

Introduction

The Guajira Basin is located in a tectonic setting characterized by two right lateral strike faults of regional scale (Oca and Cuisa faults).

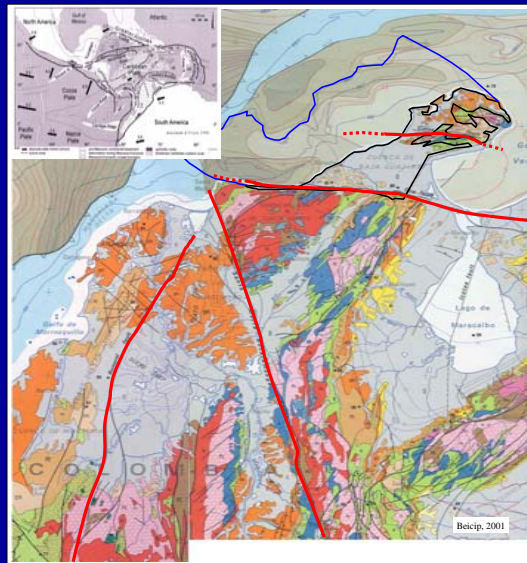
The stratigraphic section includes Jurassic and Cretaceous units having petroleum source and reservoir rock potential. The Tertiary interval, Eocene to Upper Miocene, accounts for the majority of the stratigraphic section in the basin, and Oligocene, Lower Miocene and Upper Miocene rocks are recognized as the reservoirs for most of the hydrocarbons in the basin.

Hydrocarbon occurrence in wells and gas production from Chuchupa-Ballena fields, have led, along with the interpretation of geophysical (mainly seismic), geological and geochemical information, to a good understanding of the hydrocarbon prospectivity of the basin.

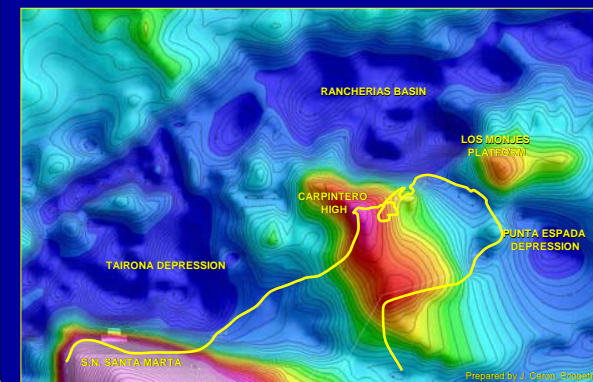
Recent efforts of information integration has allowed for the preliminary definition of petroleum systems in this basin:

Macanao - Siamana P.S. (.) northeast part of the basin,
Tertiary - Jimol/Uirpa P.S. (.) producing in the Chuchupa-Ballena fields,
Castilletes-Castilletes P.S. (?) reservoir potential in deep water clastic environments), and
Mesozoic-Cretaceous P.S. (?) reservoirs as fractured Cretaceous limestones, analogous with Mara - La Paz Venezuelan fields.

Regional Geological Features

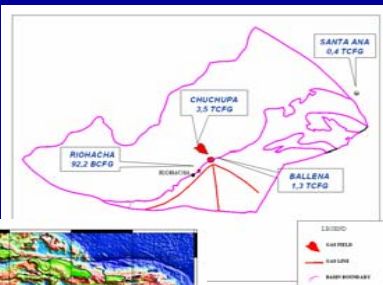


Isostatic Residual Anomaly



Basin and Gas Fields Location

The Guajira Basin is located along the northern tip of South America, bounded to the north by the Caribbean sea region. Its production history began in the mid 70's with gas discoveries by Texaco.



