

Caribbean Basins, Tectonics, and Hydrocarbons Phase III

Principal Investigators:
Paul Mann, University of Houston, USA & Alejandro Escalona, University of Stavanger, Norway
<http://cbth.uh.edu>

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Contacts:

Dr. Paul Mann
pmann@uh.edu

Dr. Alejandro Escalona
alejandro.escalona@uis.no

cbthproject@gmail.com

Edited by:
Jeff Storms
jeffstormswork@gmail.com

Mailing Address:
312 Science and Research Bldg. 1
Houston, TX 77204
(712) 893-1731

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What's New

As the New Year begins, the Caribbean Basins, Tectonics, and Hydrocarbons (CBTH) Project has been keeping busy both at our new location at the UH and at the UiS in Norway.

CBTH subsurface imaging and interpretation lab is now complete at the University of Houston

Over the past few months, we've been working to complete our new, 2000-square-foot computer lab and are proud to announce that the construction and setup is finished! The lab on the fourth floor of the geology and physics building on the main UH campus includes 12 fully-equipped graduate student workstations, a conference area, three private offices, and a full-service printing and scanning area, and teleconferencing facility. The group also has licenses to most major interpretation softwares used for hydrocarbon research including Petrel, Kingdom, Landmark, ArcGIS, MOVE, PaleoGIS, Fledermaus, and Montaj.



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What's New

CBTH subsurface imaging and interpretation lab

We greatly appreciate the efforts and financial support of UH in getting our lab completed along with the efforts of Connie Johnson and Christie Gell at Landmark for finalizing the new UH Landmark agreement. Our lab design is similar to the one established by Alejandro Escalona at Stavanger with financial support by UiS and Statoil, a longtime CBTH sponsor. Graduate students in the new UH facility occupy a large, common work area as opposed to smaller and separated offices used by students during Phases I and II. The larger work area facilitates more interactions including instant sharing of what is on their computer screens via a link to a projector mounted on the ceiling. Sponsors are welcome to drop by and visit the facility: room 427 in the Science & Research 1 Building on the main UH campus.

New CBTH server and database

With funds provided by UH we have established a new 8 TB server in the main UH computer room that is dedicated to the CBTH database that currently occupies a volume of 3.5 TB. We appreciate the efforts of Jay Krishnan, IT manager at UH for his efforts in getting the new server online.

UH and UiS exploring opportunities for exchange of academic and research activities in the geosciences program

High level UH officials including Dr. Jack Casey of the Department of Earth and Atmospheric Sciences will travel to the UiS in Norway to discuss an exchange program for faculty and graduate and undergraduate students studying geology and geophysics at both universities. Stavanger is the oil center of Norway with offices of most major oil companies and is a sister city of Houston. Most of the teaching in geosciences, including all graduate level courses, at Stavanger are conducted in English, making it a convenient place for US students without Norwegian language skills to study abroad.

Personnel working on CBTH-supported projects at UH and UiS

The University of Houston (UH)

1. Paul Mann (Principal Investigator)
2. Jeff Storms (Project Manager)
3. Murad Hassan (New Hire - GIS Specialist)
4. Tricia Alvarez (at UT; PhD, Trinidad)
5. Rocio Bernal (PhD, Lower Magdalena, Colombia)
6. Javier Sanchez (PhD, Cesar-Rancheria, Colombia)
7. Luis Pachon Parra (MS, Putumayo, Colombia)
8. Lucia Torrado (MS, N. Llanos, Colombia)
9. Kyle Reuber (MS, N. Brazil)
10. Zach Wolfe (MS, eastern Mexico)
11. Bryan Ott (MS, Jamaica)
12. Alex Dale (MS, Bahamas)

The University of Stavanger (UiS)

1. Alejandro Escalona (Principal Investigator)
2. Lisa Bingham (Project Manager)
3. Brendan Figueira (MS, Eastern Venezuela Basin)
4. Catalina Moreno (MS, S. Llanos, Colombia)
5. Luisa Campiño (MS, Pacific margin, Colombia)

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What's New

Javier Sanchez wins Midland Valley's Post-Graduate Student Structural Prize

In late January, Javier Sanchez, a first-year PhD student at UH currently supported by the CBTH project, was awarded first place in the Post-Graduate category of Midland Valley's 2012 Student Structural Prize. The title of his submission which was based on his master's thesis supervised by Dr. Brian Horton at the University of Texas was: Integration of structural reconstructions and thermochronologic data of the eastern margin of the Middle Magdalena Valley basin, northern Andes, Colombia. Congratulations to Javier for winning this international competition! He is currently using Midland's MOVE software for creating a series of restored transects through northwestern South America based on surface and subsurface data that he will present as his poster at the AAPG meeting in Long Beach, California in April 2012. A summary of his master's work is now in press for the journal Tectonics.



