

Chapter 1

# **Executive Summary—Assessment of Undiscovered Oil and Gas Resources of the Jurassic-Cretaceous Composite Total Petroleum System in the North Cuba Basin, Cuba, 2004**

By U.S. Geological Survey North Cuba Basin Assessment Team



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Chapter 1 of

## **Jurassic-Cretaceous Composite Total Petroleum System and Geologic Assessment of Oil and Gas Resources of the North Cuba Basin, Cuba**

By U.S. Geological Survey North Cuba Basin Assessment Team

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# Executive Summary—Assessment of Undiscovered Oil and Gas Resources of the Jurassic-Cretaceous Composite Total Petroleum System in the North Cuba Basin, Cuba, 2004

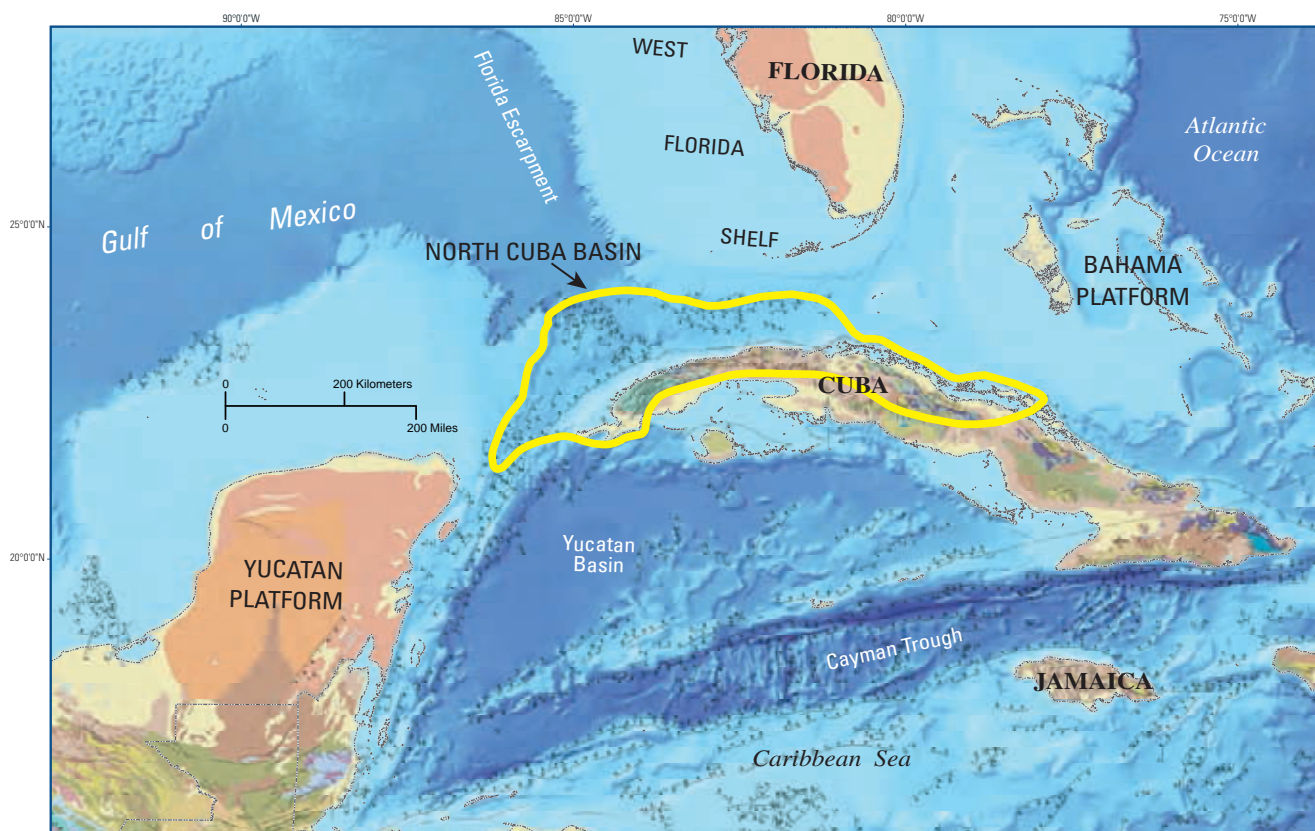
By U.S. Geological Survey North Cuba Basin Assessment Team