Stratigraphic Record

EPH	FORMATION	THICKNESS
HOLOCENE		
PLEISTOCENE	Fm. Gallinas	
PLIOCENE	Fm. Castilletes	692
	Fm. Jimol	940
MIocene	Fm. Uirpa	342
OLIGOCENE	Fm. Siamana	302
	Fm. Macanao	>550
Eocene		
PALEOCENE		
MAAST		
CAMP	Fm. Calles	>500
SAN	Fm. Guadalupe	
CON		
TUR	Fm. La Luna	79-130

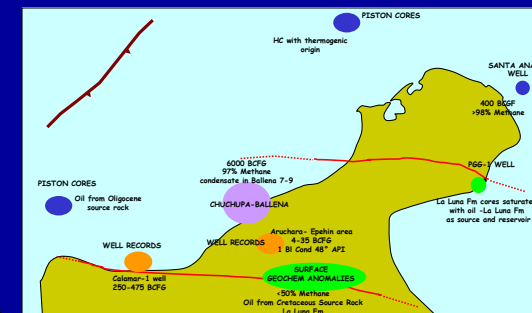
SUBSURFACE TERTIARY STRATIGRAPHIC RECORD:

Lower Guajira: From Lower Miocene to Recent

Upper Guajira: From Upper Eocene to Recent

Local record of Cretaceous La Luna- Colon Formations

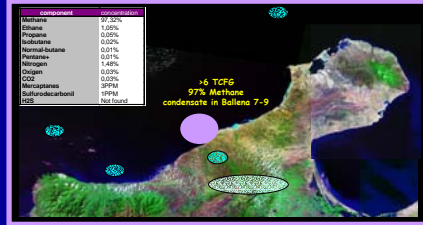
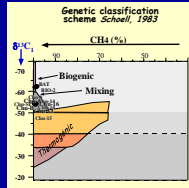
Hydrocarbon Occurrences



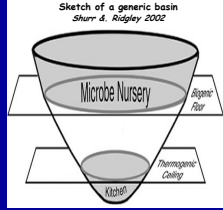
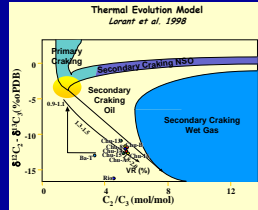
Traditionally, the Guajira Basin has been regarded as a biogenic gas province (more than 6 TCF discovered of dry gas, 97% methane, low maturity levels). Multiple hydrocarbon occurrences in the basin, along with recent geochemical and geological data, support the interpretation of several petroleum systems, involving thermogenic processes relevant to the evolution of the basin. These P.S. are an important factor in the appraisal of the gas and oil prospectivity of the basin and to tie the offshore exploration potential to the inland known geological features.

Tertiary-Jimol/Uitpa P.S. (.)

Hydrocarbon characteristics of producing fields

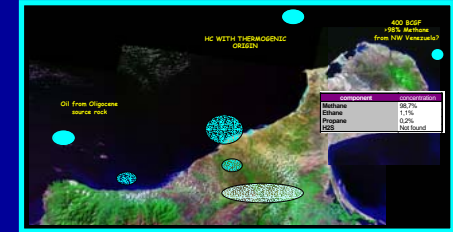


Tertiary - Jimol/Uitpa P.S. (.): The source rock is the middle to upper Miocene Castilletes Formation (thermally immature), assuming a biogenic origin of the gas. If all or portion of the gas were thermogenic in origin, the source rock would be a pre-Miocene thermally mature unit such as the Macarao or Siamana Formations. The Castilletes Formation could be a thermogenic source rock, in an area of the basin where it is buried deeper and has higher maturity levels. The reservoir rocks are the lower Miocene Uitpa and Jimol Formations. This petroleum system is gas prone.

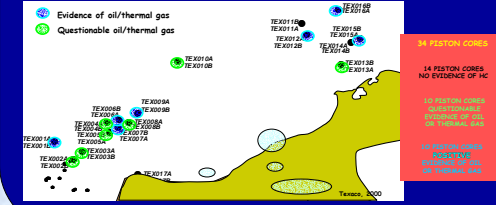


Macarao-Siamana P.S. (.)