Targeted internship program gains momentum with CBTH students and sponsors

The average time in school is two years for MS students and five years for PhD students. At both UH and UH, MS students are expected to produce

one publishable paper while PhD students are expected to produce three papers. For this reason, using time effectively becomes a major challenge for students who typically spend their first year taking courses. In 2010 and 2011, we arranged "targeted internships" with some of our sponsors, where both MS and PhD students worked on summer internships that were directly related to their MS or PhD research. These internships allowed them to make steady progress over the summer months and was beneficial to the sponsor interested in their topic of research.

Targeted internships in summer 2010:

Shell: Henry Campos, Subsurface geology and flexural modeling, northern Llanos basin; completed MS thesis, August, 2011, now explorationist with Shell Colombia group, Houston, Texas

Shell: Anthony Rodriguez, Subsurface geology, Mexican sector of the Gulf of Mexico, completed MS thesis, August, 2011, now explorationist with Chevron, Houston, Texas.

Targeted internships in summer 2011:

Repsol: Rocio Bernal, Subsurface geology, Lower Magdalena basin, Colombia; PhD in progress and to be completed 2014.

Targeted internships in summer 2012:

If you or your company are interested in participating in targeted internships with CBTH students on their respective study areas, please contact us to discuss the details

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New hire for GIS at UH: Murad Hassan

CBTH Houston would like to welcome a new staff member, Murad Hassan, who will be joining the project as a GIS specialist and project assistant in early March, where he will re-establish the CBTH Web Mapping Application (scheduled to be online by April 2012). This application provides a mapmaking tool for sponsors who have no previous knowledge of GIS. He will also assist Lisa Bingham in the Stavanger group with the organization and plotting of the next atlas release and develop the CBTH GIS database using modern technology, extensions, and equipment. He will also help restart our undergraduate research assistant program at UH that CBTH supported during Phases I and II at UT that produced several key workers for the current CBTH project (Jeff Storms, Bryan Ott).

Murad holds a Masters in Environmental & Water Resources Engineering from Norwich University in Northfield, Vermont, a Graduate Certificate in Geographic Information Systems (GIS) from the University of Houston, and a Bachelors of Science in Water Resources Engineering from the University of Dohuk in Dohuk City, Iraq.

Over the course of his career, Murad has worked with remote sensing in the Euphrates-Tigris Basin, modelled oil transport and water development projects in GIS, and worked in the engineering department for the United States Army in Northern Iraq from 2007-2009. In the future, Murad hopes to study for a Ph.D. and to work in the Houston oil industry. His interests include satellite imaging of natural oil seeps onland and on the sea surface and tectonic geomorphology. We are proud to have him as an addition to our team and we hope you'll join us in welcoming him to the group.

Plans for the CBTH Website

For 2012, the CBTH Project has plans for a major redesign of our project website. We have begun consultations with MyLabCMS (<http://mylabcms.com>), a service which provides web solutions for scientific research programs at universities like Cornell and George Mason University. With their expertise, we will be able to streamline our website to make all project data easily accessible in both web-based formatting and the web mapping application with a new, modern design. With MyLabCMS, we at CBTH hope to increase the professional quality of our web site while optimizing it for viewer simplicity across a variety of formats, including tablet and mobile platforms. We hope to have the new site design ready by summer and will keep you posted on progress.

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AAPG CBTH annual sponsors Luncheon

With AAPG Long Beach approaching on April 22-25, 2012, CBTH is again planning to host a sponsor luncheon where we will update sponsors on our current activities including the 5 presentations at the meeting and the summer activities of the project personnel. We will notify you of the time and location, please RSVP so we can have a head count.

