



**AREAS  
ADVERTISEMENT  
2022**

# **GAS POTENTIAL OF COLOMBIA CARIBBEAN OFFSHORE**

**VICTOR RAMIREZ, CESAR MORA, PAULA ARCILA, FABRICIO COMBITA, JHON MUÑOZ, RAFAEL ROBERTSON,  
FABIAN GALLEGO, CHRISTIAN PEÑAFORT, ANTONIO RANGEL, SONIA ALVARADO, YULIANA MALAGON**

**ACKNOWLEDGMENTS TO A. FUENZALIDA, V. AMARIS (SGC) AND EPIS PERSONNEL**

**September 30th, 2022**

**HYDROCARBON POTENTIAL  
KNOWLEDGE REVIEW  
PETROLEUM SYSTEMS REVIEW  
PLAY CONCEPTS / PFW MAPS  
MAIN CONCLUSIONS**

# INFORMATION SOURCES

ANH-SGC, 2021. CORREDORES EXPLORATORIOS CARIBE. Dirección Técnica de Hidrocarburos SGC para ANH. Bogotá.

ANH-SGC, 2022. INTEGRACIÓN, ANÁLISIS, INTERPRETACIÓN Y MODELAMIENTO GEOQUÍMICO DE MUESTRAS DE FONDO MARINO EN EL CARIBE COLOMBIANO. Dirección Técnica de Hidrocarburos SGC para ANH. Bogotá.

Carvajal L.C., Torrado, L., Mann, P., English, J., 2020. Basin modeling of Late Cretaceous / Mio-Pliocene (.) Petroleum system of the deep-water eastern Colombian Basin and South Caribbean Deformed Belt. *Marine and Petroleum Geology* 121 (2020) 104511.

Leslie, S. and Mann, P., 2020. Structure, stratigraphy, and petroleum potential of the deepwater Colombian Basin, offshore northern Colombia. Interpretation. November 2020.

Ramirez, V., Vargas, L. S., Rubio, C., Niño, H., and Mantilla, O., 2015. Petroleum systems of the Guajira Basin, northern Colombia, in C. Bartolini and P. Mann, eds., *Petroleum geology and potential of the Colombian Caribbean Margin: AAPG Memoir 108*, p. 399–430.

Reuber, K., Goswami, A. and Campbell, C., 2022. Offshore Colombia: Highlights of prospective margin segments using newly reprocessed 2D seismic data. ANH Talks. <https://www.youtube.com/watch?v=OF26wNzIxP0>

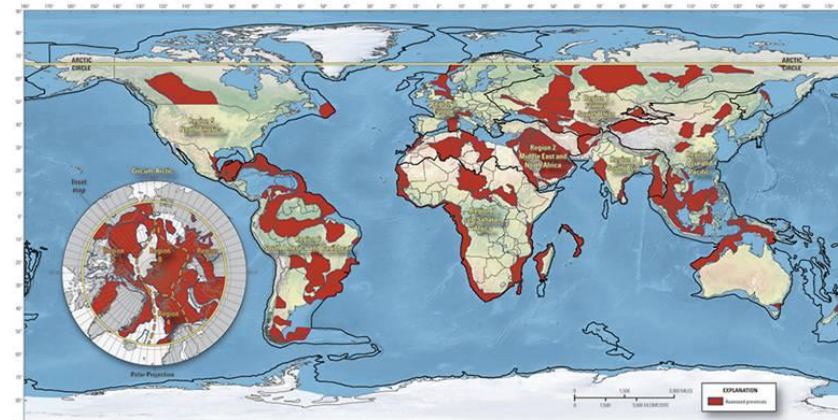
# HYDROCARBON POTENTIAL

# CARIBBEAN BASIN POTENTIAL

- CERI, 2000 (probabilistic): 85 TCFG – Colombia Gas Potential.
- Ryder Scott, 2000 (Offshore, probabilistic lead inventory: 50 TCFG Caribbean Offshore.
- Ecopetrol, 2001 (detailed lead inventory): 35 TCFG offshore.
- ANH, 2009 (mass balance and leads inventory): 56 TCFG, 87 TCF (volumetric estimate), Colombia offshore.
- ANH 2020. Deep Caribbean Potential 39 TCFG and 1400 MMBO
- [http://www.aapg.org/explorer/2012/09sep/w\\_conventional0912.cfm](http://www.aapg.org/explorer/2012/09sep/w_conventional0912.cfm)

“An Estimate of Undiscovered Conventional Oil and Gas Resources of the World, 2012,” is a new report that is part of the USGS World Petroleum Resources Project. The agency estimated mean volumes of 565 billion barrels of undiscovered conventional oil, 5,606 trillion cubic feet of undiscovered conventional natural gas and 166,668 million barrels of natural gas liquids in 171 priority geologic provinces of the world – exclusive of the United States. The fact sheet released for the 2012 undiscovered conventional resources study noted that approximately 75 percent of the undiscovered conventional oil in the world occurs in four regions:

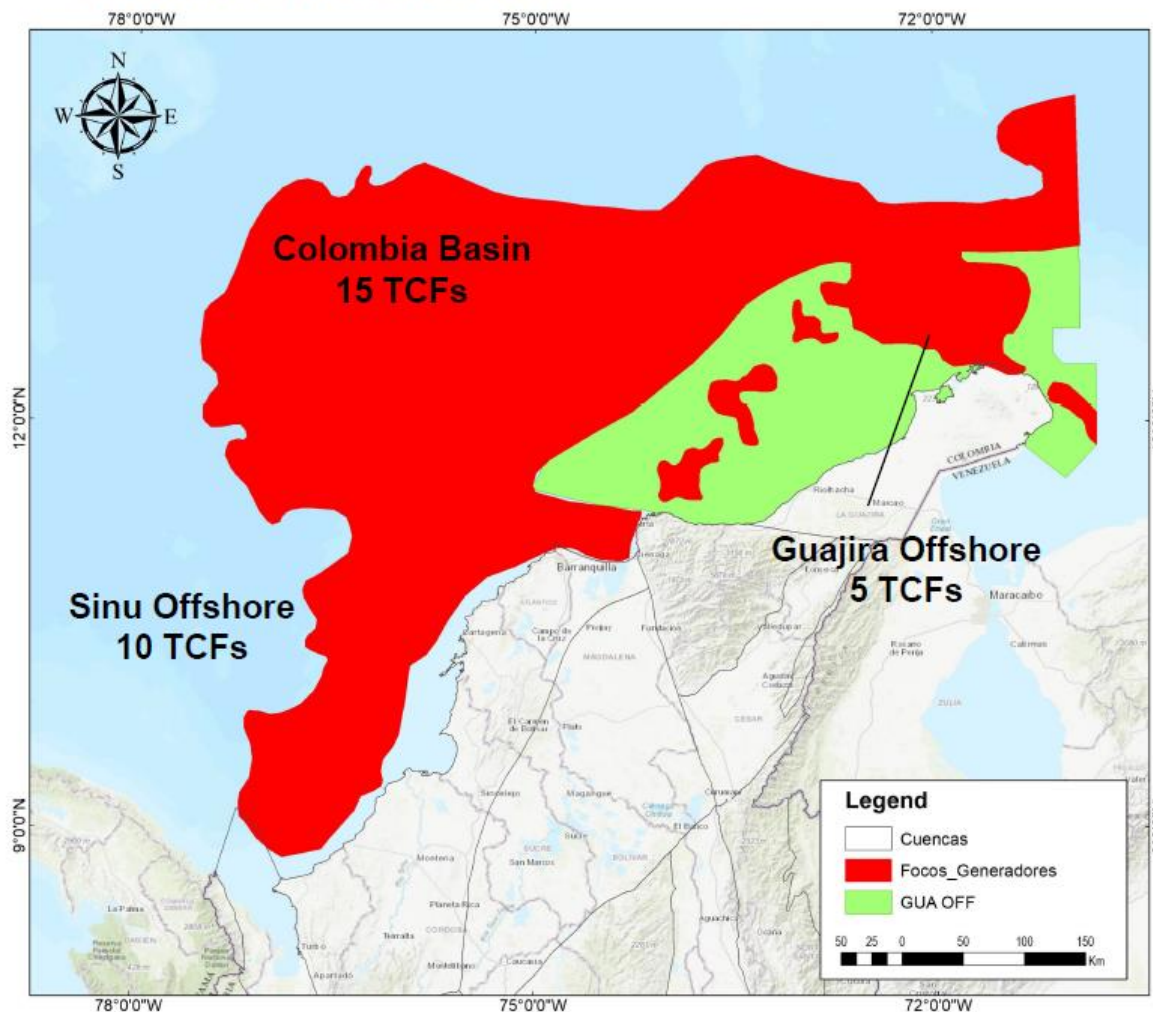
**South America and the Caribbean.**  
Sub-Saharan Africa.  
Middle East and North Africa.  
Arctic provinces of North America.



