the other papers.

The writers are grateful to George V. Cohee, Charles W. Hatten, Howard A. Meyerhoff, Peter Misch, Hugh D. Miser, and Othmar T. Tobisch, all of whom reviewed the entire original manuscript and offered numerous helpful suggestions, of which almost all were adopted in this version. The views expressed here, however, are those of the writers. Deep appreciation is due Mrs. Carol Thompson, Miss Ernestine Voyles, Miss Amy Lee Brown, and Mrs. Joyce Buchanan for typing, Mrs. Kathryn L. Meyerhoff for drafting, Peggy Rice, and Robert H. Dott, Sr., for help in the final stages.

Radiometric dates were obtained from the All-Union Institute of Geological Researches (VSEGEI), Leningrad, the United States Geological Survey, and other sources, both published and unpublished. The help of the following persons led to the acquisition of many of the radiometric dates in Table 4: A. Abdel-Monem, Carl O. Bowin, Mrs. Harriett Ewing, Fred A. Hildebrand, Miss Marjorie Hooker, S. E. Kesler, K. M. Khudoley, Peter H. Mattson, Arthur E. Nelson, William T. Pecora, T. W. Stern, and Othmar T. Tobisch. Paleontological data for the Tithonian-Aptian were obtained in part from Ralph W. Imlay and Norman F. Sohl. C. E. Helsley loaned the writers a copy of his thesis (1960) and offered valuable comments. Paul J. Fox gave the writers details of Cretaceous-Eocene samples collected from the Beata Ridge area. John B. Saunders helped the writers with the paleontology and stratigraphy of several areas. T. W. Donnelly provided several valuable suggestions for improving the paper. R. L. Chase gave the writers a stimulating and informative written discussion of the Puerto Rico Trench. Watson H. Monroe supplied reprints of papers which gave valuable insight into the middle Tertiary of northern Puerto Rico and the age of the Puerto Rico Trench. Thomas

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George V. Cohee, Chairman of the Geologic Names Committee, U.S. Geological Survey, and Hugh D. Miser, U.S. Geological Survey, edited the original manuscript and reviewed the stratigraphic terminology. George V. Cohee, in his capacity as a member of the American Commission of Stratigraphic Nomenclature, reviewed stratigraphic usage and capitalization. Any errors in nomenclature and capitalization, however, are the responsibility of the writers.

Permission of the Standard Oil Company of California to publish this paper is acknowledged with gratitude.

Introduction

The purposes of this volume are several. The most important is to present a review of published and unpublished information, including some of the writers' researches, on the geology of the Greater Antilles. Much space is given to pre-Early Cretaceous stratigraphy because numerous, scattered facts that bear on these older rocks have never been brought together.

A second purpose is to update the classic summary and synthesis of this region that was published by Schuchert (1935). The more recent works by Butterlin (1956) and Weyl (1966) are summaries, but are not true syntheses. Brief, but important syntheses also have been published (Bucher, 1947; Eardley, 1954; H. A. Meyerhoff, 1954; Woodring, 1954; North, 1965; MacGillavry, 1970), but few data were presented in those works. Many superficial speculations also have been published on this area.

A final purpose is to interpret the information from this area in the form of paleogeographic maps. Because the writers generally agree on field observations (with a few notable exceptions), but are in fundamental disagreement regarding several interpretations, they believe that their two viewpoints should be presented in a single article rather than in separate publications. Hopefully, this method of presentation will generate similar papers—not only by workers from different countries, but also by workers in the same country.

Abstract

The Greater Antilles Mesozoic-early Tertiary orthogeosyncline originally was either a basin between the Bahamas platform on the north and a land-mass on the south (on the site of the present Caribbean), or an island-arc system between the Bahamas-Turks and Caicos-Atlantic Ocean basin on the north, and an oceanic basin (modern Caribbean Sea) on the south. The Greater Antilles was not continuous with, or a part of, the Lesser Antilles arc, which is a younger, independent tectonic unit.

The oldest Greater Antillean rocks may be Paleozoic, and are present mainly in central and western Cuba. They consist of metamorphosed gray-wacke, argillite, tuff, mafic igneous extrusive flows, mafic sills, and carbonates. The oldest rocks dated paleontologically are Early and Middle Jurassic terrigenous clastic strata and evaporites in Cuba.

The Greater Antilles orthogeosyncline formed in latest Jurassic-Early Cretaceous time from Cuba to the Virgin Islands, and persisted until Eocene time. Locally 10 to 12 km of mafic to silicic igneous rocks and clastics accumulated. In Cuba and the Bahamas, 6 to 7 km of carbonates and evaporites were deposited. A Cretaceous foredeep trough occupied northeastern Jamaica. This trough faced the western Jamaica Paleozoic(?) "backland," which the writers interpret to be an eastward extension of the Paleozoic-Tertiary Northern Central American orogen. Since Eocene time, isolated basins developed in which carbonate sedimentation was dominant, and the Greater Antilles no longer was a tectonically active arc.

Orogeny and related crustal movements have been almost continuous since the Jurassic. Wrench-type and vertical block faulting, beginning locally in middle Cretaceous or earlier time, gradually fragmented the once-continuous orthogeosyncline. Granodioritic intrusions, having radiometric dates ranging from 180 to 46 m.y., are scattered through the orthogeosynclinal sequence. Tectonism—not of the island-arc type—continues today.