Year-end meeting date at UH planned for Sept. 21, 2012

We've also planned the date for our 2012 Sponsors Meeting where we'll release the results from Phase III, Year One. Tentatively, the meeting will be held at Michael Cemo Hall at the University of Houston on September 21, 2012. The meeting will include results from both the UH and UoS groups. Let us know if this date works for you, or if another date would be preferable, and we'll keep you posted on any potential scheduling changes.

CBTH alumni news

Trevor Aitken (MS, 2005, offshore Trinidad) moved from Apache Corporation to HRT and is exploring offshore Namibia.

Emilio Garciacaro (MS, 2006, offshore Trinidad) was promoted to exploration well manager for the Gulf of Mexico, Statoil.

UH group works on Haiti earthquake fault

In January, 2012, Paul Mann and Robert Stewart (standing on right) collected onlap seismic reflection data across the blind thrust fault in Haiti that ruptured in January, 2010, and killed over 200,000 persons.



The study including two UH geophysics graduate students, Li Chang (to left) and Nathan Babcock (center). The group was assisted by geologists from the Haitian Ministry of Mining and Energy Resources and local inhabitants from the area. The study is part of an effort to be funded by the SEG program, "Geophysicists without Borders," that provides geophysical studies for problems of practical importance in developing countries. The eventual goal is to bring the UH Vibroseis truck to Haiti to provide higher resolution images of the blind earthquake fault. Mann and Matt Hornbach (Southern Methodist University) are completing a similar study using offshore surveying of faults that possibly destroyed Port Royal (now Kingston, Jamaica) in 1692.

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CBTH Students at the University of Houston



Tricia Alvarez

Tricia is working with CBTH on the Trinidad offshore area. She is in the final year of her PhD and remained at UT where she will graduate in December 2012. Paul Mann at UH and Lesli Wood at UT BEG are co-supervisors of her study. Her study will include an offshore synthesis of data from the Trinidad area along with seismic tomography to relate the deeper structure to the upper crustal structure seen on seismic reflection data. Her study that will be presented as a talk at the Long Beach AAPG meeting will include an offshore synthesis of data from the Trinidad area along with seismic tomography to relate the deeper structure to the upper crustal structure seen on seismic reflection data. She will begin a job as an explorationist with ConocoPhillips in Houston in January of 2013.

Rocio is currently in the third year of her PhD study on the Lower Magdalena basin of Colombia and will complete here study in 2013. Her goal is a complete crust to mantle description of the Lower Magdalena basin and the underlying Caribbean subducted slab using earthquake information, gravity, and seismic reflection data. She is integrating information from earthquake seismology to document the Caribbean slab underlying the basin which she has mapped in detail. She is presenting her work at an international GSA Penrose meeting on forearc basins to be held in Italy in March 2012. She will also present her work at the AAPG Long Beach meeting.



Rocio Bernal



Alex Dale

Alex began his work with CBTH in January 2012, where he is working in the Bahamas region. The focus of his MS study will be the Bahama carbonate platform using both gravity and seismic reflection data. Goals will be to better understand the regional effects of the Caribbean Great Arc collision on the Bahamas platform. A regional gravity study with Dr. Dale Bird of UH will seek to better define the continental vs. plateau vs. oceanic basement types upon which the thick carbonate rocks of the platform were deposited. Alex is a member of the 2012 UH AAPG Imperial Barrel team. He received his BS in geology from Baylor University in 2011.

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Bryan Ott

Bryan, a December 2012 graduate in geology from UT Austin, is completing an undergraduate research project with Paul Mann on Papua New Guinea that he worked on as a junior and senior supported by an NSF grant at UT. While at UT, he was a summer intern at Statoil working on GIS compilations of information from the Gulf of Mexico. His MS thesis at UH supported by the CBTH project will be a synthesis of seismic and well information from the northern Nicaraguan Rise and Jamaica. Bryan informally participated the 2010 UT Imperial Barrel team and is presently the captain of the 2012 UH Imperial Barrel team.

Luis arrived from Colombia in August 2011 and began an MS study on the Putumayo foreland basin of Colombia. Luis worked for two years as an exploration geologist with La Cortez Energy on this study area after graduating with a degree in geology from National University in Bogota in 2007. His MS thesis is scheduled to be completed in August 2013 and his research interests include structure, stratigraphy, and elastic modeling of the Putumayo foreland basin. Luis plans to travel to Uis in 2012 to work with Dr. Nestor Cardozo and Alejandro Escalona on flexural modeling of the basin.