# CARIBBEAN BASIN POTENTIAL

## GAS OPPORTUNITIES CONVENTIONAL OFFSHORE CARIBBEAN BASINS

Yet to Find



### PROSPECTIVE RESOURCES

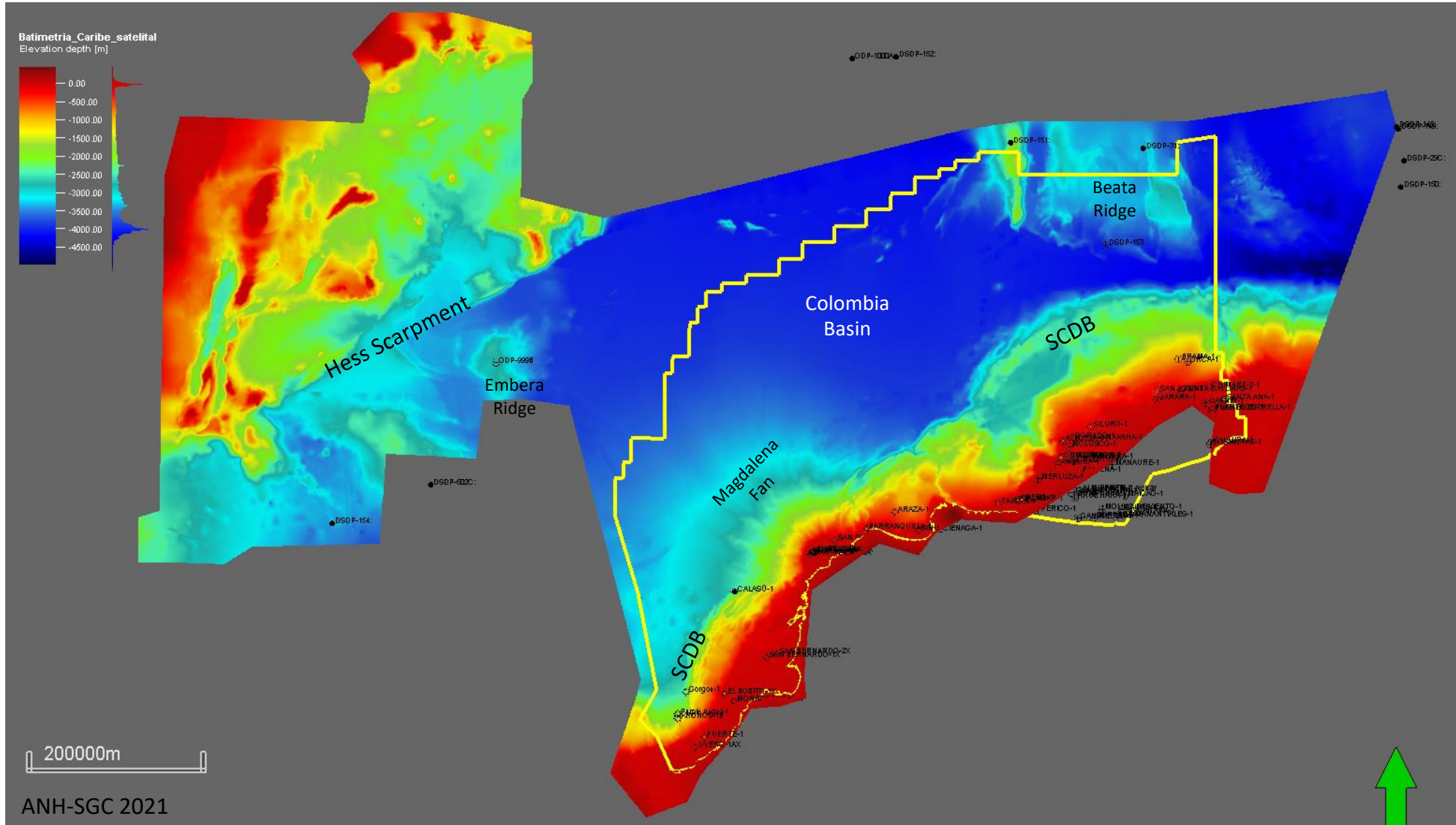
- COLOMBIA BASIN 15 TCFs
- SINU OFFSHORE 10 TCFs
- GUAJIRA OFFSHORE 5 TCFs

**TOTAL 30 TCFs**

# KNOWLEDGE REVIEW

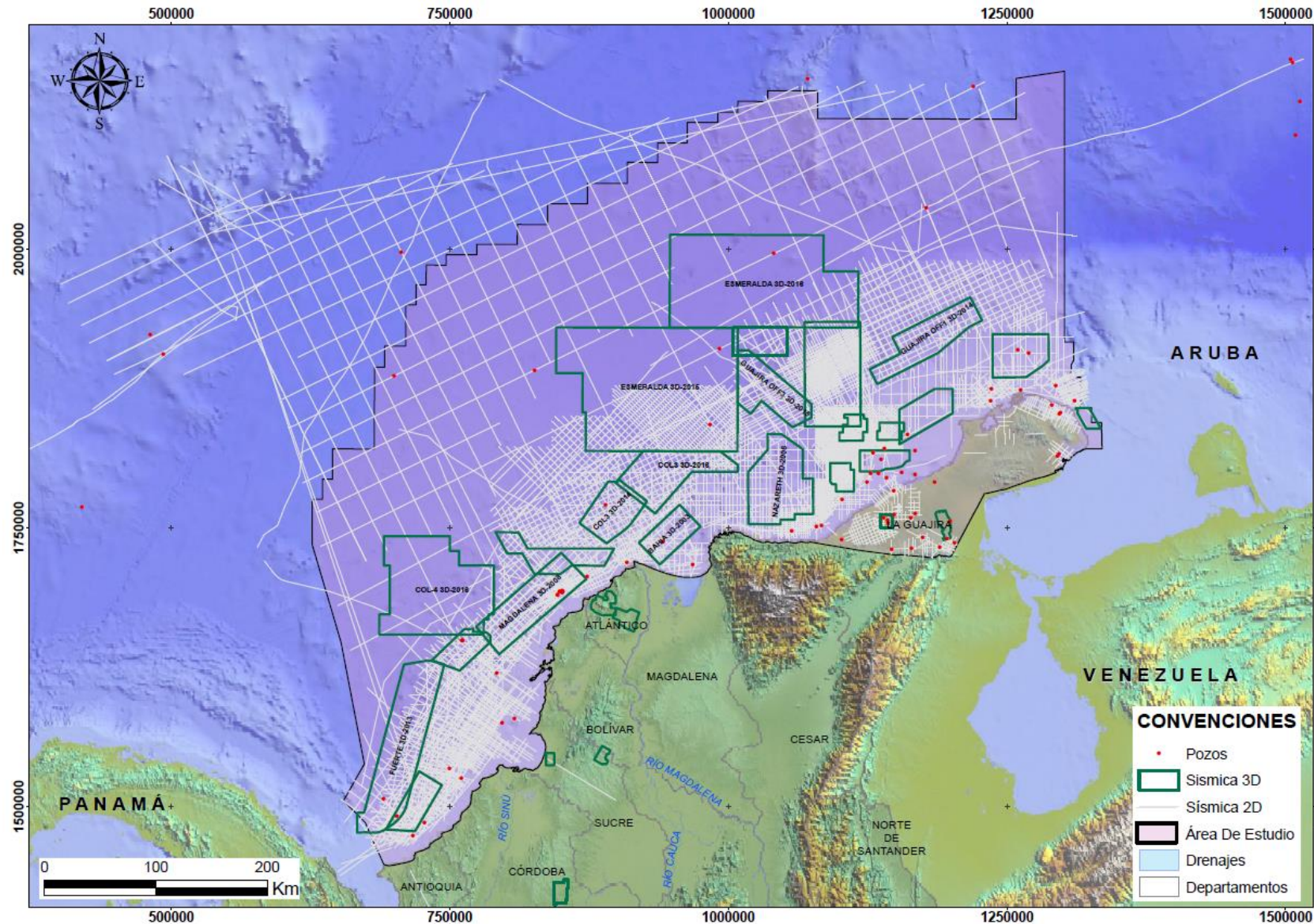


# REGIONAL FEATURES ON BATHYMETRY





# SUBSURFACE DATABASE



Basin area of more than  
250.000 km<sup>2</sup>

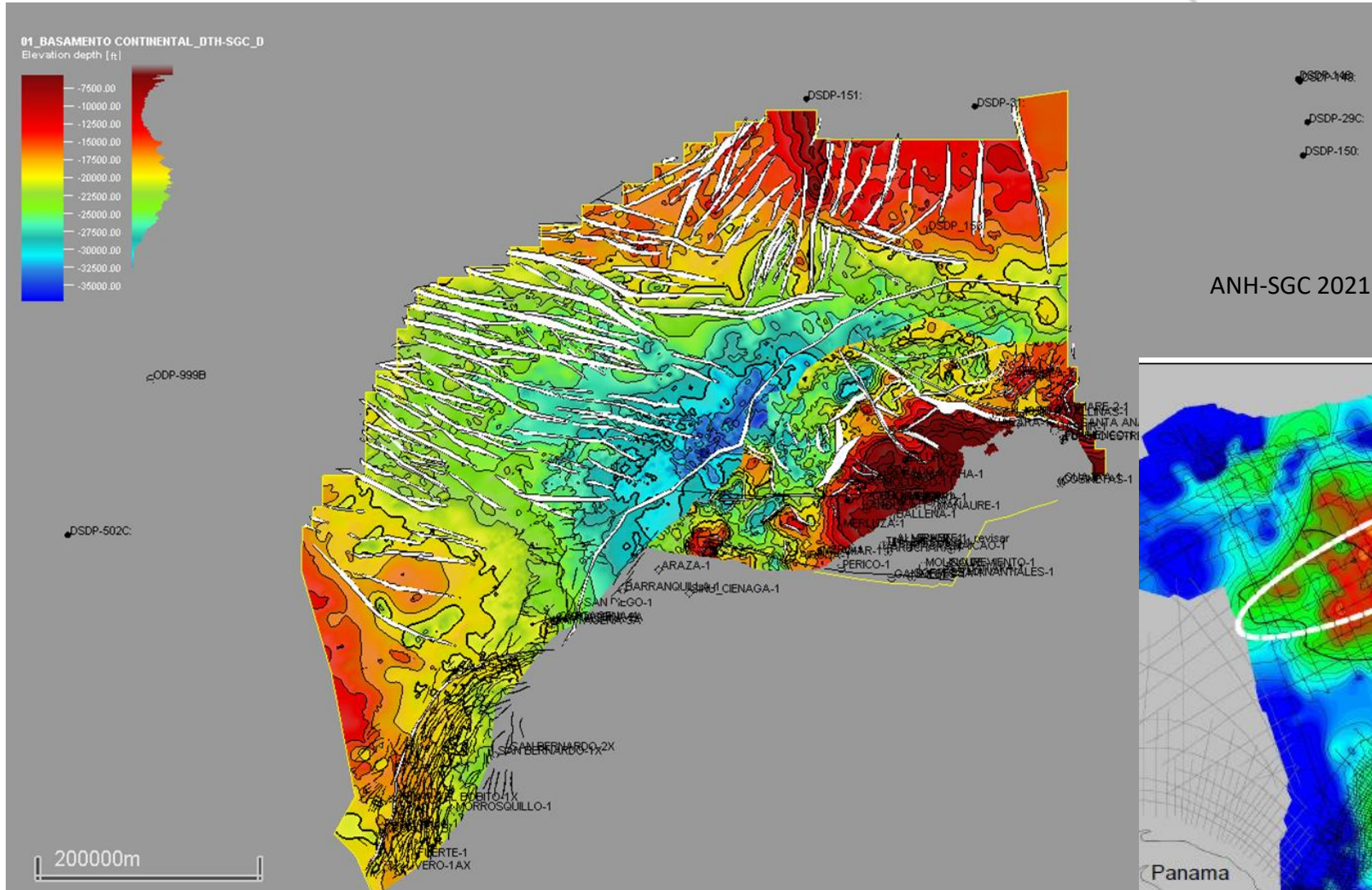
110.000 km of 2D  
seismics, some 10.000  
km<sup>2</sup> of 3D (out of more  
than 75.000 km<sup>2</sup>) and 66  
Wells.

