

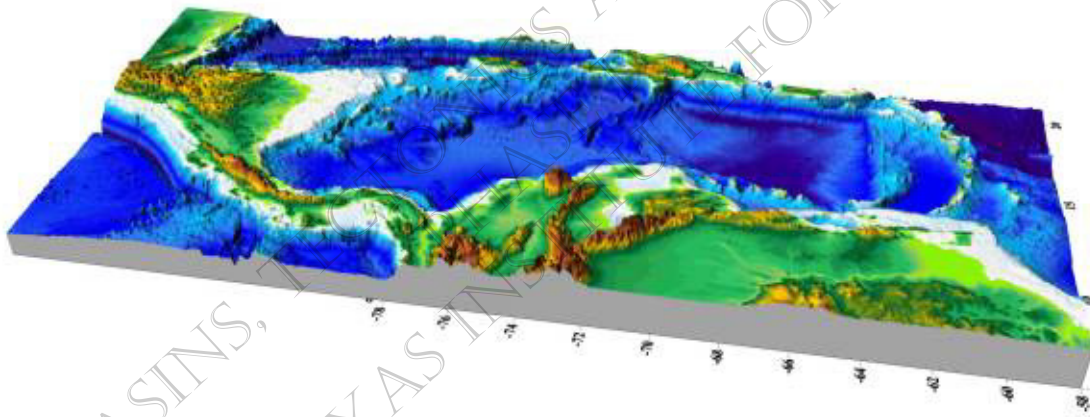
*Proposal from Institute for Geophysics*

*Jackson School of Geosciences, The University of Texas at Austin*



**Caribbean Basins, Tectonics, and Hydrocarbons (CBTH):  
Industry Consortium for Regional Study of Depositional Systems,  
Basinal Structure, and Hydrocarbon Potential in the Caribbean Region**

**(Phase I: Northern South America)**



Submitted by:

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## **EXECUTIVE SUMMARY**

### **Proposed project:**

To create a GIS-based digital synthesis of available seismic and well data to define the regional hydrocarbon potential of the unexplored Caribbean region. Phase I of this project, with a duration of three years, will cover known hydrocarbon basins of onshore and the less known offshore basins of northern South America (Venezuela, Colombia, and Trinidad). Phase II of the project will address deepwater frontier areas of the Caribbean including the Venezuela and Colombian basins along with unexplored plate edge areas like Cuba and the Bahamas platform. Our main objectives are to compile all the available digital seismic and published data in a regional basis -particularly offshore Venezuela, Colombia and Trinidad- to create an integrated geologic synthesis of tectonosequences, depositional systems, major structures, petroleum geology and paleogeographic quantitative plate reconstructions for a better understanding of the hydrocarbon systems in the region. To our knowledge, a project involving this amount of data and of this scope has never previously been attempted for northern South America.

**Cost:** \$40,000 per year per company for three years (\$120,000). Late buyins to the CBTH consortium will be charged 150% of this rate per project year.

### **Principal investigator:**

**Dr. Paul Mann: Senior Research Scientist, The University of Texas, Institute for Geophysics:** Expertise in tectonics and geology of the Caribbean, tectonics of active strike-slip transpressional, and subduction margins, structural and tectonic interpretation of seismic reflection, petroleum geology, and Arc/Info database development.

### **Timing and products for CBTH:**

1. ***Year one (September 1, 2005-August, 2006):*** Basemaps displaying all available seismic and well data. Regional structural maps of the main tectonosequences in the region and interpreted GULFEX seismic lines. Complete digital GIS data base of all previously published onland and subsurface data and

bibliographic database for the region. Year-end research seminar for sponsors held at UT in August, 2006.

2. **Year two (September, 2006-August, 2007):** Complete regional structural maps incorporating seismic mapping and integration with previous onland studies. Complete preliminary plate tectonic model/animation supported by observational data. Year-end research seminar held at UT in August, 2007.

3. **Year three (September, 2007-August, 2008):** Complete paleogeographic maps that integrate all depositional, structural, and plate tectonic observations. Complete digital, final written report and hardcopy atlas including seismic lines, maps, etc. Final year-end research seminar for sponsors held at UT in August, 2008, to convey Phase I research results and Phase II, follow-on proposal.

**Benefits of study to industry sponsors:** The study would provide sponsors a regional synthesis in a GIS format of a critical hydrocarbon region at a fraction of the cost to the sponsor attempting a similar inhouse study or by hiring outside consultants. The study supports long-term partnership and information transfer between industry and the University of Texas at Austin and the training of undergraduate, graduate and postdoctoral students in petroleum exploration at the University of Texas at Austin.



## **PROJECT DESCRIPTION**

### **Proposed project:**

The Institute for Geophysics of the UT Jackson School of Geosciences proposes a collaboration with industry to create a digital synthesis of available seismic and well data to define the regional hydrocarbon potential of the Caribbean region. The initial three-year phase of the proposal will be an integrated synthesis of depositional systems and regional tectonics of northern South America. The study will provide new insights into its geologic history and its hydrocarbon potential – especially in unexplored deep-water areas. Phase II of the project (starting 2008) will include a much larger area of the Caribbean including the Venezuelan and Colombian basins and the area of Cuba, the Bahamas platform, and the southern Gulf of Mexico. A major objective of the study is to generate onshore-offshore structural and stratigraphic interpretations that will include all offshore, poorly-explored clastic depocenters. Synthesis of previous work and archived seismic and well data at UT will form the basis for construction of regional structural transects and paleogeographic maps covering the interval from the early Caribbean paleoseaway (Late Jurassic-Early Cretaceous) to the entry of the exotic Caribbean plate into its present-day position (Figs. 1 and 2). A key objective of the study is to identify the extent and thickness of known potential source and reservoir rocks. Our ultimate goal is a series of digital maps, seismic sections and plate reconstructions integrating all available data. Maps, cross sections, and other interpretation products will be made available to sponsors in GIS format as well as a large-format hardcopy atlas (Figs. 1 to 6). Our inhouse data will be augmented by donated 2D and 3D seismic and well data provided by industry sponsors. The cost for the three-year project (Phase I) is ~\$999,289. Participating companies would make a three-year commitment of \$120,000, or \$40,000 per year.

### **SETTING AND RATIONALE OF STUDY**

The Caribbean region is dominated by complex Mesozoic-Cenozoic tectonic interactions between North American, South American and Caribbean plates. Despite the tectonic complexity, geologic studies have led patient and systematic explorationists to the discovery of about 30 giant oil and gas fields in northern South America and limited production and plays in the Cuba-Bahamas area, Dominican Republic, and Central

America (Mann et al., 2003) (Fig. 1). This region provides one of the closest and most secure sources of hydrocarbons to the US and provides about 4 MMBO of the hydrocarbon production in the western hemisphere (more than 3 MMBO come from Venezuela and Trinidad- BP, 2002). Despite some widespread areas of productivity and potential source rocks, some areas of the Caribbean including the offshore areas of Venezuela remain virtually unexplored for hydrocarbons.