## Introduction

The U.S. Geological Survey (USGS) recently completed an assessment of the undiscovered oil and gas resources of the Jurassic-Cretaceous Composite Total Petroleum System (TPS) in the North Cuba Basin of northwestern Cuba (fig. 1). The TPS boundary is the postulated extent of the area in which petroleum migration from thermally mature Jurassic and possibly Cretaceous source rocks occurred. The assessment is based on available information characterizing the essential geologic elements that define a petroleum system, which include petroleum source rocks (source-rock maturation,

petroleum generation, and migration), reservoir rocks (sedimentology and petrophysical properties), and petroleum traps (trap formation and timing). By using this approach, the USGS defined the Jurassic-Cretaceous Composite TPS within the North Cuba Basin and three Assessment Units (AU) within the TPS, and quantitatively estimated the undiscovered oil and gas resources within each AU (table 1).

The North Cuba Fold and Thrust Belt AU was defined to encompass all structures within the Late Cretaceous-Paleogene fold and thrust belt in northwestern Cuba (fig. 1). The North



**Figure 1.** North Cuba Basin of northwestern Cuba and its defined Jurassic-Cretaceous Composite Total Petroleum System (boundary shown by yellow line) and three assessment units (AU) that were assessed in this study. Fine black lines on the ocean floor are faults; ball and bar on downthrown side.

2 Geologic Assessment of Oil and Gas in the North Cuba Basin, Cuba

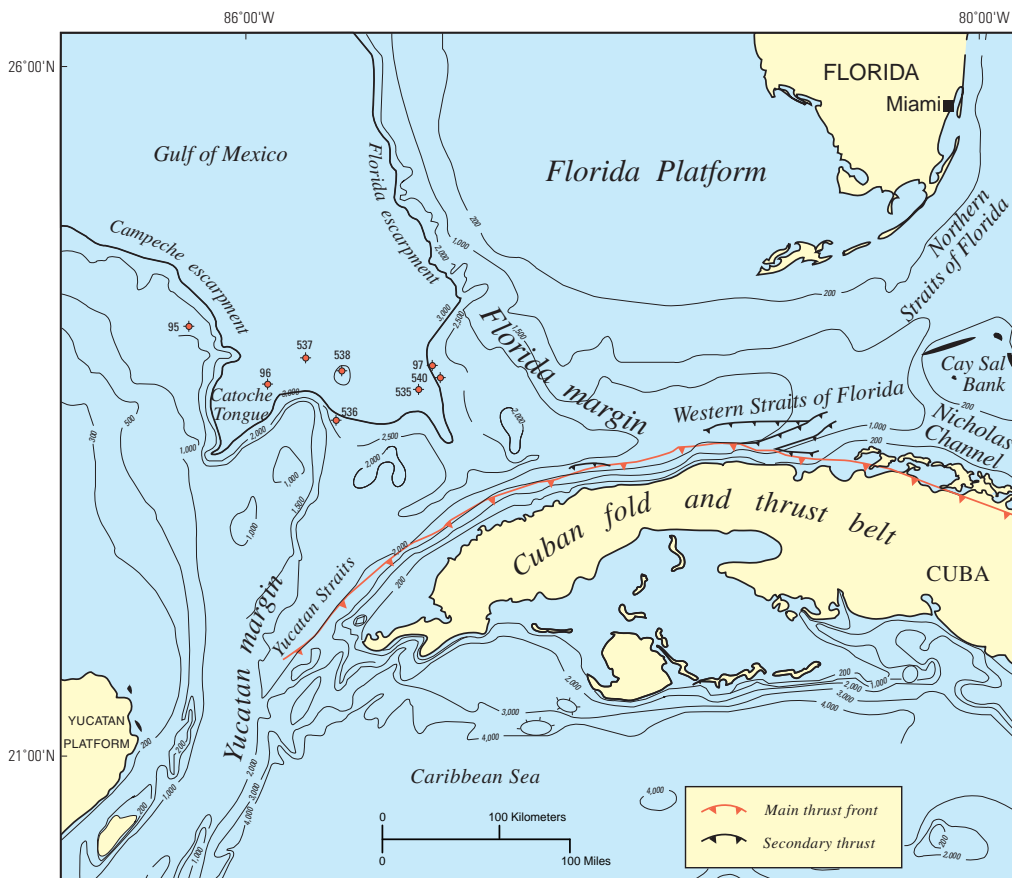
**Table 1.** North Cuba Basin assessment results.

[MMBO, million barrels of oil; BCFG, billion cubic feet of gas; MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. For gas fields, all liquids are included under the NGL (natural gas liquids) category. F95 denotes a 95-percent chance of at least the amount tabulated. Other fractiles are defined similarly. Fractiles are additive under the assumption of perfect positive correlation. Gray shade indicates not applicable.]