1295 piston core  
locations

ANH-SGC 2022

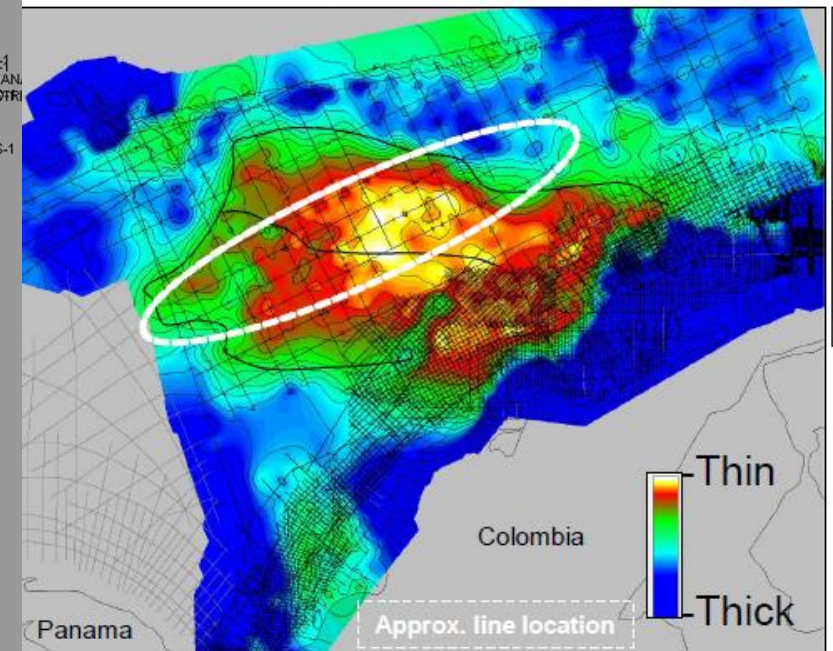


# BASEMENT STRUCTURAL MAP



Basement depth map.

Conspicuous W-E  
Structural trend.

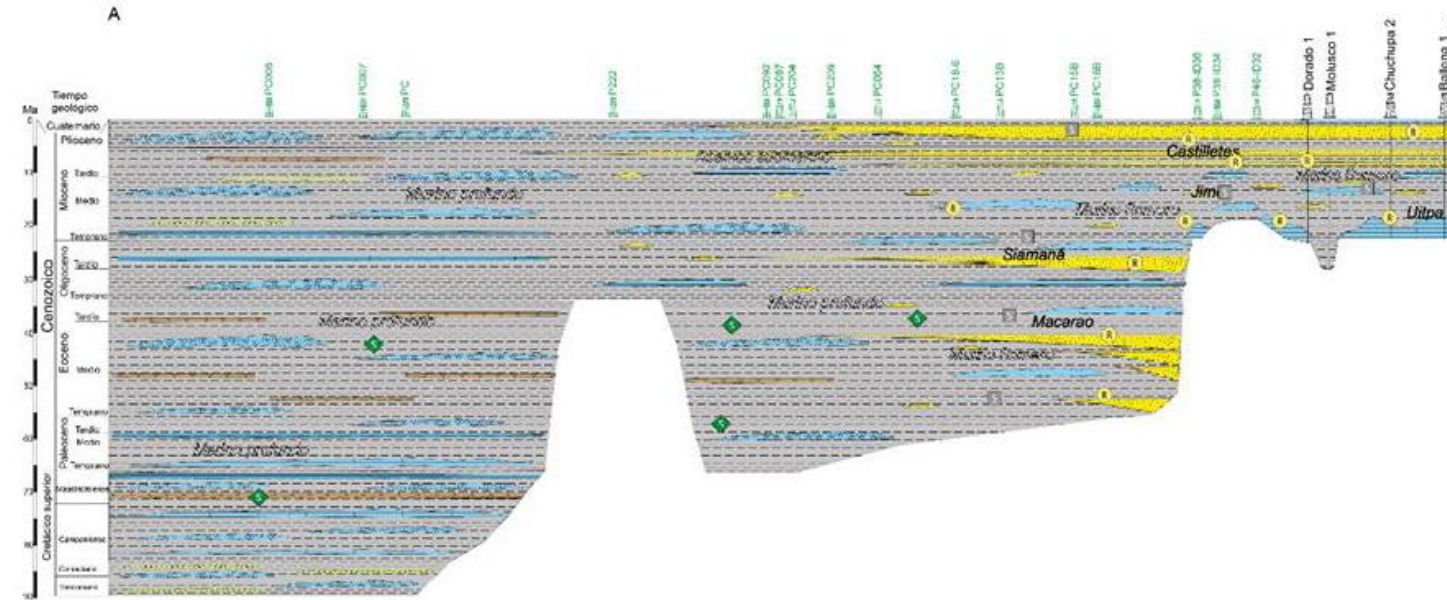


Reuber et al, 2022

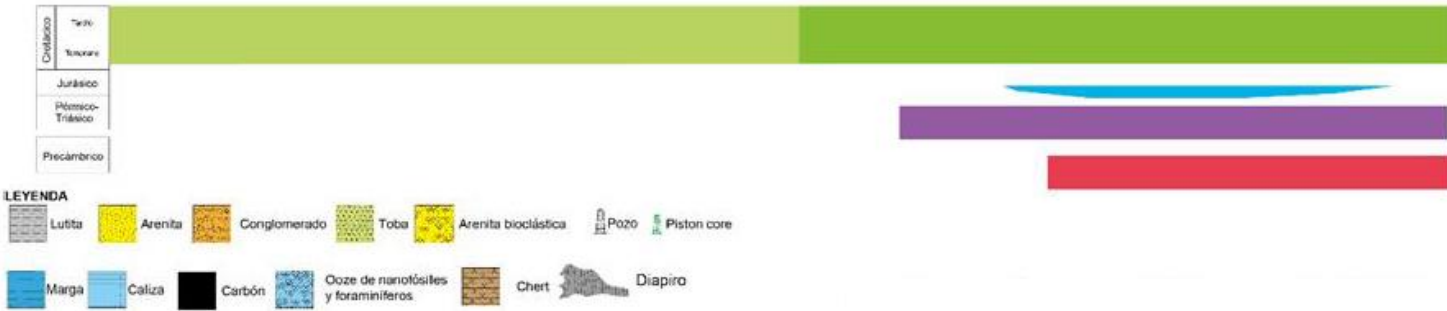




# CHRONOSTRATIGRAPHIC CHART



- Basamento Ocoánico: Incluyen fragmentos de la Gran Provincia ígnea del Cretácico Caribe-CLIP y un arco interoceánico que se originó como consecuencia de la subducción la placa proto-Caribe durante el Turoniano-Campaniano, Burke, 1988; Nivia, 1996, 2001; Kerr et al., 1996; Sinton et al., 1998; Villagómez et al., 2011; Zapata et al., 2017; Pardo-Trujillo et al., 2020.
- Rocas metamórficas de edad Cretácico superior (U/Pb 70Ma, Martínez et al; 2015) en los pozos Mero 1 y Tairona 1
- Magnetismo jurásico de la SNSM (165 a 195 Ma; Rodríguez et al., 2019), datación U/Pb en el pozo Merluza 1, Martínez et al; 2015)
- Rocas metamórficas del Permico y Triásico (e.g. 224 y 252 Ma; adatasiones U/Pb Siluro 1 y Jarara 1; Ramirez, 2005).
- Rocas metamórficas (esquistos y Gneisses de edad Precámbrico (Restrepo-Pazo, 1995; Rodríguez y Londoño, 2002; Maya, 2001), con edades mas nuevas asociadas a eventos tectonotermales (Alvarez, 1997; Cardona et al., 2006), Granitos de edad Precámbrico (Rotins, 1960; MacDonald, 1964; Lookwood, 1965).