Main tectonic stages in the development of basins and hydrocarbon systems in the region include: 1) separation between North and South America during Jurassic-Early Cretaceous rifting and formation of the Proto-Caribbean seaway; this period included deposition of high-quality source rocks including those of the northern Gulf of Mexico area; 2) Passive margin formation above rifted margins; this phase was accompanied by the deposition of the Late Cretaceous La Luna and Querecual shales, the main source rock for hydrocarbons in Venezuela and Trinidad; 3) Late Cretaceous to Recent oblique convergence between the Pacific-derived Caribbean island arc, subduction of oceanic Proto-Caribbean crust, and west-to-east arc-continent collision; this phase led to the deep burial, maturation, and trapping of many of the giant fields of northern South America; 4) Eocene to recent, north-south convergence between North and South America and shortening structures at the margins of the Caribbean plate; and 5) east-to-west strike-slip displacement of the Caribbean plate since the middle Eocene.

Previous geologic synthesis of the Caribbean region have been produced in the form of regional geologic maps based on over 50 years of outcrop mapping (Case and Holcombe, 1980; Mascle and Letouzey, 1990) and, more recently, satellite-based gravity maps, GPS studies, and areas of onland and offshore subsurface studies using both seismic and well data provided by industry. The three units of the University of Texas, Jackson School of Geosciences have been long active in outcrop and subsurface mapping in the Caribbean. Much of this effort has been in the form of geologic and geophysical MS and PhD studies by UT graduate students. Currently, more than 10 researchers and students are continuing this long tradition of Gulf of Mexico-Caribbean geologic-geophysical studies, particularly in the area of subsurface mapping. These studies have been primarily focused at the scales of individual basins so there has been no previous effort to integrate the entire region in a single study. Integration and regional synthesis of the offshore Caribbean region is key for understanding the complex tectonic history and its control on hydrocarbons distribution.

## OBJECTIVES

The main objective of the proposal Phase I of CBTH is to provide sponsors with an integrated, digital synthesis of the Caribbean region. Data sources include 2D seismic data transects acquired by UTIG, previous publications on the region, and data donated by the sponsoring companies (Figs. 1 and 3). The study will use seismic interpretation and well correlation over the entire region to produce a series of structural, isopach and paleogeographic maps. Deliverables will include a series of structural and stratigraphic maps ranging from the top of acoustic basement to key tectonosequences bounded by regional unconformities. All results will be integrated into a user-friendly GIS-HTML database and as a large format hardcopy atlas. Specific objectives include the following:

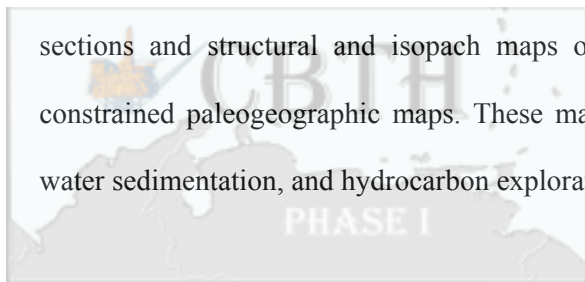
- Identify source and location of main sedimentary depocenters: The clastic sources of the major sub-basins of the Caribbean Sea are poorly constrained partly because of the large scale Cenozoic displacements of the Caribbean plate margins (Fig. 2). Previous workers (e.g., Kasper and Larue, 1986; Diaz de Gamero, 1996; Driscoll and Diebold, 1999) have all speculated that major depocenters along the northern South American margin and the Venezuela basin represent offshore deltas and submarine fans deposited by the paleo-Orinoco River.

By integrating all the UTIG seismic data, this study will provide a better constrained isopach map of the sedimentary basins in the region and its margins as shown in Escalona and Mann (2004). These maps will provide strategies for deep water exploration by identifying major sand accumulations and linking these to their source areas and onshore basins in northern South America.

- Continuity of tectonosequences and terranes along the Caribbean region: Most workers accept that the Caribbean region originated in the eastern Pacific in Late Cretaceous and was transported into its present position between North and South America plates (Pindell and Barrett, 1990; Mann, 1999). By looking at the different, regional, Caribbean-wide cross-sections and maps of key seismic horizons, this study will allow us to understand the timing of formation of the main tectonosequences, their lateral extent, and the diachronous tectonic controls on tectonosequences during Caribbean plate evolution (Fig. 3 to 5). We hope

to improve on- and offshore correlations between well studied areas of the Maracaibo and Eastern Venezuela basin and much less studied areas like the Gulf of Venezuela and Bonaire basins.

- Produce the first regional offshore geologic synthesis of the Caribbean region: Regional seismic cross-sections and structural and isopach maps of the Caribbean region will allow the production of well constrained paleogeographic maps. These maps will be valuable for understanding tectonic styles, deep-water sedimentation, and hydrocarbon exploration plays in presently unexplored offshore areas.



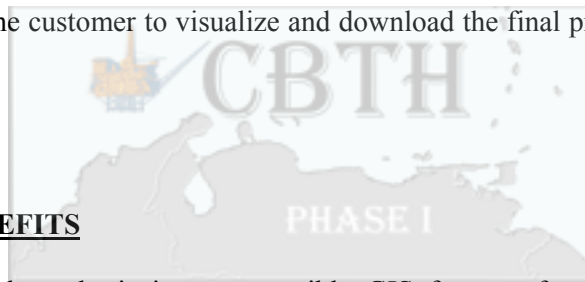
### **DATA AND PROPOSED METHODS**

Data to be used in this study include all 2D seismic data acquired by the Institute for Geophysics during the last 20 years in the Caribbean region (Figs. 1 and 2). We are confident that we currently possess more geologic information of the Caribbean region than any other single academic institution. In addition to interpretations of these data, we will provide the sponsors digital compilations of regional published data in the region and previous theses and dissertations that have been done by UT students (Figs. 1, 2 and 3) and existing wells including DSDP/IODP wells in the Caribbean. We will also solicit the sponsors for seismic and well data to augment our rapidly growing database.

All digital seismic data will be loaded into Landmark interpretation software on workstations available at UTIG and purchased through this proposal to assist in this study. Seismic interpretations will allow the production of structural and isopach maps for the entire region. As in previous studies conducted by UTIG and BEG, GIS will be used to organize this large amount of data into a user-friendly database. The GIS database will be integrated with an HTML database that will allow the customer to visualize and download the final products of the research.

### **BENEFITS**

The study would provide sponsors a regional synthesis in an accessible GIS format of a critical hydrocarbon region at a fraction of the cost and time expenditure of the sponsor attempting a similar, inhouse study or by hiring outside consultants. The study supports partnership and information transfer between



academia and industry including the training of undergraduate and graduate students, and postdoctoral researchers at UT Austin.

### TIMING AND RESEARCH PRODUCTS

Phase I of CBTH is a three-year project beginning September 1, 2005:

**Year One (2005-2006):** Assembly of the digital seismic data provided both by UT and industry sponsors. Construction of isopachs and recognition of the main tectonosequences along regional transects. An ArcGIS data base will be built and integrated with Html files for visualization and archiving of relevant data. A sponsor's research meeting will be held in August, 2006, to discuss the results and plans for the coming year.

**Year Two (2006-2007):** Construction of cross sections and maps showing the main depositional settings and structural controls for the different tectonosequences. A preliminary written and digital atlas and report will be provided and a sponsor's meeting will be organized in August, 2007, to discuss results and to seek feed back from sponsors for the coming year.

**Year Three (2007-2008):** Synthesis of all data used in the project, compilation into the data base (ArcGIS-Html) and construction of the final Atlas-report that summarizes all the information. One of the main goals is to validate a consistent plate tectonic model, paleogeographic evolution and petroleum systems of the region. A final project report held at UT in August, 2008, will convey research results to sponsors and discussion for Phase II of the project.