Luis Pachon Para



Kyle Reuber

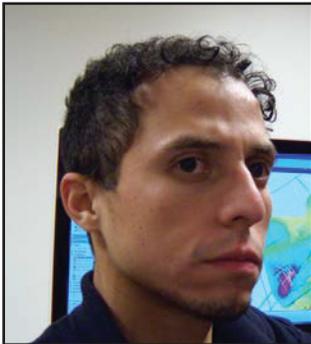
Kyle began a two-year MS study of the northern margin of Brazil to investigate its petroleum potential and stratigraphic links to large discoveries in Ghana and French Guiana. His project will consist of a detailed analysis of the structural and tectonic histories of the offshore transform and passive margin of northern Brazil using gravity, seismic and well data. Kyle received a B.S. in geology from Wright State University. Kyle is a member of the 2012 UH AAPG Imperial Barrel team.

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Javier Sanchez

Javier completed his MS at the University of Texas in August 2011 and began a PhD study in September on the complex tectonics and basin history of the Santa Marta massif, Cesar-Rancheria basin, Sierra Perija and Maracaibo basin. His study hopes to link the geology of Colombia and western Venezuela that have previously been poorly integrated. He is using satellite images for remote or politically sensitive areas in the border region. He plans field work to collect additional structural and fission track information.

Lucia is in her second year of a MS study of hydrocarbon-bearing channels and changing fluvial styles in the northern Llanos basin of Colombia jointly supervised by Janok Bhattacharya and Paul Mann. She is using one of the largest 3D merged data sets to date in the Llanos basin. The study to be presented at the Long Beach AAPG meeting establishes variations in fluvial systems in the foreland setting through the Cenozoic and establishes criteria for recognizing and predicting sand versus shale-filled channels in hydrocarbon-rich Oligocene fluvial deposits of the northern Llanos basin. She plans to graduate in December, 2012. She will be a 2012 summer intern with the Shell Colombia group.



Lucia Torrado



Zach Wolfe

Zach Wolfe is completing his MS on the structural evolution of the Laramide-age Sierra Madre Oriental Fold and Thrust Belt of eastern Mexico and its control on major sedimentary sequences in the western Gulf of Mexico. He is using high-resolution satellite imagery to improve mapping of fold and thrust structures and MOVE software for restorations. He is co-supervised by Dr. Mike Murphy and plans to graduate in May 2012.

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CBTH Students at the University of Stavanger



Luisa Fernanda
Campiño

Luisa is currently studying for an MS in Petroleum Geoscience Engineering at UiS. She will be working in the tectono-stratigraphic evolution of the southern Pacific region-Colombia within the framework of the CBTH project. Luisa has also participated in the geologic evaluation of exploratory blocks in different basins in Colombia and Peru. Her research interest includes structural geology and basin analysis. She plans to graduate in June 2013

Brendan is working on his MS study titled "Tectono-stratigraphic evolution of the southern Gulf of Paria, Trinidad-Venezuela." His area lies within the Eastern Venezuela Basin (EVB), one of the world's most prolific hydrocarbon producing areas. The goals of the study are to understand the structural complexity of the area and determine its stratigraphic implications, incorporating the analysis into a tectonic evolutionary framework and focusing on the impacts for hydrocarbon prospectivity. Brendan is a citizen of Trinidad & Tobago and attended the University of the West Indies (UWI), where he graduated with a BSc. Petroleum Geoscience in 2009. Brendan had a summer internship in 2011 with Statoil and will begin working in the Statoil Stavanger offices after graduation in June 2012.



Brendan Figueira



Catalina Moreno

Catalina Moreno is currently working on an MS project in Petroleum Geosciences Engineering titled "Tectono-stratigraphic evolution of the southern Llanos basin, Colombia." The main objective of her study is to provide an overview of the southern Llanos basin tectono-stratigraphic evolution based on 2D seismic interpretation in order to understand and show evidence of the deformation styles and timing of the structures. Her research interests include structural geology, tectonics and petroleum applications. Catalina had a summer internship in 2011 with GEMS SA, who also provided her thesis data, and will graduate in June 2012.