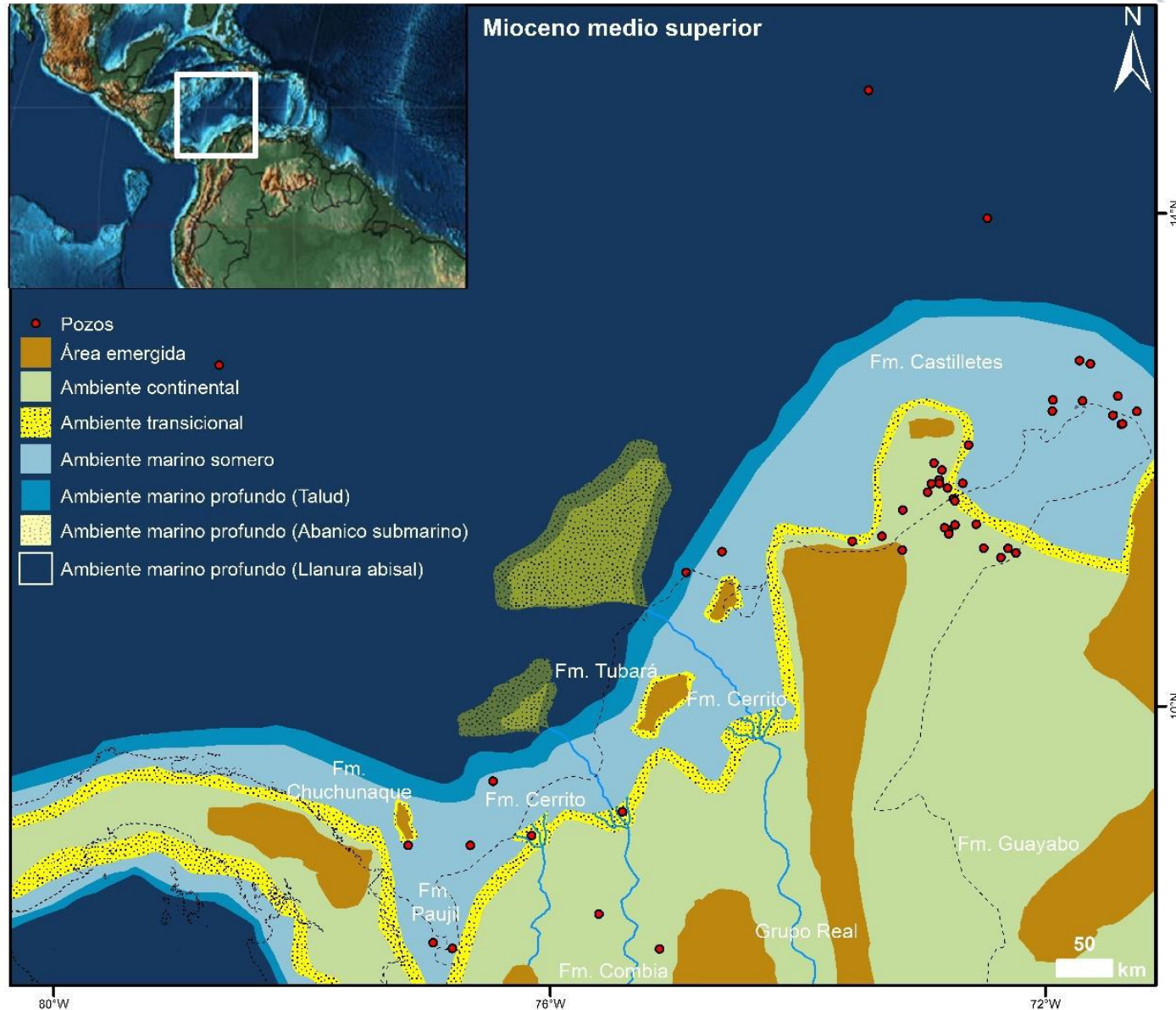
ANH-SGC 2022

Interpreted record of deposition during the Tertiary in the basin





# PALEOGEOGRAPHY

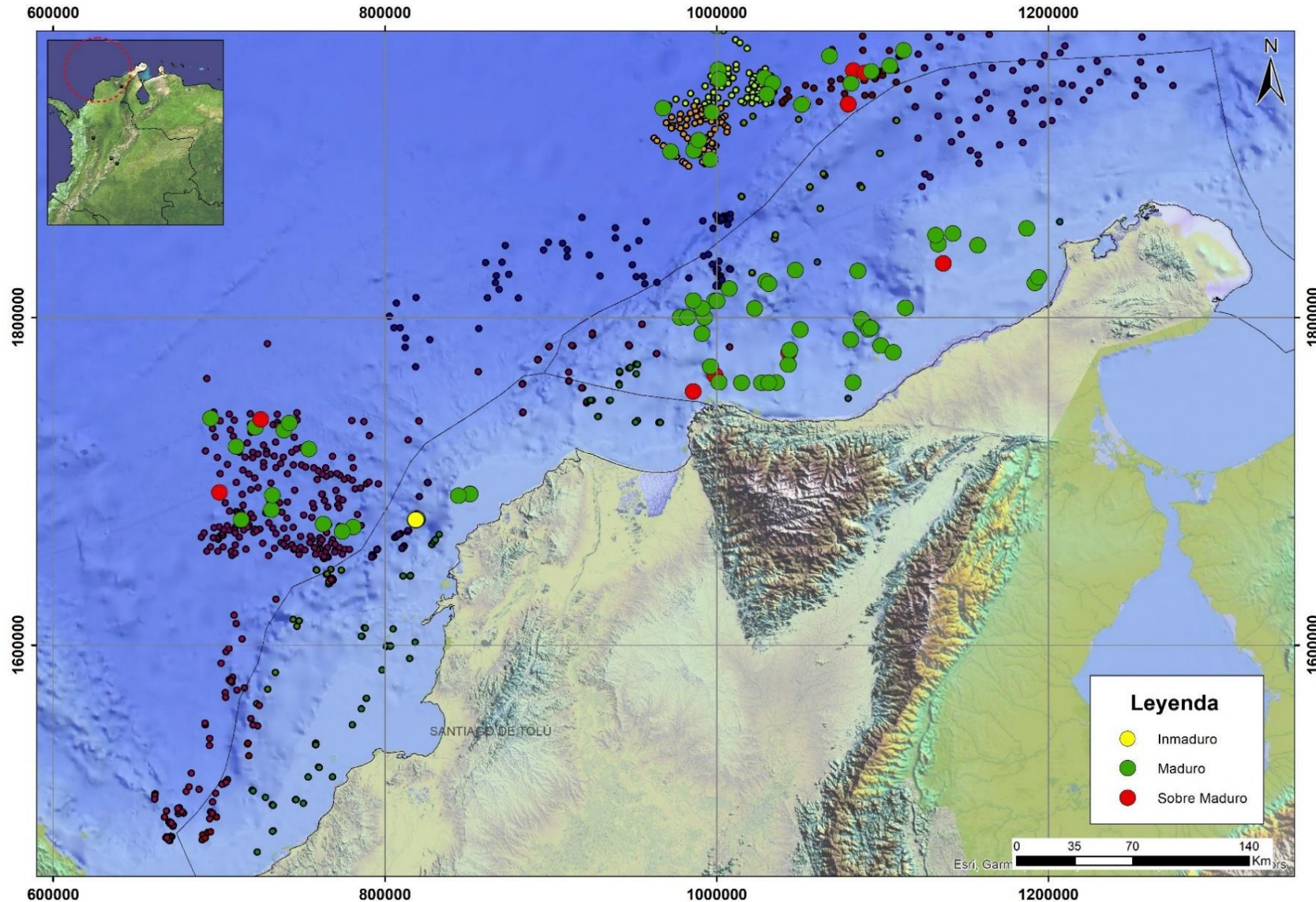


Upper Middle Miocene  
Regional paleogeography  
(ANH-SGC 2022)



# PETROLEUM SYSTEMS UPDATE

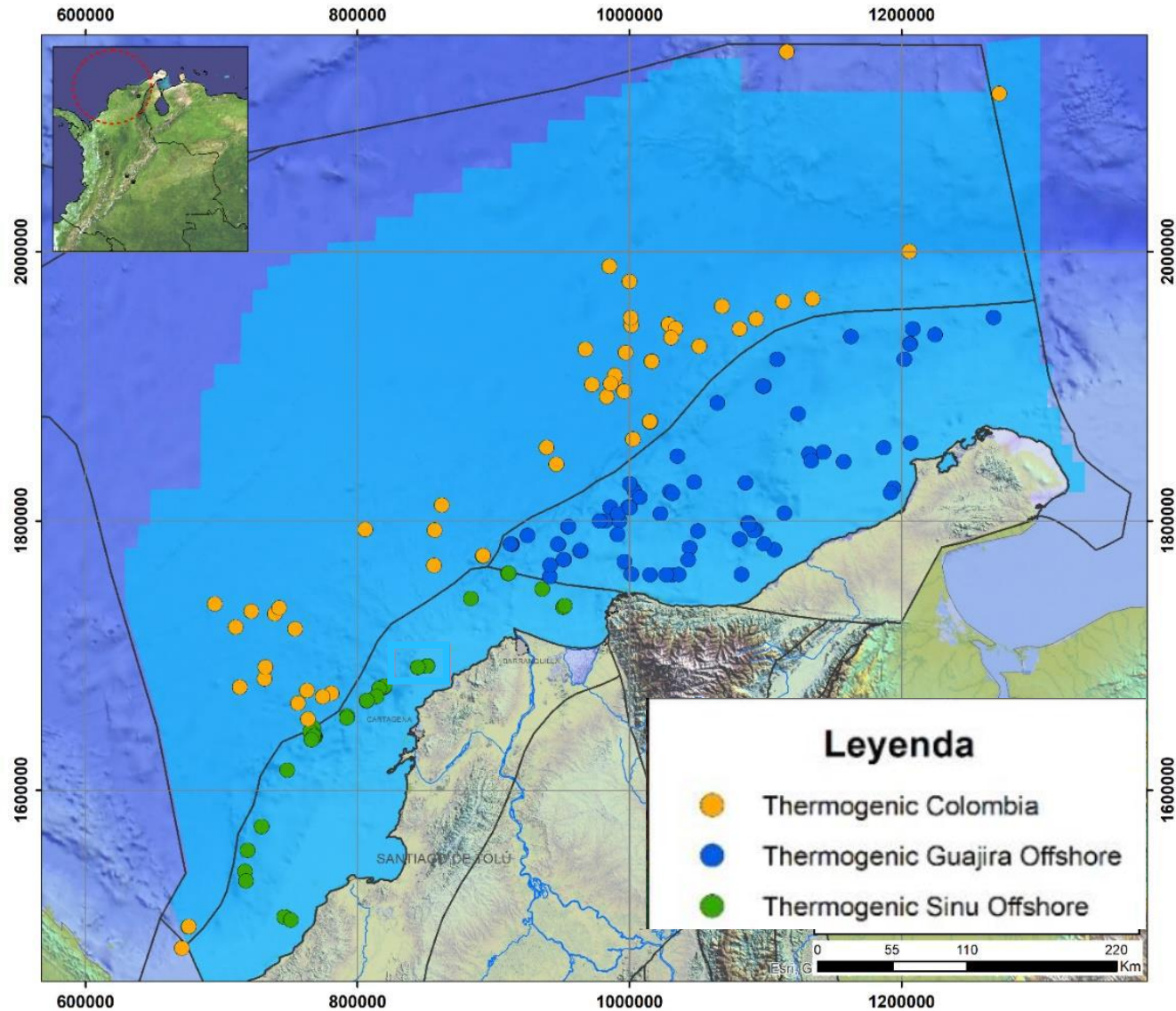
# HYDROCARBON EVIDENCES



Maturity level interpreted on piston core locations from biomarkers analyses.

ANH-SGC, 2022

# HYDROCARBON EVIDENCES

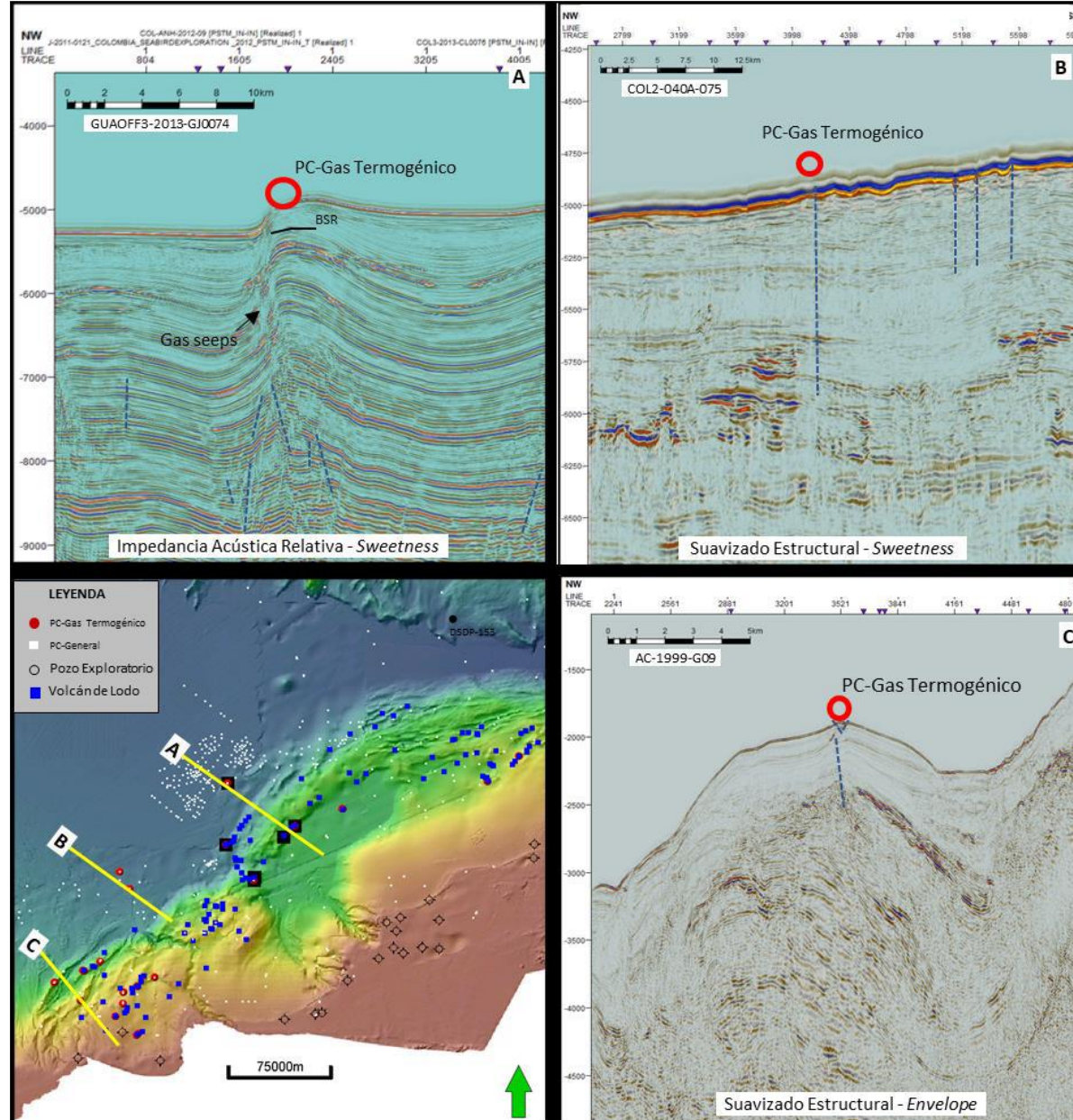


Record of thermogenic processes from diamondoid evidences on piston core samples.