### PERSONNEL AND BUDGET JUSTIFICATION

#### Personnel supported:

**Principal investigator:** Dr. Paul Mann (UTIG) has worked on onland and marine geophysical studies of the circum-Caribbean since 1978. Since 1989, he has been co-chief scientist on four major geophysical cruises along active plate boundaries in the Caribbean and southwestern Pacific. He has supervised several UT master and PhD graduate students in the Caribbean region. These results have been published as peer-reviewed and form much of the scientific basis for the present proposal (Lugo and Mann, 1995, Babb and Mann, 1997, Escalona and Mann, 2003). Currently he is a co-investigator in a NSF funded acquisition and interpretation of



offshore and onland seismic data along the Venezuelan margin (cf. “SE Caribbean margin” at [http://www.ig.utexas.edu/research/projects/venez\\_margin/venez\\_margin.htm](http://www.ig.utexas.edu/research/projects/venez_margin/venez_margin.htm)). We plan to integrate these new offshore data into our proposal study.

**Post-doctoral fellow:** Dr. Alejandro Escalona (UTIG) has worked on onland and marine seismic and well data of the Venezuelan margin since 1997. His main focus is to understand petroleum systems and basin formation in the region by interpretation of regional to reservoir-scale, subsurface data. Currently, he is a post-doctoral fellow working with Dr. Paul Mann on the evolution of Venezuela’s offshore basins.

**Other personnel:** Funds are requested to also support: 1) one UT graduate student and one UT undergraduate that will assist in the interpretation of regional transects, constructions of maps and the ArcGIS-database and use aspects of these studies as part of their degrees at UT Austin; and 2) one UT administrative assistant who will handle communications, correspondence with sponsors and will organize year-end sponsor meetings.

**Capital equipment:** The project will utilize existing facilities at the Institute for Geophysics of the Jackson School of Geosciences, Institute for Geophysics. Capital equipment purchases for the project and related expenses include: 1) 1 Sun Workstation; and 2) hard disk (~2000 GB) to store the data used and generated by the project.

**Other:** Other requested expenses include funds for travel to conferences and meetings with sponsors, publications, costs of produced deliverables to sponsors, supplies, copying, postage, and communications.

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- Mann, P., Gahagan, L. and Gordon, M., 2003, Tectonic setting of the world's giant oil and gas fields, in Halbouty, M. (eds.), *Giant Oil Fields of the Decade, 1990-2000*, p. 15-105.
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**Professional Summary January 2005**

**Education**

B.A. Oberlin College, Oberlin, Ohio, 1978, Geology  
Ph.D. State University of New York at Albany, Albany, New York, 1983, Geology

**Areas of expertise**

Expertise in tectonics and geology of the Caribbean, tectonics of strike-slip transpressional and subduction margins, structural and tectonic interpretation of seismic reflection data, petroleum geology and Arc/Info database development.

**Professional experience:**

1999– Senior Research Scientist, Inst. for Geophysics, Univ. Texas at Austin  
1999–00 French Academy of Sciences Fellowship, University of Nice-Sophia Antipolis, France  
Feb.–March, 1997  
Invited Erskine Fellow, Canterbury University, Christchurch, New Zealand  
1991–99 Research Scientist, Inst. for Geophysics, Univ. Texas at Austin  
1983–91 Research Associate, Inst. for Geophysics, Univ. Texas at Austin  
1982–83 Graduate Teaching Assistant, State University of New York at Albany  
1981–82 Graduate Research Assistant, State University of New York at Albany  
1978–81 University Fellow, State University of New York at Albany

**Memberships:**

American Geophysical Union  
Geological Society of America  
Phi Beta Kappa

**Five most relevant publications (\* ut grad student co-author):**

Sullivan, S. \*, Wood, L., and Mann, P., 2005, Distribution, nature, and origin of mobile mud features offshore Trinidad, Transactions of the Gulf Coast Association of Geological Sciences, in press.  
Mann, P., Hippolyte, J., Grindlay, N., and Abrams, L., Neotectonics of southern Puerto Rico and its offshore area, in Mann, P., *Active tectonics and seismic hazards of Puerto Rico, the Virgin Islands, and offshore areas*, Geological Society of America Special Paper 385, in press.  
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### **Five other relevant papers**

- Mann, P., and Taira, A., 2004, Global tectonic significance of the Solomon Islands and Ontong Java Plateau convergent zone, in P. Mann and A. Taira (editors), Special Issue on Tectonics of the Solomon Islands, *Tectonophysics*, v. 389, p. 137-190.
- Cowley, S.\*, Mann, P., Coffin, M., and Shipley, T., 2004, Chronology of Oligocene-Recent events recorded in the seismic stratigraphy and structure of the Central Solomons intra-arc basin, Solomon Islands, in P. Mann and A. Taira (editors), Special Issue on Tectonics of the Solomon Islands, *Tectonophysics*, v. 389, p. 267-307.
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### **Published volumes on complexly deformed plate boundary areas**

- Mann, P.**, Draper, G., and Lewis, J. F., editors, 1991, *Geologic and Tectonic Development of the North America-Caribbean Plate Boundary in Hispaniola*, Geological Society of America Special Paper 262, 401 p.
- Mann, P.**, editor, 1995, *Geologic and Tectonic Development of the Caribbean Plate Boundary in Southern Central America*, Geological Society of America Special Paper 295, 349 p.
- Dolan, J. F., and **Mann, P.**, editors, 1997, *Active Strike-slip and Collisional Tectonics of the Northern Caribbean Plate Boundary Zone*, Geological Society of America Special Paper 326, 174 p.
- Mann, P.**, 1999, *Caribbean Sedimentary Basins*, Elsevier Sedimentary Basins of the World Series, volume 4, Volume editor: Paul Mann, Series Editor: K. Hsu, (21 chapters, 736 pages).
- Mann, P.**, and Taira, A., editors, 2004, *Tectonics, seismicity, and crustal structure of the Ontong Java Plateau-Solomon Islands convergent zone, southwest Pacific Ocean*, Special issue of *Tectonophysics*, v. 389.
- Mann, P.**, editor, 2005, *Active tectonics and seismic hazards of Puerto Rico, the Virgin Islands and Offshore areas*, Geological Society of America Special Paper 385, in press.
- Mann, P. and Escalona, A.**, editors, 3D anatomy of a Supergiant: Maracaibo basin, Venezuela, submitted as a special issue of *AAPG Bulletin*, submitted January 2005

### **Grad student mentoring and support over past five years:**

- **Alejandro Escalona**, 2003, Regional tectonics, sequence stratigraphy, and reservoir properties of Eocene clastic sedimentation, Maracaibo basin, Venezuela, unpubl. Ph.D. dissertation, Univ. of Texas at Austin, 222 p (now post-doctoral researcher at UTIG).
- **Martha Jaimes**, 2003, Seismic stratigraphy and structure of the Cariaco basin, Venezuela, unpubl. MS thesis, University of Texas at Austin, 117 p. (now explorationist with PDVSA, Caracas, Venezuela).
- **Robert D. Rogers**, 2003, Jurassic-Recent tectonic and stratigraphic history of the Chortis block of Honduras and Nicaragua, unpubl. Ph.D. dissertation, University of Texas at Austin, 264 p. (now assistant professor with Department of Geology, University of Puerto Rico, Mayaguez).
- **Veronica M. Castillo**, 2000, Structural analysis of Cenozoic fault systems using 3D seismic reflection data in the southern Maracaibo basin, unpubl. Ph.D. dissertation, University of Texas at Austin, 207 p. (now explorationist with ENI, Caracas, Venezuela).

