Book Reviews

Caribbean Geology

Paleogeography and Geological History of Greater Antilles. K. M. KHUDOLEY and A. A. MEYERHOFF. Geological Society of America, Boulder, Colo., 1971. xvi, 200 pp., illus. $12. GSA Memoir 129.

Probably many Caribbean geologists (myself included) are suffering from varying degrees of geologic schizophrenia, torn between the general popularity of the plate tectonic concept and the knowledge that to date the Caribbean region has not been satisfactorily integrated into this new world scheme. If plate tectonics cannot incorporate key areas such as the Caribbean, the hypothesis will require some major overhauling.

So it is with some relief that I find little mention of this concept in the volume by Khudoley and Meyerhoff. Much of the text was written before plate tectonics was in vogue. I believe it is all the better for that and should be read by everyone who might want to attempt to impose plate tectonics upon the Caribbean. Meyerhoff's "antimobilist" position has been well spelled out elsewhere during the past two years.

There are enough geophysical models of the Caribbean afloat to satisfy everyone; what the area needs now is critical geological information. This volume serves that need for the Greater Antilles, most particularly for Cuba. The older Cuban information is summarized, while new and formerly scattered data are brought together for the first time. Information from the other islands is mainly in the form of a literature review but is presented in a sequential series of paleogeographic maps—the first modern attempt. The implication of this type of presentation, and of the text in general, is that none of the Greater Antilles have moved great distances laterally, nor have any major portions been significantly rotated. Published evidence for either type of movement is not convincing.

The authors' format, presenting alternate interpretations of the same data in the same volume, is a novel approach (see their figures 15, 16, 17 for example) and excellent testimony to the fact that geologic maps, cross sections, and stratigraphic sections are dynamic documents, partially controlled by known facts but strongly influenced by individual training and experience.

The volume is well organized, edited, and documented and contains a good index. Most important is the fact that data treatment is *fair*; fact is clearly separated from interpretation.

The authors' characterization of the Greater Antilles as an orthogeosyncline is not appropriate, with the possible exception of Cuba and westward toward Central America. East of Cuba the early volcanics, in my opinion, accumulated as submarine piles, possibly above fracture zones, but not in basins. As Khudoley and Meyerhoff point out, there is no miogeosyncline east of Cuba. That belt ends abruptly for no apparent reason—very peculiar orthogeosyncline indeed (see their figure 13). The authors believe the eugeosyncline belt to have been fragmented since the early Cretaceous, various portions behaving independently from that time on. I believe independent behavior of arc segments to be an important characteristic of both the Greater and the Lesser Antilles, a phenomenon which has led to extraordinary difficulties in correlating rock units and tectonic events from island to island.

Readers will find important unresolved problems pertaining to the Caribbean area neatly summarized—for example, the nature of the Caribbean crust, the ages of the oldest rock in the Caribbean, and the serious knowledge gap due to lack of detailed information from Hispaniola.

Marine geophysical data, experimental data, and rocks recovered in cores and dredge hauls do not favor Khudoley's interpretation that the Caribbean Sea is underlain by former continental crust. It is fair to say, however, that large areas of the Nicaragua Rise, Beata Ridge, and Aves Ridge were near or above sea level until some time in the Tertiary.

Paleozoic rocks may yet turn up in the Caribbean; suspected Paleozoic rocks are metamorphic and their age has not been determined. Metamorphic rocks (amphibolites, marbles, rare glaucophane schists) and serpentinites are now known to be much more extensive along the north coast of the Dominican Republic than is indicated in this volume. I have suggested elsewhere that the Dominican Republic is unique among the Greater Antilles in that it displays dual metamorphic belts similar to those in Pacific island arcs.

Recent dredge hauls suggest that the Nicaragua Rise–Cayman Ridge complex (I would also include the Yucatan Basin in this grouping) may be in part underlain by Paleozoic (?) metasediments, metabasalts, basalts, and granodiorites and that the Aves Ridge is composed mainly of andesitic volcanic rocks and volcanic sediments over metabasalt and granodiorite intrusives. The first is probably a geosynclinal accumulation, the second an island arc remnant. Except for vague bathymetric similarities and the possibility of extensional tectonics in both areas, I fail to see the suggested close relationship of the Nicaragua Rise–Bartlett Trough–Cayman Ridge complex to the Lesser Antilles–Aves Ridge.

The statement in the abstract which reads "The Greater Antilles was not continuous with, or a part of, the Lesser Antilles arc which is a younger, independent tectonic unit" must now be qualified since recent radiometric data from La Désirade give Cretaceous or older ages for several rock units. Either the basement structure of the Greater Antilles does continue into the northern Lesser Antilles or an oceanic crust fragment (Désirade) has been incorporated into the Lesser Antilles. In a recent paper Meyerhoff has modified his position toward the first suggestion.

It falls upon those of us, such as Khudoley and Meyerhoff, who have tramped the terrain, collected and studied the rocks, dredged, cored, and drilled the sea bottom, looked at the structures in the field, and worked out the stratigraphy to finally do the Caribbean justice. For those who want basic information on Caribbean geology, this volume is a powerful reference.

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