ANH, SGC, 2022

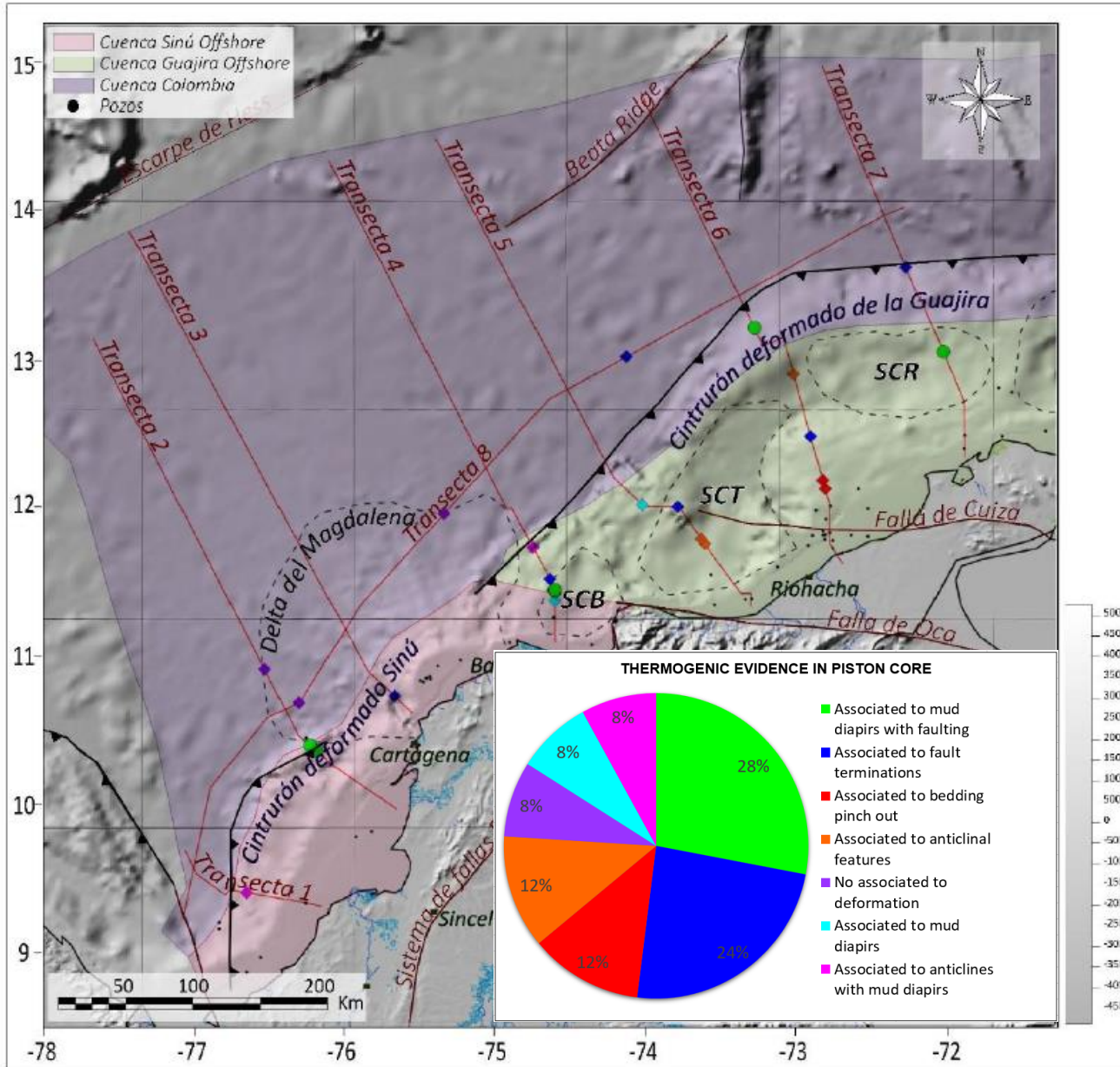


# HYDROCARBON EVIDENCES



Sea bottom and subsurface deformation features likely associated to fluid migration. Some with hydrocarbons recorded in piston cores.

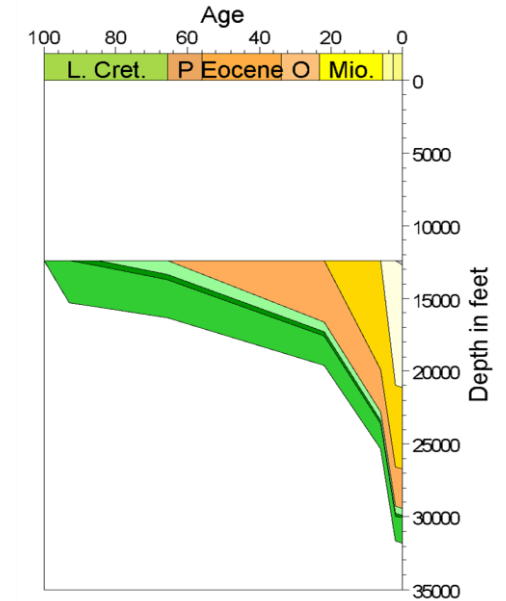
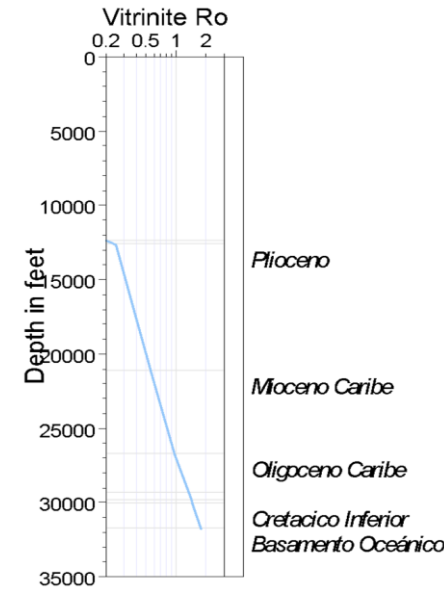
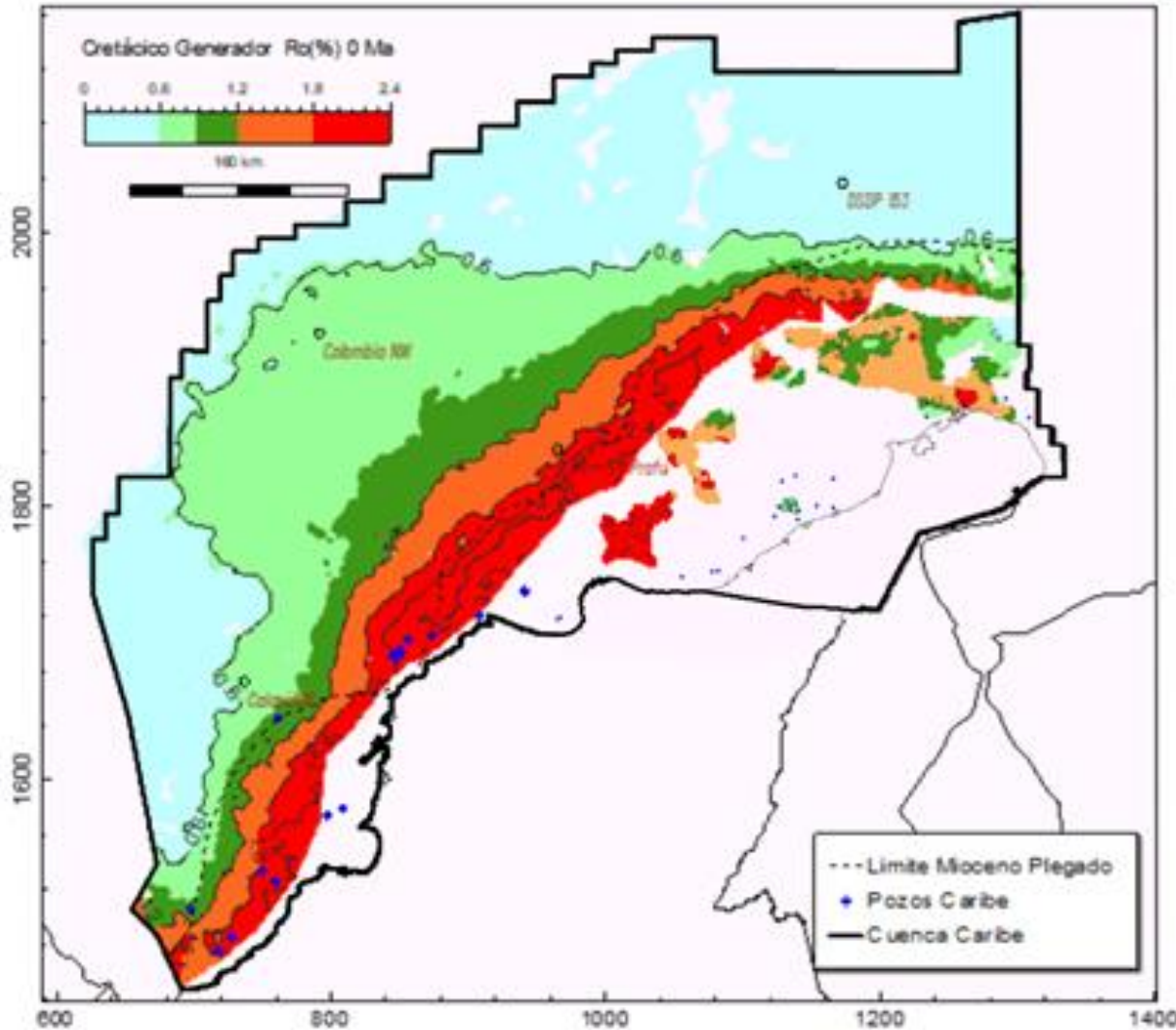
# HYDROCARBON EVIDENCES



Relationship of thermogenic evidences from piston cores with subsurface features.