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### **Professional Summary January 2005**

#### **Education:**

B.A. Univ. Central de Venezuela, Caracas, Venezuela, 1995, Geophysical engineer  
Ph.D. The University of Texas at Austin, Austin, Texas, 2003, Geology

#### **Areas of expertise**

Expertise in seismic and well interpretation of western and offshore Venezuela, basin analysis, sequence stratigraphy, petroleum systems and Arc/Info database development.

#### **Employment experience**

2004- Postdoctoral fellow, Ins. for Geophysics, University of Texas at Austin  
2001-2003 Teacher and research assistant, Ins. for Geophysics, Dept. of Geological Science, Bureau of Economic Geology, University of Texas at Austin  
1999 Lecturer at the Department of Geology, Mines and Geophysics, Univ. Central de Venezuela  
2000 1997-1999 Lecturer at the Department of Geodesy, Univ. del Zulia  
1995-1999 Seismic interpreter-production geoscientist, Petroleos de Venezuela, S.A.

#### **Memberships**

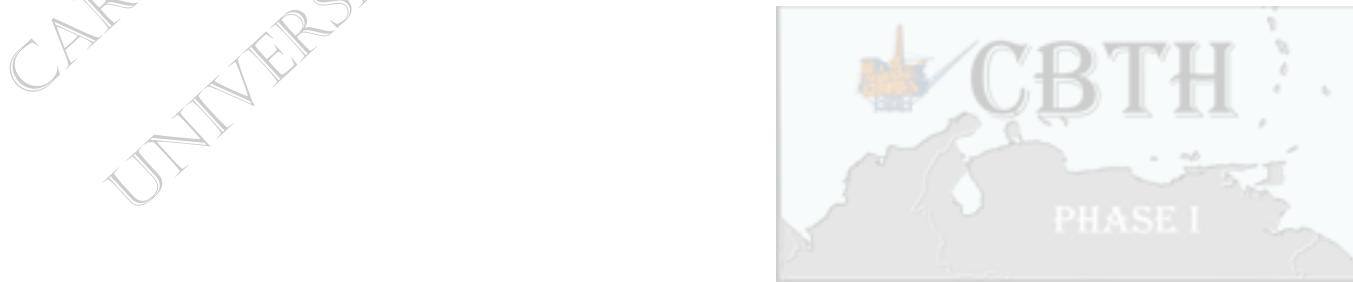
America Geophysical Union  
The American Association of Petroleum Geologists

#### **Publications** (<http://www.ig.utexas.edu/people/staff/escalona/publications.htm>)

1. Escalona, A., Mann, P and Bolivar Group, 2004, Tectonic reconstructions of sedimentary basins associated with the proto-Maracaibo and proto-Orinoco rivers: New constraints from BOLIVAR and GULFEX seismic data. Abstract and poster, AGU Annual convention, San Francisco, California, December 2004
2. Escalona, A. and Mann, P., 2004, Regional tectonics, sequence stratigraphy and reservoir properties of Eocene clastic sedimentation in the Maracaibo basin, Venezuela. Expanded Abstract and poster, AAPG Annual convention, Dallas, Texas, April, 2004.
3. Escalona, 2003, Regional tectonics, sequence stratigraphy and reservoir properties of Eocene clastic sedimentation in the Maracaibo basin, Venezuela. Ph.D. dissertation, The University of Texas at Austin, 220 p.
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7. Lucas, Carol MacDonald and Escalona, Alejandro, 1998, 3D Characterization of the upper sandstone, Member C2X, east flank of the North Dome, Centro Lago field, Lake Maracaibo. In: *The Leading Edge*, v. 12, 1748-1752. AAPG Annual convention, San Antonio, Texas 1999, Abstract.
8. Duerto, L. and Escalona, A., 1995, Reprocesamiento e interpretacion structural de 350 km de lineas sismicas 2D en el area de Cerro Negro, Faja Petrolifera del Orinoco. (Unpublished thesis, Universidad Central de Venezuela). Congreso Venezolano de Geofisica, Maracaibo, Venezuela 1996, Resumen.



**BUDGET SUMMARY**

Caribbean Basins, Tectonics and Hydrocarbons (CBTH):  
Regional Study of Depositional Systems, Basinal Structure, and Hydrocarbon Potential in the Caribbean Region  
(Phase I: Northern South America)  
01 September 2005 - 31 August 2008

	Year 1	Year 2	Year 3	Total
<b>A. Senior Personnel</b>				
Dr. Paul Mann (Principal investigator)	3.00	3.00	3.00	9.00
<b>B. Other Personnel</b>				
Dr. Alejandro Escalona (post-doctoral fellow)	12.00	12.00	12.00	36.00
Graduate student	7.50	7.50	7.50	22.50
Undergraduate student	7.50	7.50	7.50	22.50
Technical support	2.00	2.00	2.00	6.00
Administrative Associate	1.50	1.50	1.50	4.50
<b>Total Salaries and Wages</b>	\$ 135,434.00	\$ 142,201.00	\$ 149,308.00	\$ 426,943.00
<b>C. Fringe Benefits</b>	\$ 35,671.00	\$ 37,455.00	\$ 39,324.00	\$ 112,450.00
<b>Total Salaries and Fringe Benefits</b>	\$ 171,105.00	\$ 179,656.00	\$ 188,632.00	\$ 539,393.00
<b>D. Travel</b>				
<b>3 people visit sponsors</b>				
Per diem (10 days @ \$120/day)	1,200.00	1,200.00	1,200.00	3,600.00
Airfare (3 @ \$600 each)	1,800.00	1,800.00	1,800.00	5,400.00
<b>3 people to attend professional meetings</b>				
Per diem (10 days @ \$120/day)	1,200.00	1,200.00	1,200.00	3,600.00
Airfare (3 @ \$600 each)	1,800.00	1,800.00	1,800.00	5,400.00
Registration (3 @ \$600 each)	1,800.00	1,800.00	1,800.00	5,400.00
<b>Total Travel</b>	\$ 7,800.00	\$ 7,800.00	\$ 7,800.00	\$ 23,400.00
<b>E. Other Direct Costs</b>				
<b>1) Materials and Services</b>				
Expendable Supplies	3,000.00	3,000.00	3,000.00	9,000.00
Software and data purchases	5,000.00	5,000.00	5,000.00	15,000.00
Publications Costs	3,000.00	3,000.00	3,000.00	9,000.00
Postage/Communications	3,000.00	3,000.00	3,000.00	9,000.00
Personal computers	9,000.00	0.00	0.00	9,000.00
<b>Total Materials and Services</b>	\$ 23,000.00	\$ 14,000.00	\$ 14,000.00	\$ 51,000.00
<b>2) Computer Usage Charges</b>	\$ 6,000.00	\$ 6,000.00	\$ 6,000.00	\$ 18,000.00
<b>3) Seminars and others</b>	\$ 2,000.00	\$ 2,000.00	\$ 2,000.00	\$ 6,000.00
<b>4) Tuition and Fees</b>	\$ 6,700.00	\$ 7,200.00	\$ 7,700.00	\$ 21,600.00
<b>5) Capital Equipment</b> (Workstations, hard disk)	\$ 21,000.00	\$ 0.00	\$ 0.00	\$ 21,000.00
<b>Total Other Direct Costs</b>	\$ 66,500.00	\$ 37,000.00	\$ 37,500.00	\$ 141,000.00
<b>F. Total Direct Costs</b>	\$ 237,605.00	\$ 216,656.00	\$ 226,132.00	\$ 680,393.00
<b>G. Modified total direct cost (MTDC)</b>	209,905.00	209,456.00	218,432.00	637,793.00
<b>H. Indirect Costs (50% excl. tuition, fees and cap. equip.)</b>	\$ 104,952.00	\$ 104,728.00	\$ 109,216.00	\$ 318,896.00
<b>I. Total Direct and Indirect Costs</b>	\$ 342,557.00	\$ 321,384.00	\$ 335,348.00	\$ 999,289.00
<b>Total Costs:</b>				\$ 999,289.00