Piston cores and Santa Ana gas composition

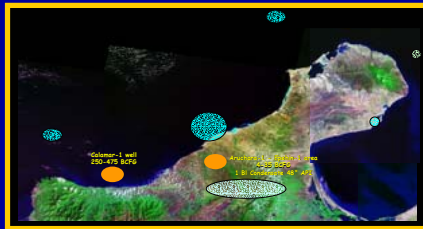


Macarao - Siamana P.S. (.): The source rock for this system is the Eocene Macarao Formation and reservoirs are sandstone beds of the Siamana Formation. Analyses of offshore piston cores and well samples, indicate source rock potential also for the Siamana Formation. In the Alta Guajira offshore, the reservoir potential is attributed to the Macarao Formation. The petroleum system is gas prone.

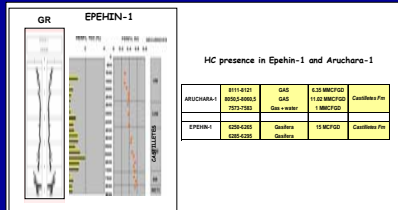


Castilletes-Castilletes P.S. (?)

Gas occurrences in several wells in the basin



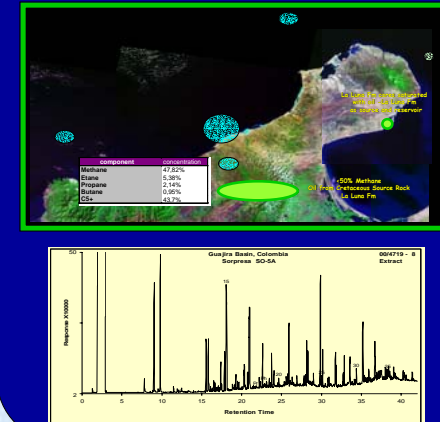
Castilletes-Castilletes P.S. (?): The source rock is the Middle to Upper Miocene Castilletes Fm, which also has reservoir potential in local clastic developments (turbidites?) with gas recorded in several wells in the basin and interpreted as present in seismic anomalies north of the gas fields. The petroleum system is considered to be biogenic gas prone.



Mesozoic-Cretaceous P.S. (?): The primary source rock for the system is the La Luna Formation in the east and northeast of the basin. The Jurassic Cuisa Shale (Cosinas ridge area) has local potential as a source rock. The reservoirs are fractured Cretaceous limestone. The potential interpreted is based on the analogy with the petroleum geology of the Mara-La Paz fields of northwestern Venezuela. The P.S. could be extended up to the PGG-1 well. Seismic information indicates the presence of this system offshore and eastward of Punta Espada. Available data are not adequate to determine if the system is mainly gas or oil prone.

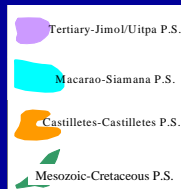
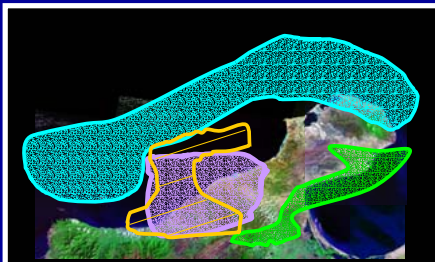
Mesozoic-Cretaceous P.S. (?)

Surface Geochemistry anomalies and well records



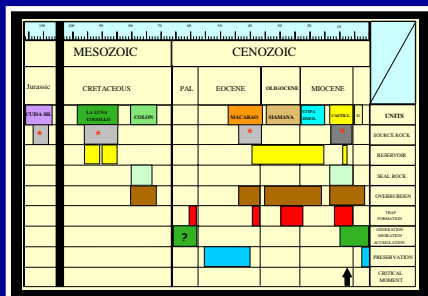
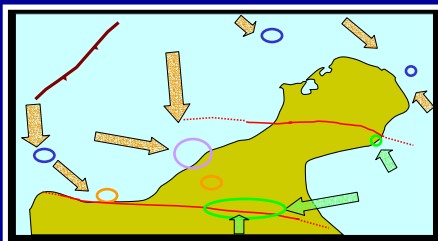
Areal Distribution of Petroleum Systems

Mesozoic source rocks are mainly recorded from the subsurface in the southeastern part of the basin (Cretaceous rocks), and from outcrops in the hills of the Alta Guajira (Jurassic Kimmeridgian Cuisa Shale). Cenozoic source rocks are known from well and outcrop data, and their distribution is interpreted from seismic in the offshore part of the basin.