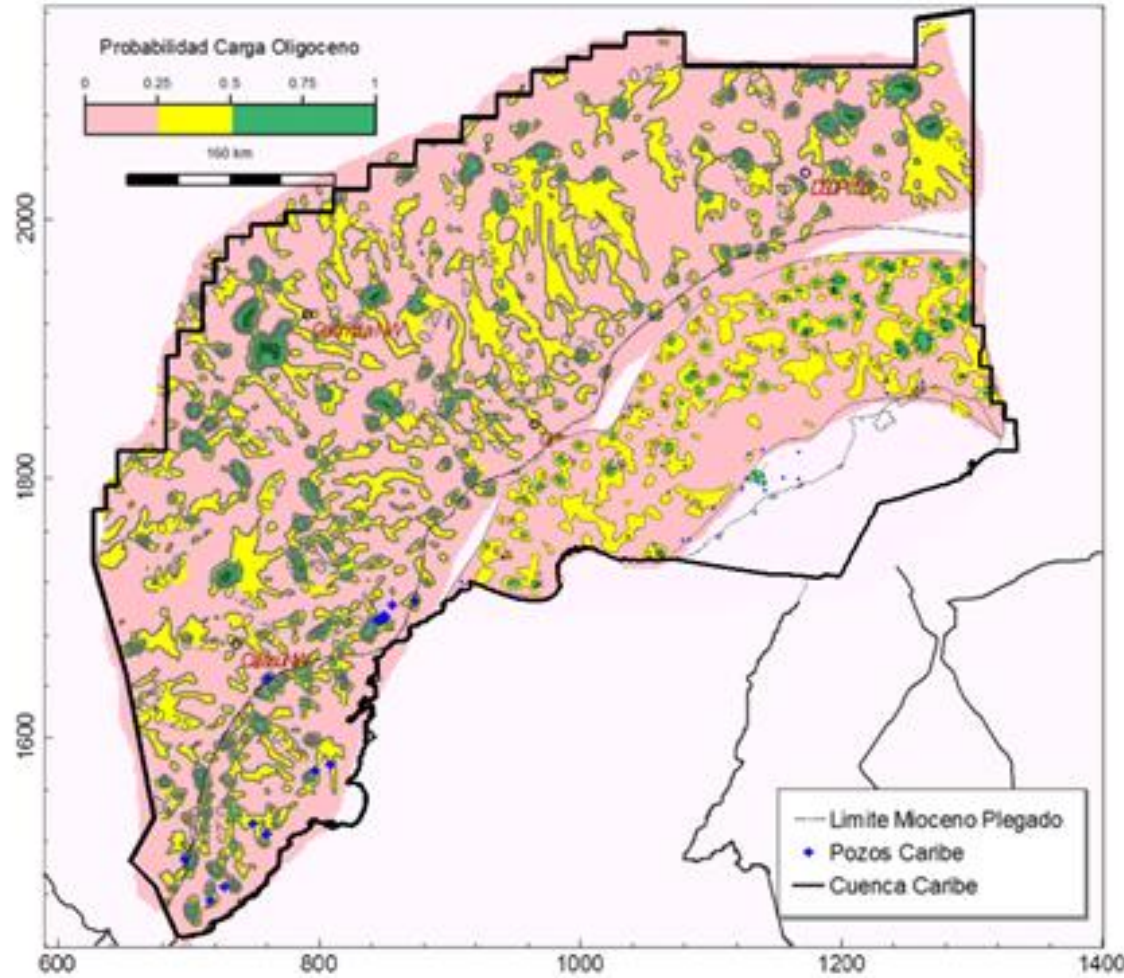
# CRETACEOUS MATURITY MODEL



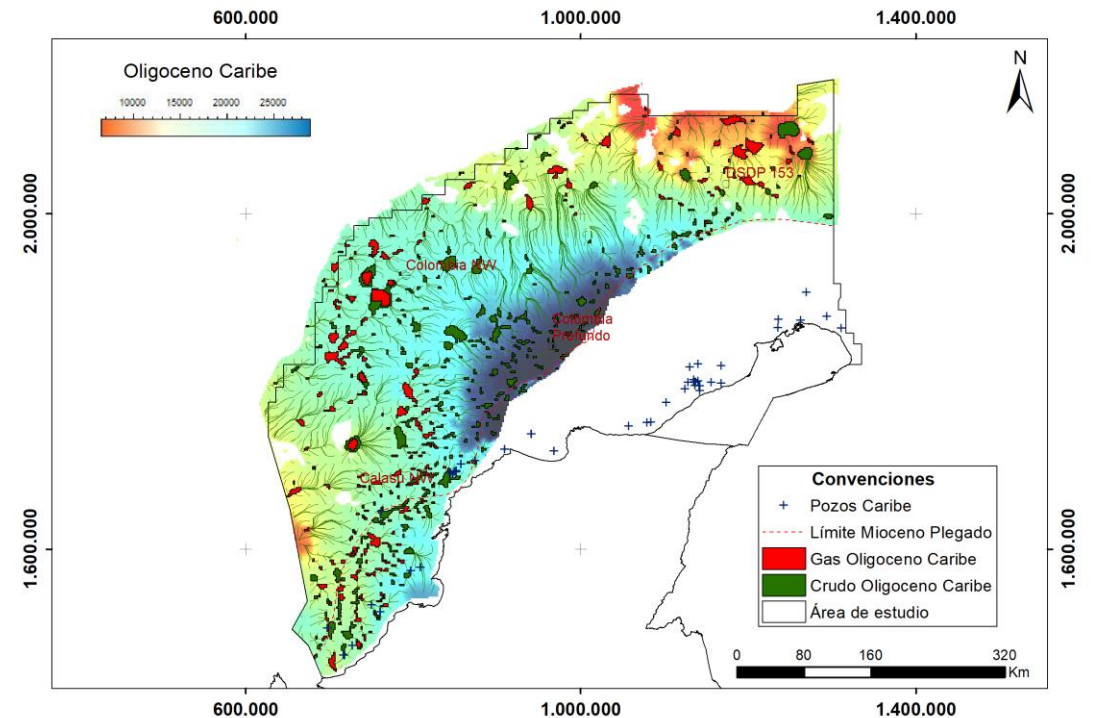
Model input from integrated structural map, 1D model in pseudowells.  
Thickness and SR quality from ODP and DSDP wells



# OLIGOCENE CHARGE MODEL



Short and long distance migration patterns identified.

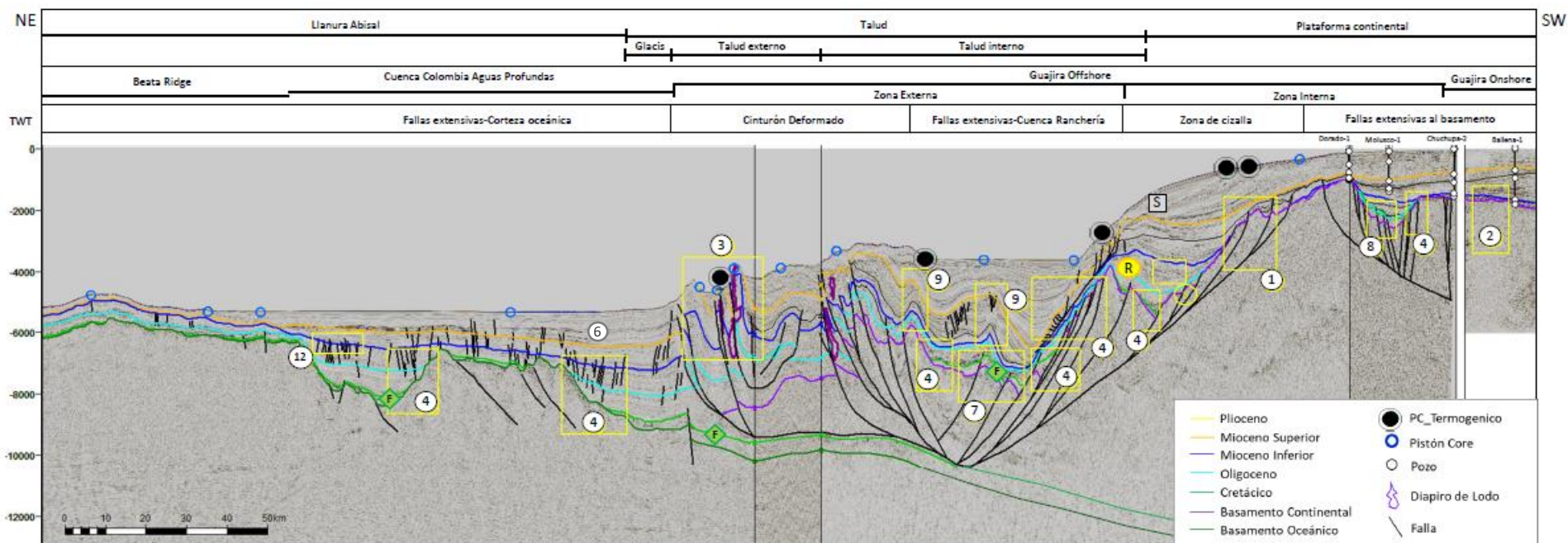


Regionally, more oil vs gas occurrences are predicted by the model.

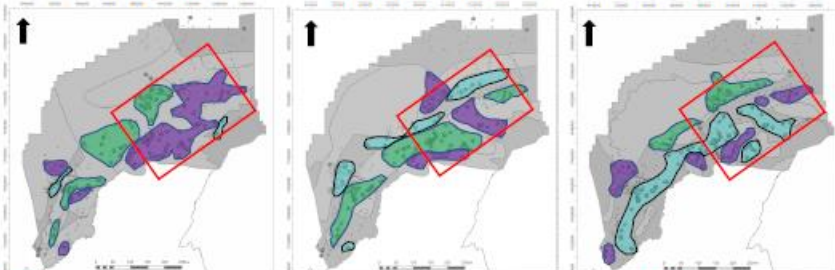
# PLAY CONCEPTS IDENTIFIED IN THE CARIBBEAN OFFSHORE OF COLOMBIA



# PLAYS REGIONAL OVERVIEW



CORREDOR EXPLORATORIO MIOCENO    CORREDOR EXPLORATORIO OLIGOCENO    CORREDOR EXPLORATORIO CRETÁCICO

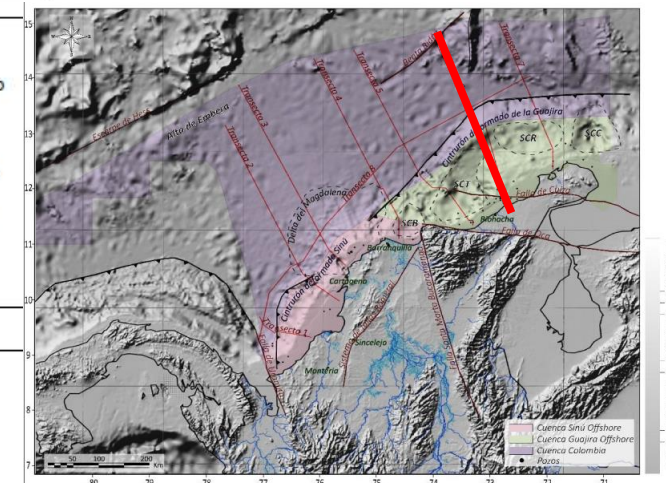


■ Tipo A - Presencia de procesos termogénicos con alta probabilidad del desarrollo del play  
■ Tipo B - Presencia de procesos termogénicos con probabilidad media del desarrollo del play  
■ Tipo C - Presencia de procesos termogénicos con probabilidad baja del desarrollo del play  
   Zona de interés  
● Pistón Core Termogénico  
● Pistón Core