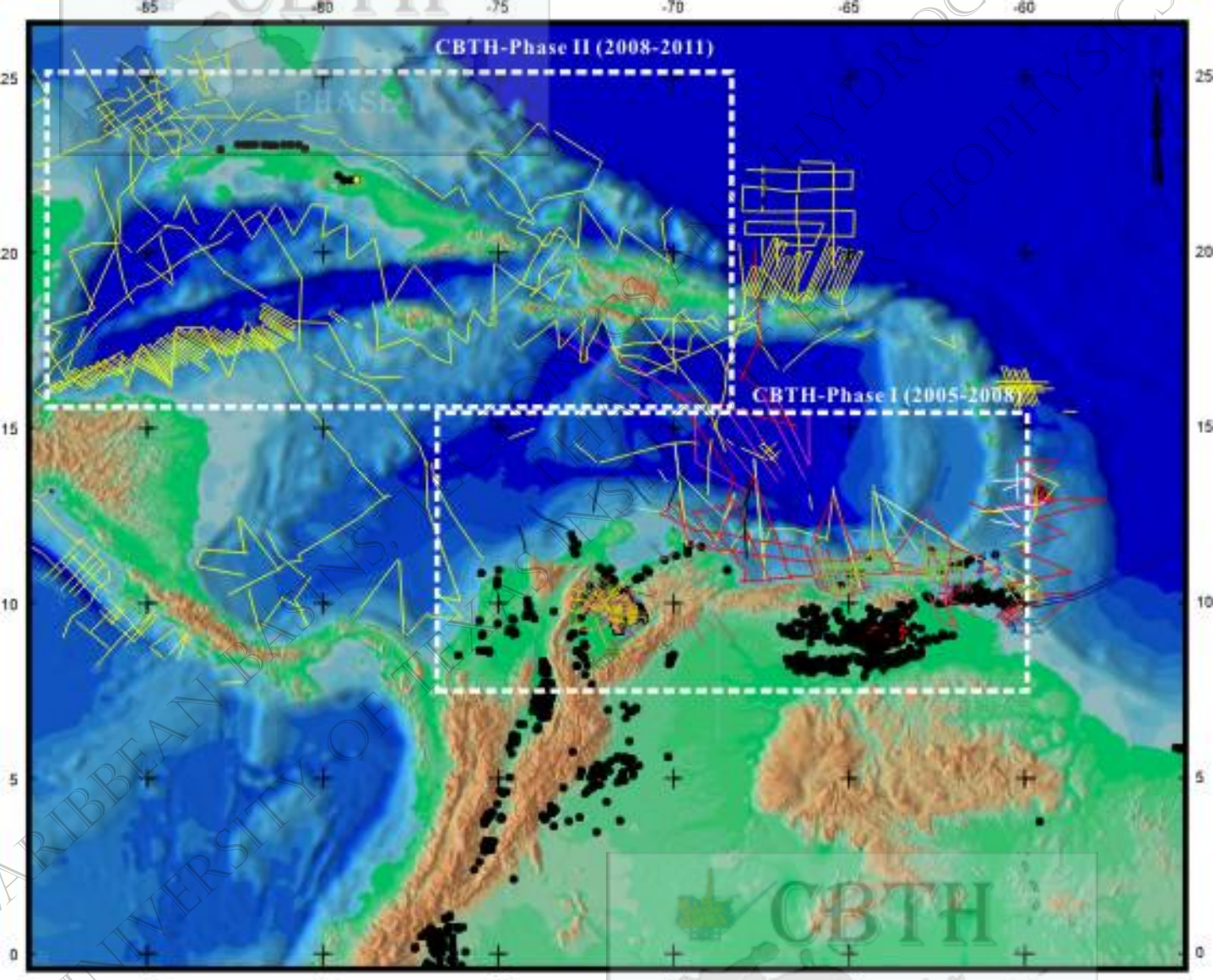


Figure 1. Topographic/bathymetric map showing available data in the Caribbean region compared to known oil and gas deposits (black dots) compiled by USGS (2004). Yellow lines represent digital seismic data available at UTIG. Boxed areas show proposed study areas for Phase I and II of CBTH.



