

AAPG Studies in Geology 58

Geology of the Gulf of Mexico

By Georges Pardo



Table of Contents

Note to the Reader	iii
About the Author	xi
OVERVIEW	
Introduction	1
Political Subdivisions	4
Regional Setting	7
Stratigraphic and Structural History	13
Restoration of Cuban Geology	15
North-Central Sedimentary Terranes	16
Southwestern Sedimentary Terranes	17
Basic Igneous-Volcanic Terranes	20
Central Cuba	20
Northern and Western Cuba	22
Eastern Cuba	23
History of Cuba	23
Early (?)–Middle Jurassic	24
Tithonian	25
Neocomian	26
Barremian	27
Aptian	27
Albian–Cenomanian	28
Turonian–Campanian	29
Campanian–Maastrichtian	29
Paleocene (Danian)	30
Early to Middle Eocene	31
Late Eocene to Present	35
Cuba's Contribution to the Understanding of Obduction	36
Cuba's Contribution to the History of the Caribbean	38
Callovian	41
Early Tithonian	41
Valanginian	42
Aptian	42
Albian–Cenomanian–Turonian	42
Coniacian–Santonian–Campanian	43
Maastrichtian	43
Paleocene–Middle Eocene	44
Early Late Eocene	44

Conclusions	44
Acknowledgments	46
References Cited	49
Additional Reading	59
Catalog of Stratigraphic Units	61
Formation Index	65
Localities	71
Glossary	73

CD-ROM MATERIAL

DATA

Chapter 1—Structural and Stratigraphic Elements	77
Pre-Upper Eocene	77
Western Cuba	77
Central Cuba	77
Eastern Cuba	79
Post-Upper Eocene	79
Development of the Cuban Structural and/or Stratigraphic Nomenclature	79
Gulf's Stratigraphic Nomenclature	80
The Belt Nomenclature Problem	80
General Remarks	82
Chapter 2—Pre–Upper Eocene Stratigraphy	85
Introduction	85
North-Central Terrane Las Villas: Northern Oriente	88
Jurassic–Cretaceous Carbonate Platform Province	88
Basal Section	90
Yaguajay* Belt	93
Coastal Region	102
Jurassic–Cretaceous Carbonate Platform Discussion	110
Cretaceous Carbonate Slope or Scarp	112
Sagua la Chica* Belt	113
Jatibonico* Belt	114
Cretaceous Carbonate Slope or Scarp Discussion	115
Jurassic Platform to Cretaceous Deep Basin Province	116
Las Villas* Belt	116
Placetas* Belt	127
Cifuentes* Belt	130
Jurassic Platform to Cretaceous Deep Basin Province Discussion	139

Southwestern Terranes	141
NonMetamorphics	141
Guaniguanico Mountains	141
Guajaibon–Sierra Azul Belt	143
Northern Rosario Belt	147
La Esperanza Belt	157
Southern Rosario Belt	161
Sierra de los Organos Belt	166
Cangre Belt	178
Guaniguanico Mountains Sediments Discussion	180
Metamorphics	184
Pinar Fault Area	184
Isla de la Juventud	184
Isla de la Juventud Section Discussion	187
Escambray Massif	187
Escambray Massif Section Discussion	192
Asuncion Area: Eastern Cuba	194
Asuncion Area Discussion	196
Basic Igneous-Volcanic Terrane	196
Central Cuba	196
Domingo* Sequence	197
Vega-Tamarindo Area	199
Santa Clara–Arroyo Blanco Area	201
Northern Escambray Area	204
Central Camaguey Area	205
Domingo* Sequence Discussion	205
Cabaiguan* Sequence	205
Seibabo Syncline, North Flank	206
Seibabo Syncline, South Flank	210
Cienfuegos Area	213
Tamarindo-Camajuani Area	213
Fomento-Taguasco Area	216
Santo Domingo–Santa Clara Area	219
Central Camaguey Area	222
Intrusives	225
Campanian–Maastrichtian Problem	227
Western Cuba	229
Domingo* Sequence	231
Bahia Honda Area: Northern Tectonic Unit	231
Gabbros	232
Other Areas	232
Cabaiguan* Sequence	232
Bahia Honda Area: Northern Tectonic Unit	232
Bahia Honda Area: Southern Tectonic Unit	234
Los Palacios Basin	235
Isla de la Juventud Area	237
Western Cuba: Basic Igneous-Volcanic Terrane Discussion	237
Northern Cuba	239
Domingo*–Cabaiguan* Sequences	239
Domingo*–Cabaiguan* Sequence Discussion	246
Eastern Cuba	247
Northern Oriente	249
Domingo* Sequence	250
Cabaiguan* Sequence	251