## PLAYS IDENTIFICADOS EN EL CARIBE

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>① Areniscas en altos de basamento</li> <li>② Carbonatos en altos de basamento</li> <li>③ Cinturón plegado</li> <li>④ Truncación contra altos de basamento</li> <li>⑤ Complejos de canales del Mioceno medio a Plioceno</li> <li>⑥ Delta del Magdalena distal</li> </ul> | <ul style="list-style-type: none"> <li>⑦ Mesozoico con potencial generador</li> <li>⑧ Cierres en estructuras en flor por fallamiento de rumbo</li> <li>⑨ Anticlinales por compactación diferencial</li> <li>⑩ Reservorios en progradaciones del Neógeno</li> <li>⑪ Estructuras asociadas a diapirismo de lodo</li> <li>⑫ Complejos de transporte en masa</li> <li>⑬ Cierres asociados a fallamiento listrico</li> </ul> |
|--|---|

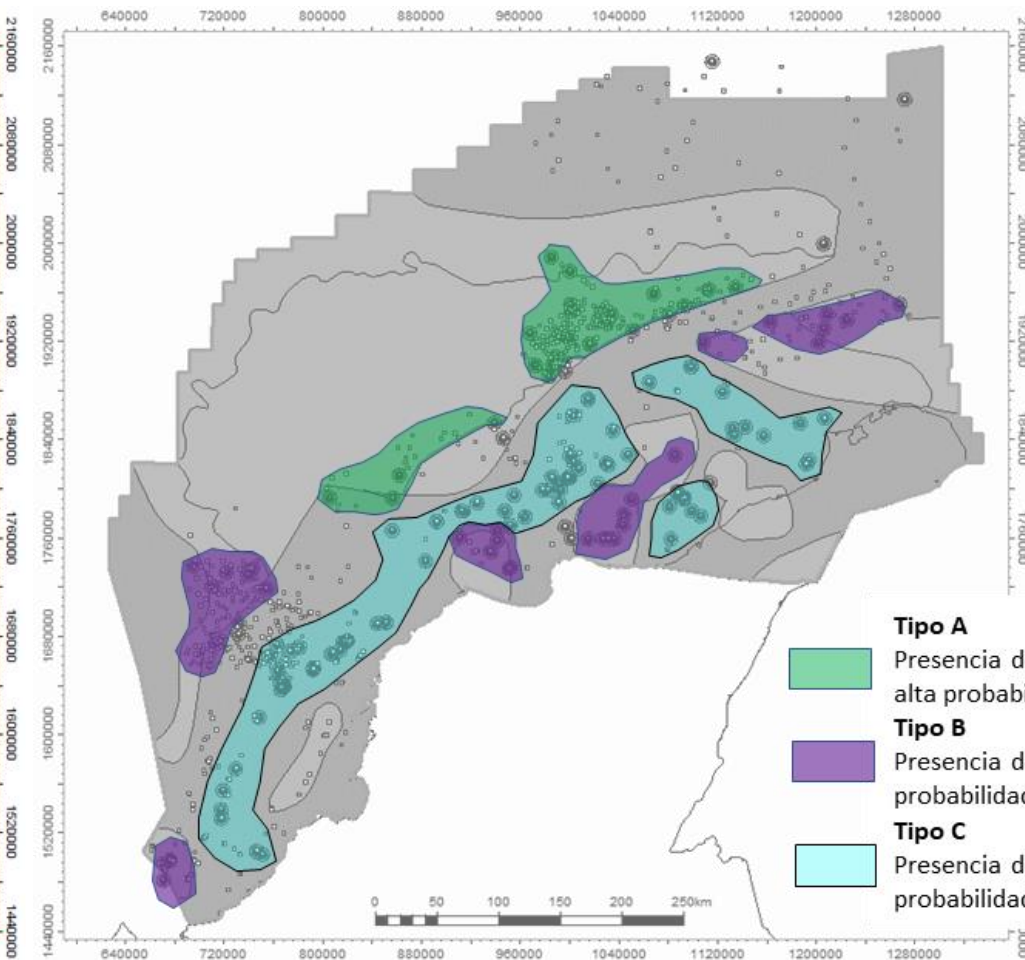
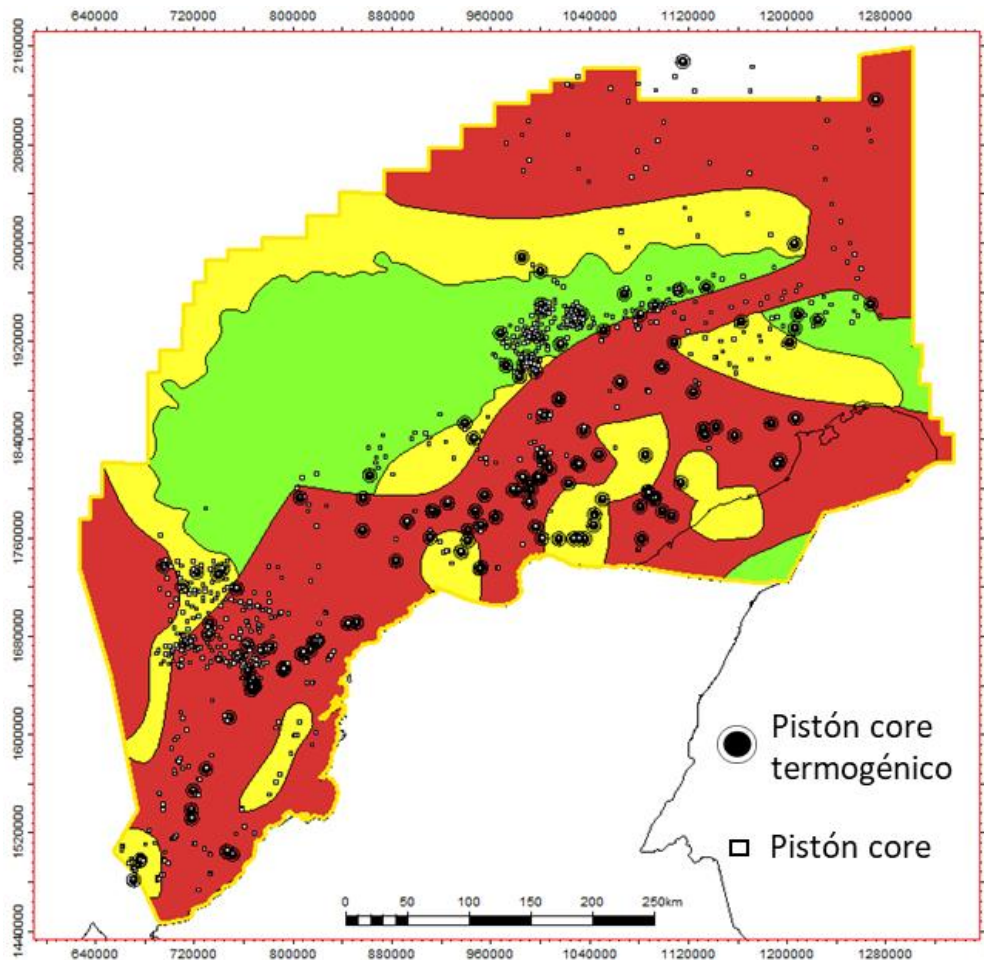
◆ Roca Fuente    ● Roca Reservorio       Roca Sello



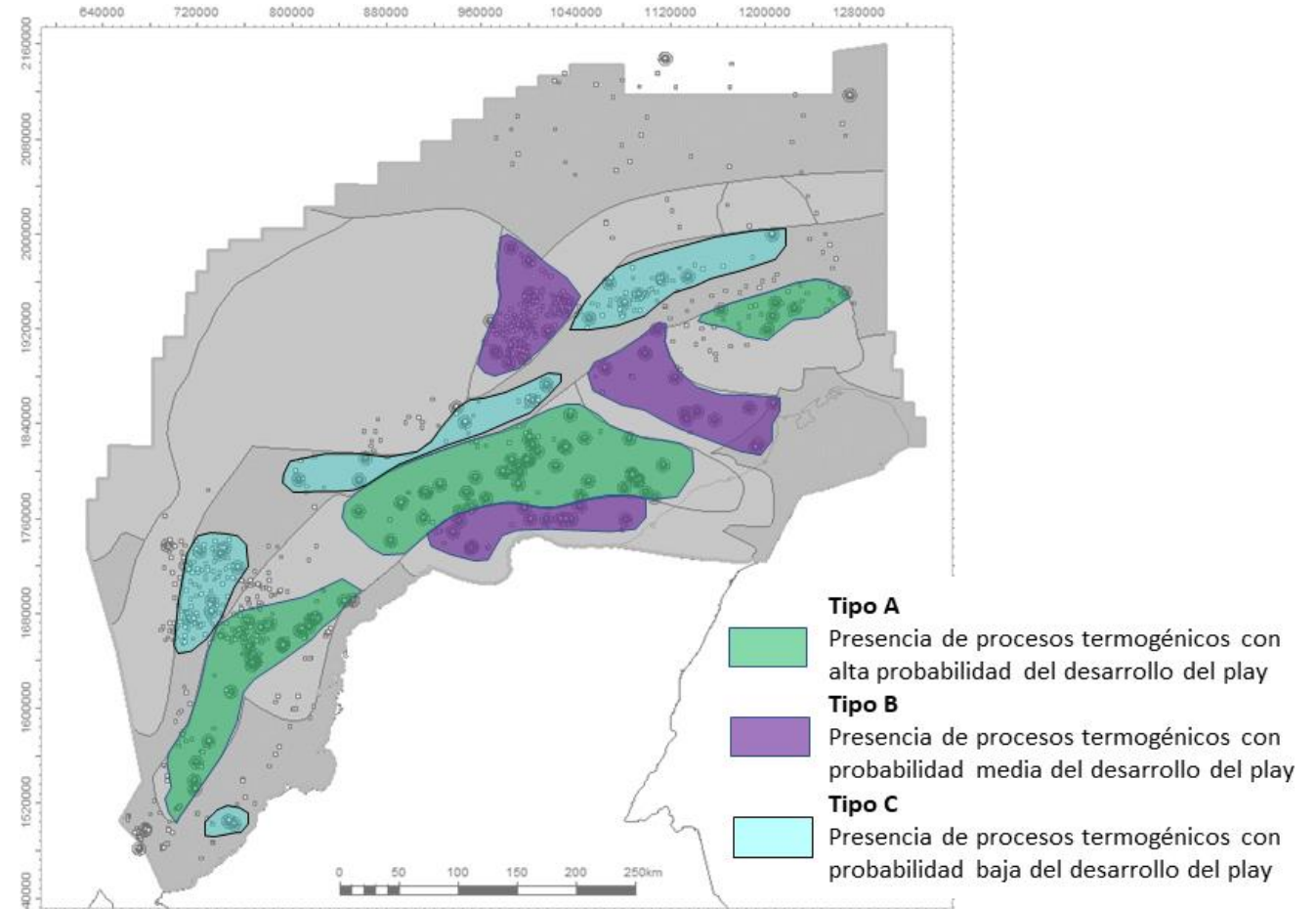
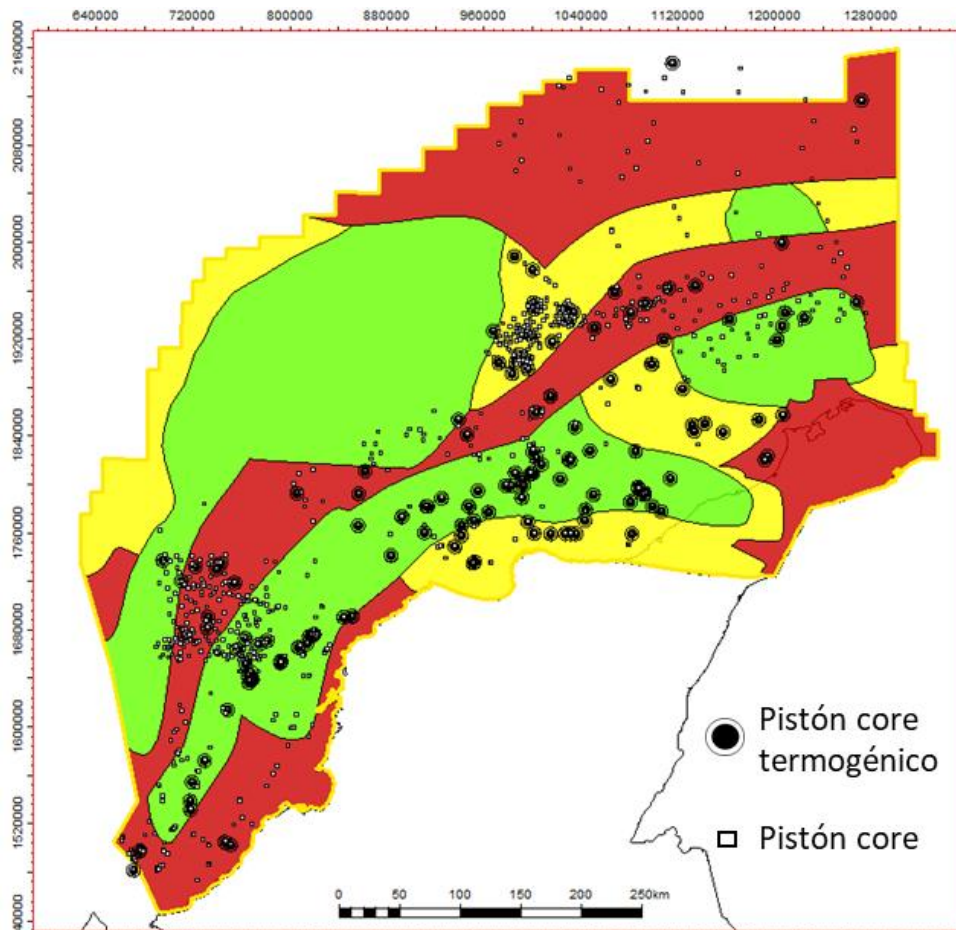
# CARIBBEAN PLAY FAIRWAY MAPS