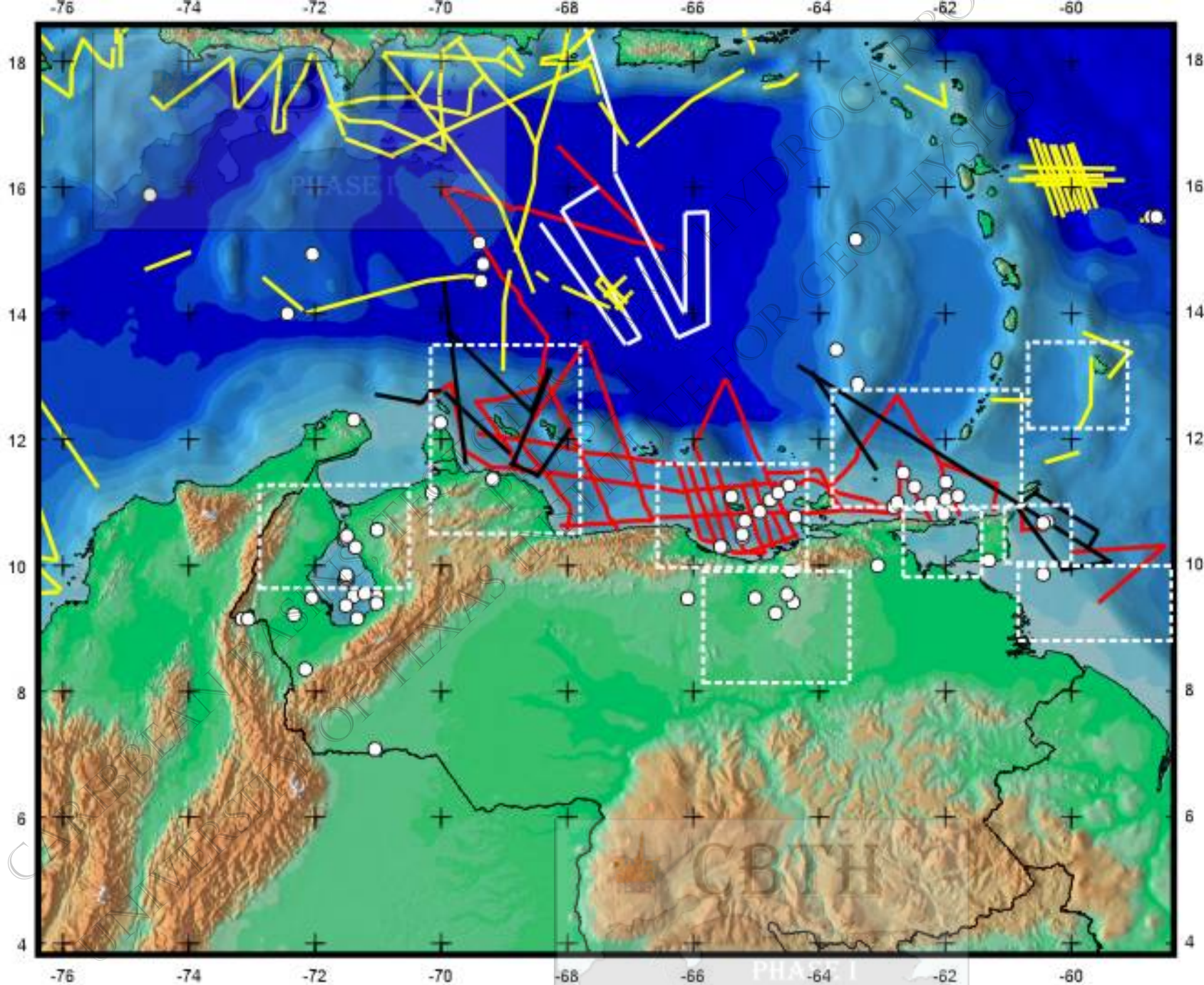
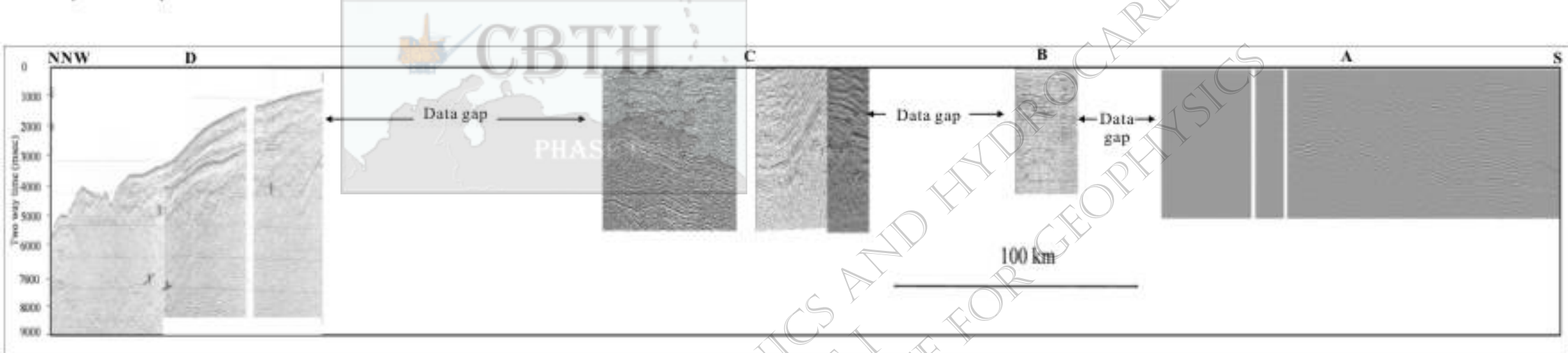


Figure 2. Topographic/bathymetric map showing CBTH Phase I study area including Colombia, Venezuela and Trinidad. Digital seismic data available at UTIG is indicated (Red lines: Gulfrefx-1975, Black lines: Bolivar-2004, White lines: EW9501, Yellow: other UTIG lines). White-dashed boxes indicate areas covered by published reports, theses and/or dissertations compile at UT. White circles represent published well data available for this study.

A. Examples of uninterpreted onshore-offshore transects, northwestern Venezuela



B. Interpreted regional transect onshore-offshore northwestern Venezuela

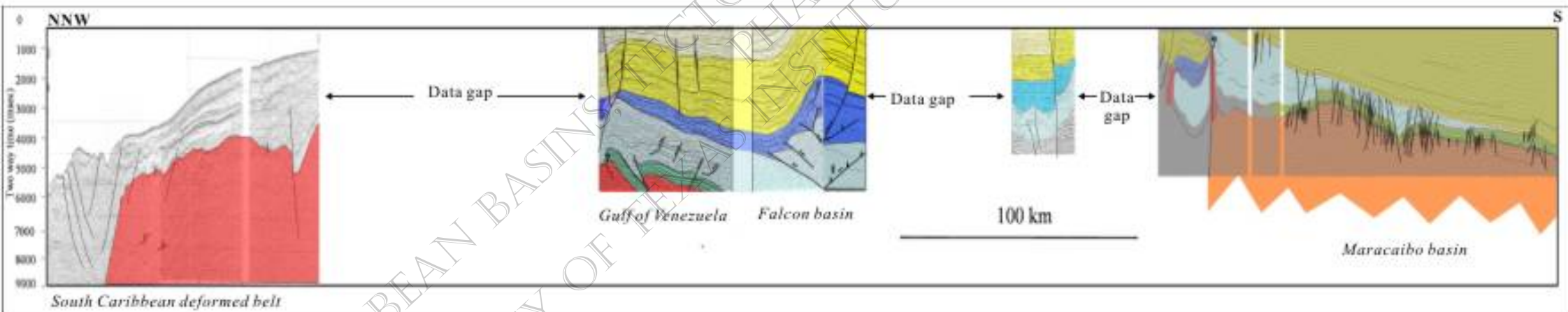
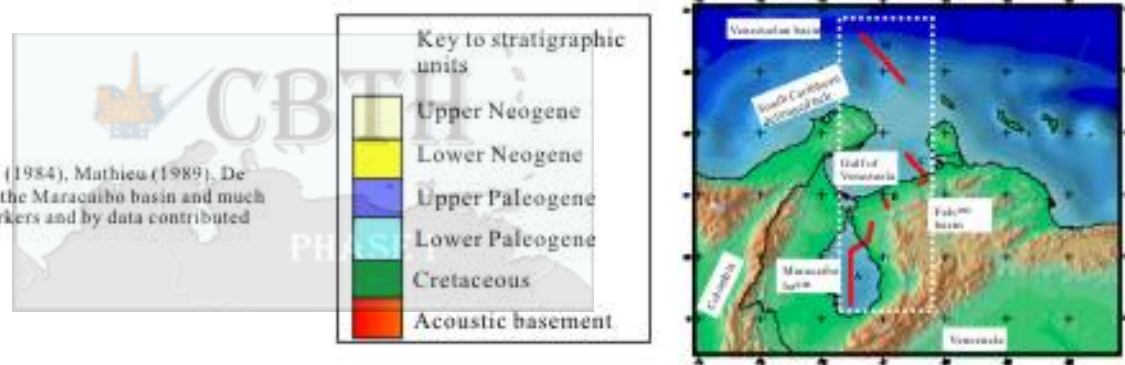
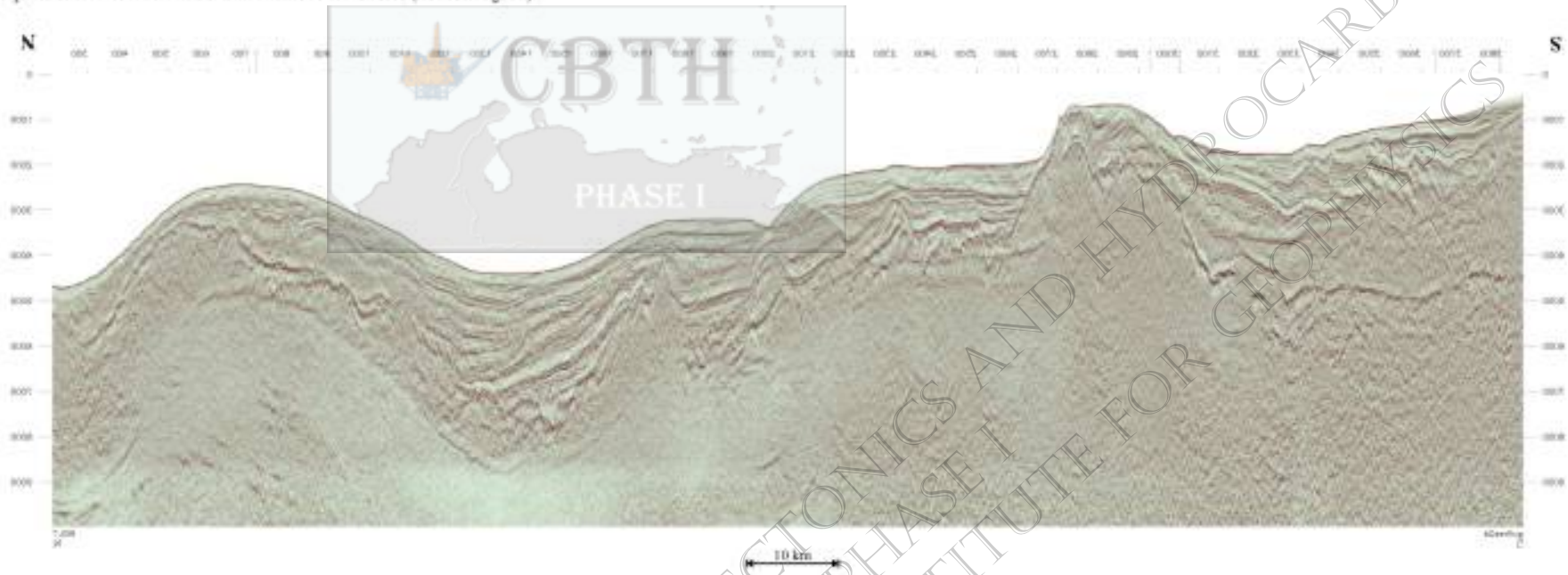