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CBTH at AAPG Long Beach

This year at AAPG, students and researchers of the CBTH project will present their work at talks and poster sessions in Long Beach. Here's a schedule of our presentations:

Presentations

T. Alvarez, P. Mann, C. Vargas, L. Wood, J. Latchman: Systematic Variations in the Age and Thickness of Subducting Crust as a Control on Regional Structure; the Barbados Accretionary Prism, the Island of Trinidad and the Associated Offshore Areas, and Implications for Hydrocarbon Prospectivity

Room 201, Wednesday, April 25 at 8:45 a.m.

Student Poster Sessions

C. J. Sanchez, P. Mann: Thick-Skinned Style and Timing of Convergent Tectonics in Northwestern South America and Implications for Petroleum Exploration

Exhibition Hall, Monday April 23 from 8:30 a.m.–12:00 p.m.

L. Torrado, P. Mann, J. Bhattacharya: Non-marine Sequence Stratigraphy and Changing Fluvial Style in the Northern Llanos Foreland Basin of Colombia

Exhibition Hall, Monday April 23 from 8:30 a.m.–12:00 p.m.

L. F. Pachon, P. Mann: Hydrocarbon Structural Traps above Inverted, Mesozoic Normal Faults in the Putumayo Foreland Basin, Southern Colombia

Exhibition Hall, Wednesday, April 25 8:30 a.m. - 12:00 p.m.

R. D. Bernal-Olaya, P. Mann, A. Escalona: Tectonic Controls on the Spatial and Temporal Migration of Depocenters in Forearc Basins: A Comparison of Modern and Ancient Caribbean Examples

Exhibition Hall, Wednesday, April 25 8:30 a.m. - 12:00 p.m.

Staff Posters

P. Mann, W. Yang, A. Escalona: Regional Effects of the Cuban Arc-Continent Collision on Structure, Stratigraphy and Hydrocarbons in the Deepwater, Southeastern Gulf of Mexico

Exhibition Hall, April 23 from 1:15 p.m.–5:00 p.m.



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CBTH at EAGE

Alejandro Escalona, Lisa Bingham, Catalina Moreno, and Brendan Figueira will be presenting their work at two meetings of the European Association of Geoscientists & Engineers in Spring 2012.

EAGE Saint Petersburg (April 2-5, 2012)

Bingham, L., Escalona, A. and Zurita-Milla, R.: GIS-based Fuzzy Logic Analysis for Petroleum Exploration and Case Study of Northern South America

Moreno, C. And Escalona, A.: Inversion history of the southern area of the Llanos basin, Colombia

EAGE Copenhagen (June 4-7, 2012)

Figueira, B. and Escalona, A.: Examination of the complex transition zone in the southern Gulf of Paria, Trinidad-Venezuela.

If you're in the area, please feel free to contact us and check out our work!

Other Meetings

Here are a few other recent and upcoming meetings the CBTH project has participated in:

SEG annual meeting, San Antonio, Texas, *September 18-23, 2011:*

Paul Mann (invited): Major hydrocarbon plays in the Mexican sector of the Gulf of Mexico, the Caribbean and northern South America

Fall AGU annual meeting, San Francisco, California, *December 5-9, 2011:*

Paul Mann, Pete Emmet, and Rick Roberson (invited), Crustal thinning of the continental borderland bounding the oceanic Cayman trough:

New observations from deep-penetration seismic reflection data

Paul Mann (invited): Are "uncharacteristic" earthquakes spatially linked to strike-slip restraining bends?

R.E. Sheriff lecture, University of Houston and Houston Geological Society, *November 28, 2011:*

Paul Mann (invited): Major hydrocarbon plays in the Mexican sector of the Gulf of Mexico, the Caribbean and northern South America

Conference on the second anniversary of the 2010 Haiti earthquake, Port-au-Prince, Haiti, *January 12, 2012:*

Paul Mann, Deformation of Tapion Ridge and Leogane Plain and Surrounding Areas and Possible Explanations for Fault Motions on January 12, 2010

University of Alaska, Fairbanks, Chapman Seminar, *February 1-3, 2012:*

Paul Mann: Effects of subducted bathymetric ridges on Caribbean and circum-Pacific subduction zones

Paul Mann: The tectonic cycle of collision, back-thrusting, and subduction initiation in the Caribbean and Solomon Islands