# CRETACEOUS PLAY FAIRWAY MAP

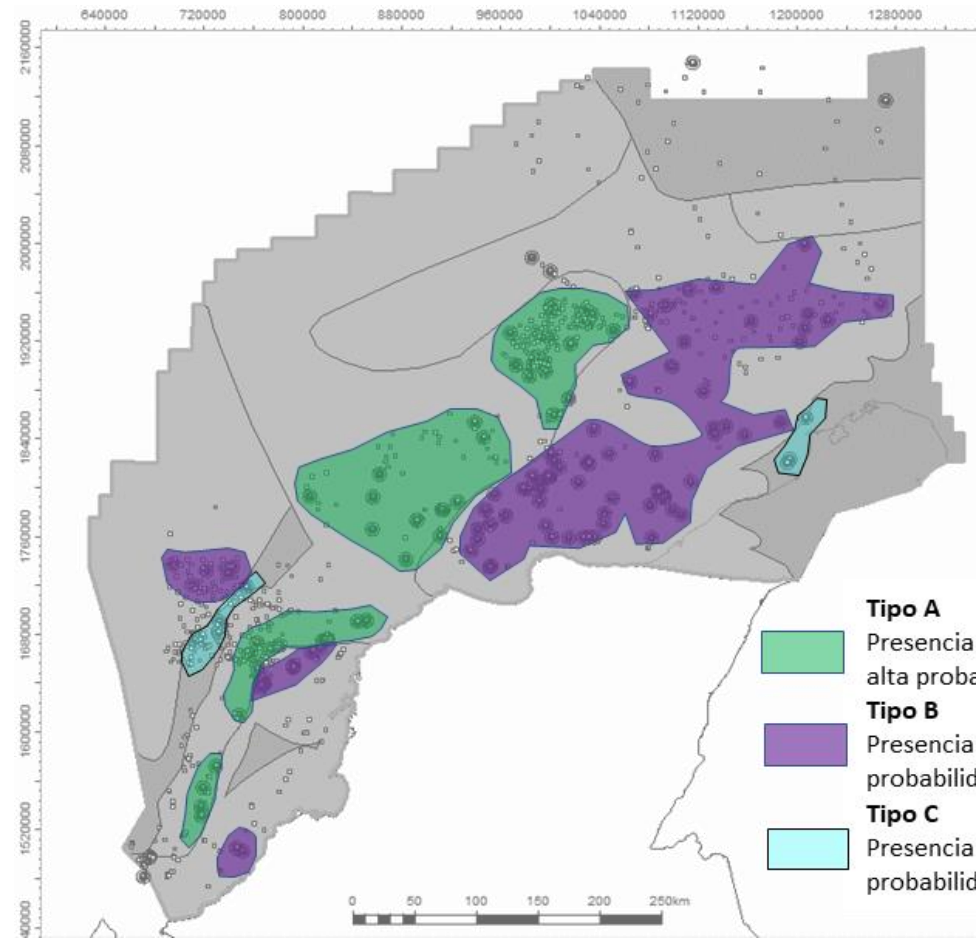
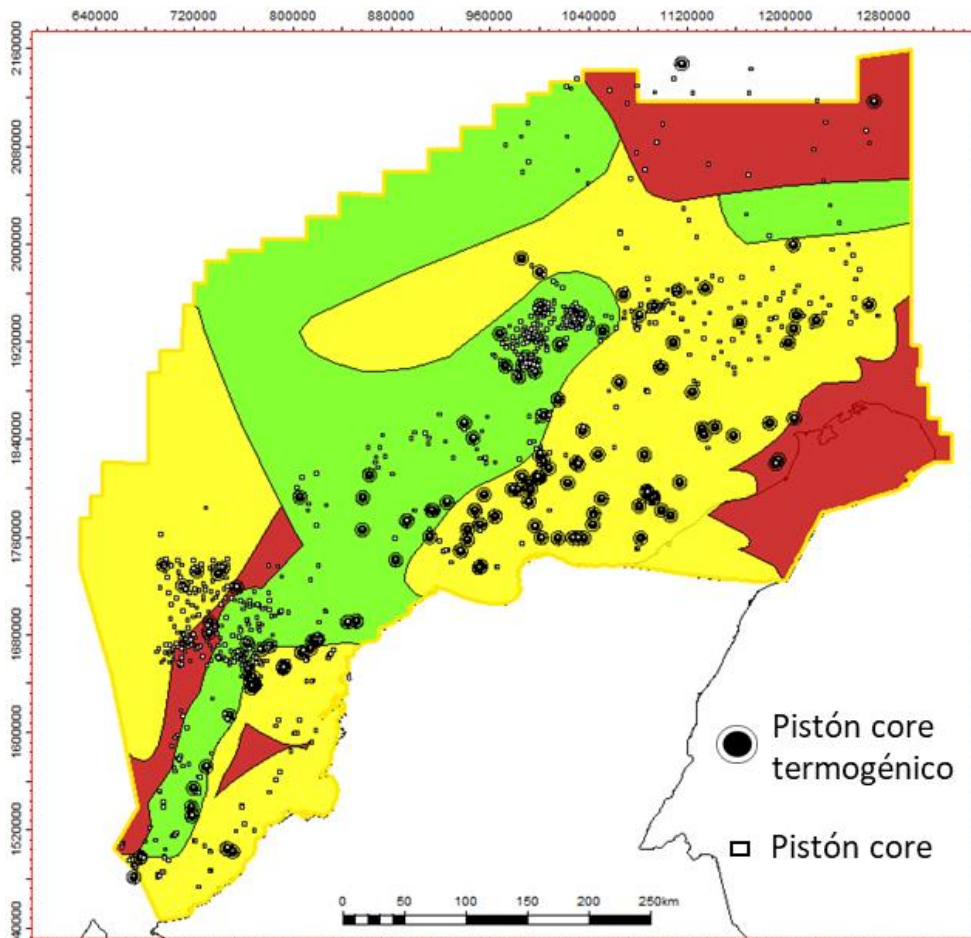


# OLIGOCENE – LOWER MIOCENE PLAY FAIRWAY MAP





# LATE MIOCENE-LOWER PLIOCENE PLAY FAIRWAY MAP



# MAIN CONCLUSIONS

# MAIN CONCLUSIONS

Caribbean Offshore basin of Colombia, with an extension of more than 250.000 km<sup>2</sup> and considered a frontier province in northern South America, is becoming an exploratory emerging region. Encouraging results from seismics, piston coring, and drilling campaigns in the last decade indicate the presence of working petroleum systems, with a hydrocarbon potential in the level of 35 to 87 TCFG, and fair to good chances of finding liquid hydrocarbons.

Two recent successful drilling operations (Uchuva -1 and Gorgón 2 ) add economic interest and valuable information on petroleum system elements in different provinces in the Caribbean.

Current knowledge of the basin implies that petroleum systems should be considered effective, and several play types have been identified, with local and regional distribution. Stratigraphic character and thermogenic potential deserve further studies with 3D seismics and modern geochemical analyses.

Ongoing projects by Dirección Técnica de Hidrocarburos –SGC- and Agencia Nacional de Hidrocarburos , such as Plays Characterization and Updated Regional Petroleum Systems Modeling, are aiming to produce quantitative results, expected to be in the level of tens of BBOE and TCFG, to constrain Yet to Find scenarios and Basin Potential Estimates, and to further discriminate between oil prone and gas prone prospectivity.

Proven gas potential in this extensive underexplored province, represents a key element to support the energy transition in Colombia, with a great opportunity of meeting the country's energy demand with our own resources.



# AREAS ADVERTISEMENT 2022

# Questions?

**VICTOR RAMIREZ, [vito\\_ramirez@yahoo.com](mailto:vito_ramirez@yahoo.com)**