Figure 3. Example of regional onland-offshore transects assembled by compilation of published data. Sources include Ladd et al. (1984), Mathieu (1989), De Toni (2001) and Escalona (2003). These transects will help improve our correlation between well studied areas in Venezuela like the Maracaibo basin and much less studied offshore areas like the Gulf of Venezuela. We hope to fill data gaps with additional lines compiled from previous workers and by data contributed by sponsors of CBTH. Knowledge of existing data will help sponsors plan future surveys and focus on exploration targets.



A. Uninterpreted Bolivar-2004 MCS line-offshore Venezuela (Ilicoa region)



B. Interpreted Bolivar-2004 MCS line-offshore Venezuela (Falcon region)

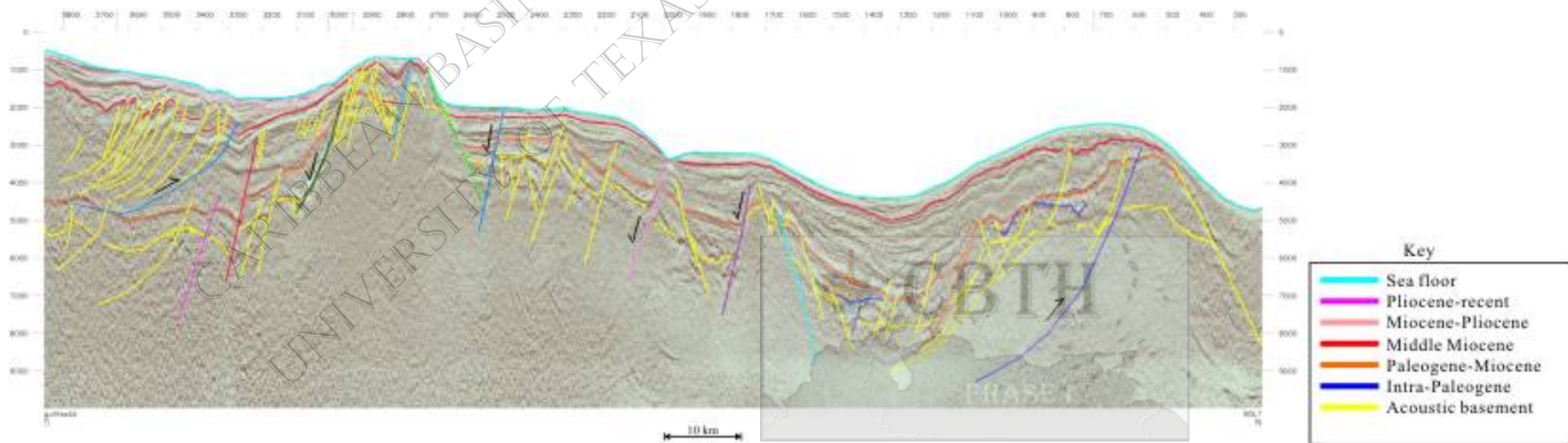
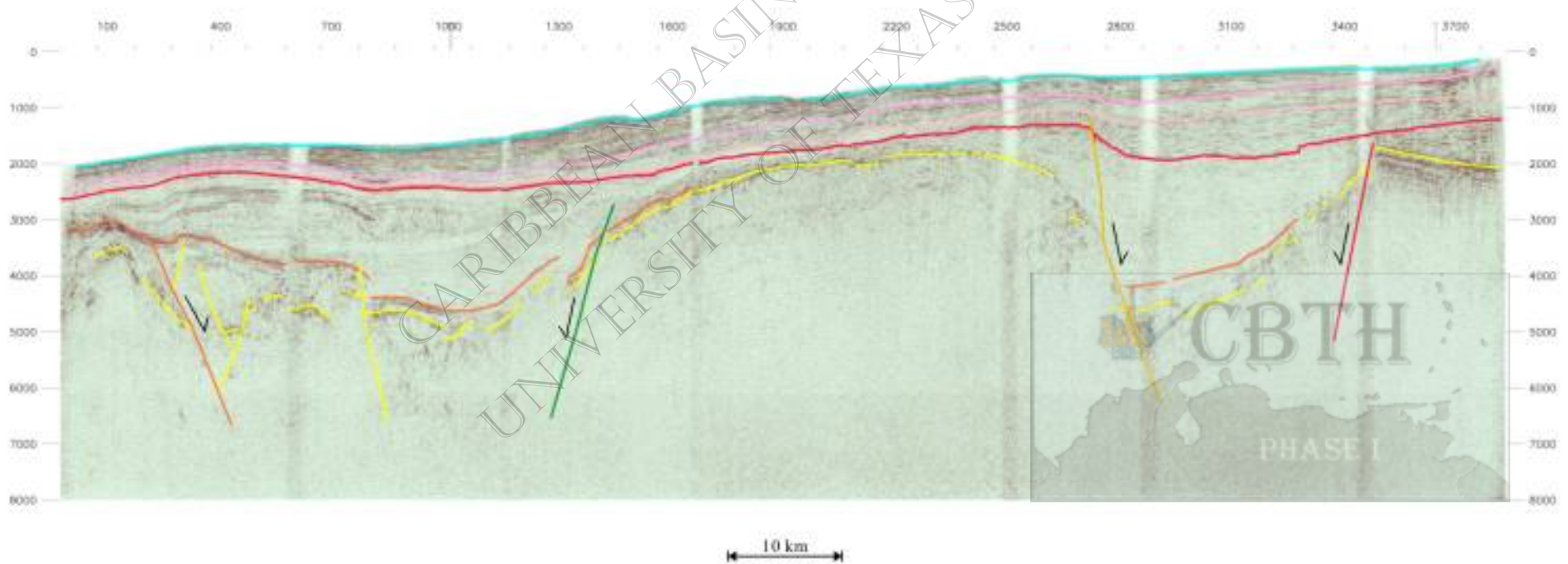