Total Petroleum Systems (TPS) and Assessment Units (AU)	Field Type	Total Undiscovered Resources												
		Oil (MMBO)				Gas (BCFG)				NGL (MMBNGL)				
		F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean	
<b>Jurassic-Cretaceous Composite TPS</b>														
Conventional Oil and Gas Resources	North Cuba Fold and Thrust Belt AU	Oil	142.22	464.25	941.03	493.64	159.47	540.32	1,200.27	591.56	8.87	31.53	75.66	35.47
		Gas					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	North Cuba Foreland Basin AU	Oil	781.13	3,014.17	6,374.50	3,218.85	1,464.93	5,863.30	13,421.82	6,451.18	137.43	569.20	1,406.66	644.74
		Gas					141.29	862.16	3,418.47	1,190.46	7.09	44.07	184.63	63.13
	North Cuba Platform Margin Carbonate AU	Oil	131.66	759.73	2,036.87	883.13	221.42	1,330.19	3,841.07	1,588.79	20.71	129.67	399.05	158.90
		Gas					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total Undiscovered Oil and Gas Resources</b>			<b>1,055.01</b>	<b>4,238.15</b>	<b>9,352.40</b>	<b>4,595.62</b>	<b>1,987.11</b>	<b>8,595.97</b>	<b>21,881.63</b>	<b>9,821.99</b>	<b>174.10</b>	<b>774.47</b>	<b>2,066.00</b>	<b>902.24</b>

Cuba Foreland Basin AU includes (1) potential oil and gas accumulations in the foreland basin that formed in front of the thrust belt, and (2) oil and gas accumulations in potential rift-related structures below rocks of the foreland basin. The North Cuba Platform Margin Carbonate AU includes all potential oil and gas accumulations in carbonate platform-margin reservoirs, including reef, reef-slope, and base-of-slope reservoirs. Principal elements of the geologic model used in the assessment are (1) oil and gas were generated from thermally mature, organic-rich Jurassic and possibly

Cretaceous mudstones in the thrust belt, and (2) oil and gas migrated to the northwest and accumulated in structures in the fold and thrust belt, in reservoirs in the foreland basin, and in reservoirs along the margin of the carbonate platform (fig. 2). The main geologic uncertainties in the assessment pertain to (1) the efficacy of lateral migration of petroleum from the thrust belt to the foreland basin and platform margin, and (2) the preservation of petroleum in traps following the generation and migration of petroleum in the Paleogene.



**Figure 2.** Schematic north-west-southeast cross section across the North Cuba Basin showing possible migration pathways of petroleum from possible Jurassic and Cretaceous source rocks within the fold and thrust belt into structures and reservoirs in the fold and thrust belt, in the foreland, and in the carbonate platform margin (after Magnier and others, 2004).

## Resource Summary

The USGS assessed undiscovered conventional oil and gas resources in the North Cuba Basin, exclusive of reserve growth. For the three AUs, estimated means are 4.6 billion barrels of oil (BBO), 9.8 trillion cubic feet (TCF) of natural gas (8.6 TCF of associated-dissolved gas and 1.2 TCF of nonassociated gas), and 0.9 billion barrels of natural gas liquids (table 1). Of the mean of 4.6 BBO, 0.49 BBO are estimated to be in the North Cuba Fold and Thrust Belt AU, 3.2 BBO are estimated to be in the North Cuba Foreland Basin AU, and 0.9 BBO are estimated to be in the North Cuba Platform Margin Carbonate AU (table 1). All of the nonassociated gas (1.2 TCF; gas in gas fields) was assessed in the North Cuba Foreland Basin AU.

This assessment of undiscovered oil and gas resources was completed in 2004, and as of mid-2008 we have not received any publically available information that would significantly alter the assessment results.

## For Further Information

Supporting geologic studies of the Jurassic-Cretaceous Composite TPS and AUs in the North Cuba Basin and the

methodology used in the assessment are in Chapter 2 of this CD-ROM. Assessment results are available at the USGS Central Energy Resources Team web site: <http://energy.cr.usgs.gov/oilgas/>.

## North Cuba Basin Assessment Team

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## Reference Cited

Magnier, C., Moretti, I., Lopez, J.O., Gaumet, F., Lopez, J.G., and Letouzey, J., 2004, Geochemical characterization of source rocks, crude oils, and gases of northwest Cuba: *Marine and Petroleum Geology*, v. 21, p. 195-214.



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