Proposed Migration Pathways

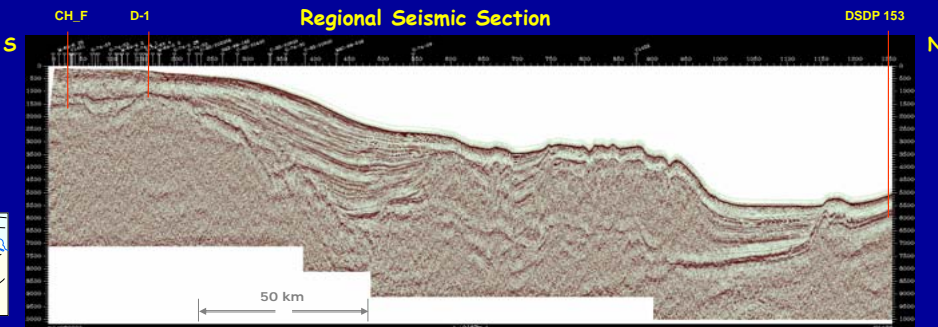
From Tertiary source rock
From Mesozoic source rock



Schematic Events chart

Regional Seismic Section

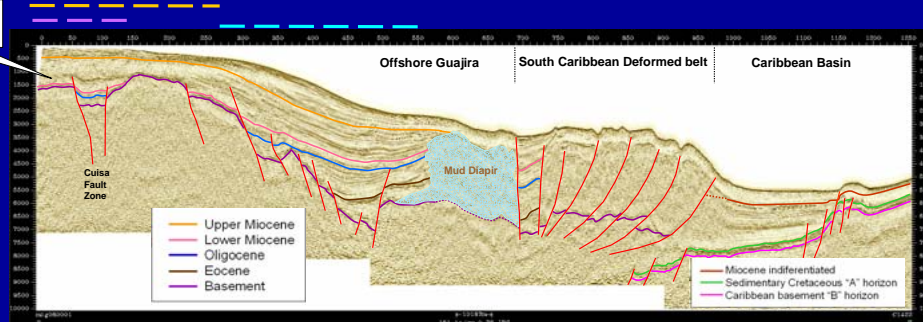
Seismic line from the shallow offshore production area to the south up to the Caribbean plate realm in the north.



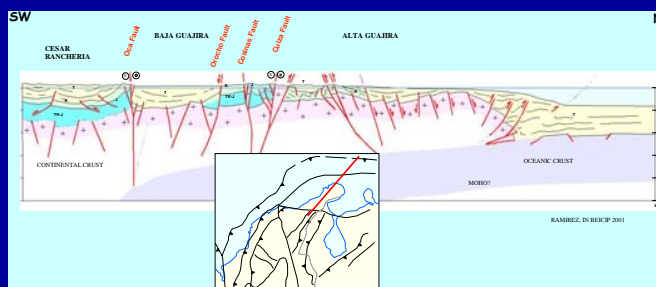
Main Tectonic Features and Petroleum Systems

Gas production area

Castilletes-Castilletes P.S. (?)
Tertiary-Jimol/Uitpa P.S. (.)
Macarao-Siamana P.S. (.)



Basin Schematic Cross Section



Summary

The petroleum systems approach provides a means to summarize the evolution of the Guajira Basin in terms of elements and processes. There are several stratigraphic units with potential as source rock (some of them are oil prone) and also there are different types of reservoirs to be considered in exploration of the basin. The tectonic evolution of the region (related to the interaction between the Caribbean and South America Plates), is a major factor for the presence of gas in the basin, and for the likely occurrence of condensate and liquid hydrocarbons along the migration pathways. Several events of trap formation in association with pulses of hydrocarbon generation and migration could be advantageous to the entrapment of economic amounts of hydrocarbons.