Figure 4. Example of Bolivar-2004 MCS data, offshore Venezuela

A. Uninterpreted Gulfrex-1975 MCS line-offshore Venezuela



B. Interpreted Gulfrex-1975 MCS line-offshore Venezuela



Key	
<span style="color: cyan;">—</span>	Sea floor
<span style="color: magenta;">—</span>	Pliocene-recent
<span style="color: pink;">—</span>	Miocene-Pliocene
<span style="color: red;">—</span>	Middle Miocene
<span style="color: orange;">—</span>	Paleogene-Miocene
<span style="color: blue;">—</span>	Intra-Paleogene
<span style="color: yellow;">—</span>	Acoustic basement

Figure 5. Example of Gulfrex-1975 MCS data

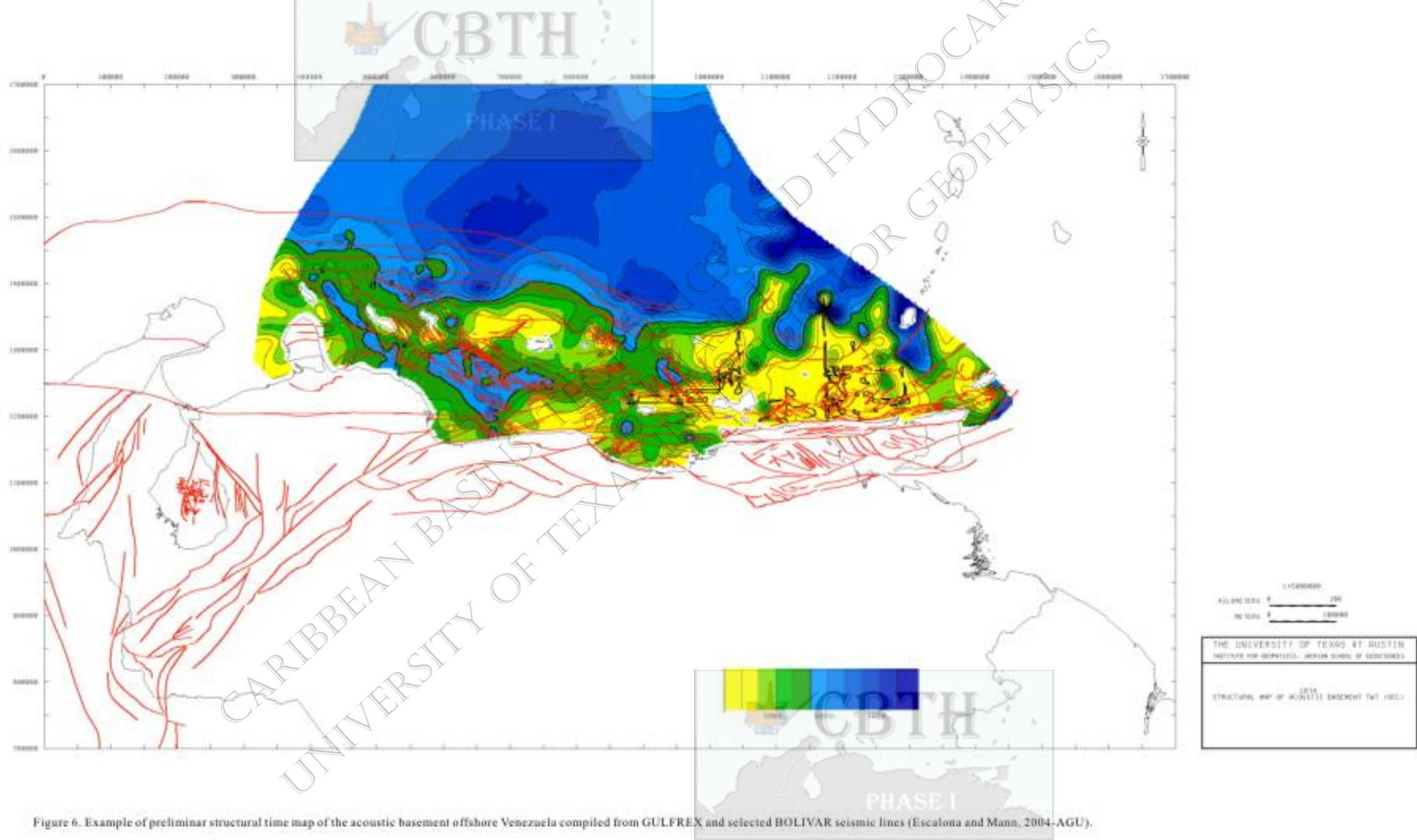


Figure 6. Example of preliminar structural time map of the acoustic basement offshore Venezuela compiled from GULFREX and selected BOLIVAR seismic lines (Escalona and Mann, 2004-AGU).

--- Interest response for consortium proposal ---

**Caribbean Basins, Tectonics, and Hydrocarbons (CBTH): Regional Study of Depositional Systems, Basinal Structure, and Hydrocarbon Potential in the Caribbean Region (Phase I: Northern South America)**

**Yes**, my company commits to support this three year project (Phase I) at the total amount of \$120,000 at the amount of \$40,000 per year, starting September 1, 2005.

The contact(s) at my company for this project will be:

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Telephone: \_\_\_\_\_

Fax: \_\_\_\_\_

Email: \_\_\_\_\_

Comments: \_\_\_\_\_

**No**, my company will not support Phase I of this project in 2005. Please indicate if you would like to be updated on Phase II of this study (deepwater, Cuba-Bahamas-Southern Gulf of Mexico-etc).

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

Comments: \_\_\_\_\_

Please mail or fax this form to:

Dr. Paul Mann

Institute for Geophysics, The University of Texas at Austin

4412 Spicewood Springs Road, Building. 600

Austin, TX 78759

Phone: 1-512-471-0452

Fax: 1-512-471-8844

Email: [paulm@ig.utexas.edu](mailto:paulm@ig.utexas.edu)