GSA Penrose meeting, Deformation, fluid flow, and mass transfer in the forearc of convergent margins, Lucca, Italy, *March 25-31, 2012:*

Chursina, I. and Escalona, A.: Frontier Exploration in Accretionary Prisms: Sinu belt Colombia

Bernal, R., and Mann, P.: Controls on Migration of Forearc Depocenters, Lower Magdalena basin, Colombia

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CBTH Publications

Recently completed CBTH publications

- Bingham, L., Escalona, A. and Zurita-Milla, R., 2011, GIS-based fuzzy logic analysis for petroleum exploration with case study of northern South America, *First Break* v. 29, p. 41-48., in press.
- Bingham, L., Zurita-Milla, R., Escalona, A., 2012, GIS-based fuzzy logic analysis for petroleum exploration with case study of northern South America, *AAPG Bulletin*, accepted pending revisions.
- Dazcko, N., Caffi, and Mann, P., Structural evolution of the Dayman dome metamorphic core complex, eastern Papua New Guinea: *Geological Society of America Bulletin*, in press, 2012.
- Escalona, A. and Wenxiu, Y.: Subsidence controls on foreland basin development of northwestern offshore Cuba. *AAPG Bulletin*, submitted.
- Kroehler, M., Mann, P., Escalona, A., and Christeson, G., 2011, Late Cretaceous-Miocene diachronous onset of backarc thrusting along the South Caribbean deformed belt and its importance for understanding processes of arc collision and crustal growth: *Tectonics*, v. 30, 30, TC6003, doi:10.1029/2011TC002918
- Mann, P., Comparison of structural styles and giant hydrocarbon occurrences within four, active strike-slip regions: California, southern Caribbean, Sumatra, and East China, in *AAPG Special Volume on Strike Slip Faults*, edited by D. Gao, in press, 2012.
- Vargas, C. and Mann, P., Morphologic expression of accretionary processes and recent submarine landslides along the southwestern Pacific margin of Colombia: in *Submarine Mass Movements and their Consequences*, edited by Y. Yamada et al., *Advances in Natural and Technological Hazards Research* 31, in press, 2012, doi:10.1007/978-94-007-2162-3_33
- Vargas, C., and Mann, P., Tearing and breakoff of subducted slabs as the result of collision of the Panama arc-indenter with northwestern South America: *Geophysical Journal International*, in press, 2012.

Recently completed CBTH MS theses:

- Bingham, L., 2011, GIS-based analysis for petroleum exploration using fuzzy logic multi-criteria evaluation and sensitivity analysis: unpublished MS thesis, University of Utrecht, Utrecht, The Netherlands, 176 p.
- Campos, H., 2011, Tectonostratigraphic and subsidence history of the northern Llanos foreland basin of Colombia: unpublished MS thesis, The University of Texas at Austin, Austin, 105 p.
- Rodriguez, A., 2011, Regional structure, stratigraphy, and hydrocarbon potential of the Mexican sector of the Gulf of Mexico: unpublished MS thesis, The University of Texas at Austin, Austin, 177 p.

Upcoming CBTH publications

- Petroleum systems of the Eastern Cordillera, foothill basins and associated Llanos Basin; Editors: Diego Garcia, Mario Alberto Guzman and Paul Mann; *AAPG Bulletin Special Issue* (in preparation)
- Tectonics, basinal framework, and petroleum systems of western Venezuela, Colombia and offshore areas; Editors: Paul Mann and Alejandro Escalona; *AAPG Bulletin Special Issue* (in preparation)

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Thanks to our new and returning sponsors!

As we continue into Phase III of the CBTH project, we'd like to thank our sponsors for their ongoing support in providing data, software, funding, and knowledge to further student research in Caribbean geology. Since our last meeting, we've had a number of companies join or re-join the project, including, RWE, BHP, ENI, and Ecopetrol ICP. Your help has ensured a valuable education for our students and your efforts are truly appreciated.

For a list of student or sponsor contact information, please e-mail cbthproject@gmail.com. Contact information for Dr. Paul Mann, Dr. Alejandro Escalona, and project consultant Jeff Storms is available on the front page of this newsletter. Let us know if you have any questions, comments, or concerns, and thank you for your interest in the CBTH Project!