Southeastern Oriente	254
Domingo* Sequence	254
Cabaiguan* Sequence	256
Southwestern Oriente	259
Cabaiguan* Sequence	259
Metamorphosed Basic Igneous-Volcanics (Purial Massif)	263
Eastern Cuba: Basic Igneous-Volcanic Terrane Discussion	266
Discussion of the Pre–Upper Eocene Stratigraphy of Cuba	269
North-Central Terranes: Carbonate Platform to Deep Basin Section	269
Southwestern Terranes: Carbonate Platform to Deep Basin Section	270
Metamorphic Province: Escambray	271
Metamorphic Province: Isla de la Juventud	271
Basic Igneous-Volcanic Terrane Sections	273
North-Central Cuba	273
Southwestern Cuba	273
Northern Cuba	273
Eastern Cuba	274
Restored Cuba Cross-Sections	274
Chapter 3–Post–middle Eocene Stratigraphy	277
Northern Coast	277
Southwestern Basins	280
Los Palacios Basin	280
Habana-Mantanzas	282
Western Las Villas	284
South-Central Basin	284
Southeastern Basins	286
Guanacayabo-Nipe Basin	287
Central Syncline	289
Guantanamo Basin	290
Southern Coast	290
Discussion of the Post–Middle Eocene Stratigraphy of Cuba	291
Chapter 4–Geophysical Characteristics	295
Gravity	295
History	295
Description of the Gravity Anomalies	295
Magnetics	297
History	297
Description of the Magnetic Anomalies	297
Crustal Measurements	298
Reflection Seismography	303
Temperature and Heat Flow	304
Paleomagnetism	305
Age Dating	306
Geophysical Data Discussion	308

Chapter 5—Structural Geology	311
Central Cuba	311
Coastal Region	311
Yaguajay* Belt	313
Jatibonico* Belt	314
Sagua La Chica* Belt	316
Las Villas* Belt	316
Las Villas Fault	316
Western Area	316
Quemado de Guines Anticlinorium	316
Central Area	317
Guayabo Anticlinorium	317
Mata Anticlinorium	318
Eastern Area	318
Meneses Anticlinorium	318
Zulueta Anticlinorium	319
Yabu Window	319
Las Villas* Belt—Southern Facies	319
Northern Area	320
Southern Area	320
Fidencia Anticline	320
Placetas* and Cifuentes* Belts	320
Cifuentes Plate Proper	321
Loma Santa Fe—Placetas Plate	321
Jarahuca Structure	323
Loma Bonachea Window	323
La Rana Olistolith(?)	324
Sierra Morena	324
Domingo* and Cabaiguan* Sequences	324
Mayajigua Area	324
Camajuani—Tamarindo Area	324
Santa Clara—Placetas Area	325
The Escambray Anticline	325
The Santa Clara Syncline	325
The Cruz Anticline	325
The Manajanabo Syncline	325
The Falcon Syncline	325
Seibabo—Cabaiguan Area	326
Seibabo Syncline	326
La Rana Syncline	326
Central Camaguey Area	326
Northern Escambray Area	327
Escambray Metamorphics	328
Central Cuba Discussion	329
Western Cuba	333
Guaniguanico Mountains	333
Sierra de Los Organos Belt	333
Mogotes Area	333
Pizarras del Sur Area	334
Cangre Belt	334
Northern Rosario Belt	334
La Esperanza Belt	335

Guajaibon–Sierra Azul Belt	335
Domingo* and Cabaiguan* Sequences	335
Bahia Honda Area	335
Los Palacios Basin	335
Isla de la Juventud	336
Western Cuba Discussion	336
Northern Cuba	336
Eastern Cuba	338
Northern Oriente	338
Southeastern Oriente	338
Southwestern Oriente	339
Structural Geology Discussion	341
Chapter 6–Hydrocarbons	343
Known Distribution and Types of Hydrocarbons	343
Central Cuba	343
Yaguajay* and Coastal Area	343
Sagua La Chica* and Jatibonico* Belts	343
Las Villas* Belt	343
Surface Indications	343
Subsurface Indications	343
Placetas* and Cifuentes* Belt, Domingo* Sequence	345
Surface Indications	345
Oil Fields	346
Cabaiguan* Sequence	346
Surface Indications	346
Oil Fields	347
Western Cuba: Pinar del Rio	347
Northern and Southern Rosario, and La Esperanza Belts	347
Surface Indications	347
Subsurface Indications	348
Sierra De Los Organos, Pizarras del Sur, and Cangre Belts	348
Surface Indications	348
Subsurface Indications	348
Domingo* and Cabaiguan Sequences	348
Western Cuba: Isla De La Juventud	349
Northern Cuba	349
Surface Indications	349
Subsurface Indications	350
Oil Fields	350
Eastern Cuba	352
Source Rocks	352
Obvious Possible Sources	352
Central Cuba	352
Las Villas* Belt	352
Placetas* and Cifuentes* Belt	353
Cabaiguan* Sequence	353

Western Cuba	353
Sierra de los Organos Belt	353
Northern and Southern Rosario Belts	353
Northern Cuba	353
Oriente	353
Speculative Sources	353
Central Cuba	354
Coastal Area: Jaguajay* and Jatibonico* Belts	354
Las Villas* Belt	354
Domingo* Sequence	355
Escambray Massif	355
Western Cuba	355
Maturation	355
Temperature	355
A Model	356
Migration and Accumulation	357
Source of Fluids	357
Central and Northern Cuba	357
* Western Cuba	358
Aquifers and Reservoirs	358
Clastics	358
Central and Northern Cuba	358
Western Cuba	358
Carbonates	358
Central and Northern Cuba	358
Western Cuba	359
Other Rocks	359
Potential Seals	359
Evaporites	359
North and Central Cuba	359
Western Cuba	359
Argillaceous Sediments	359
Central and Northern Cuba	359
Western Cuba	360