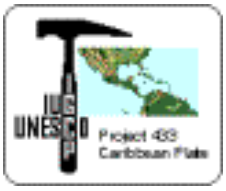

Caribbean Plate Tectonics

ANNUAL REPORT FOR THE YEAR 2002

FIRST PART

Duration and status: On going (2000-2004)

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Date of submission of report: October 20, 2002

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Website address related to the project

www.ig.utexas.edu/CaribPlate/CaribPlate.html

This website contain all the information concerning the project, including project logo, project description, past events and reports, future meetings, Caribbean bibliography, Caribbean models comparison, interesting information, and forum. The FORUM section contain important papers and presentations about the Caribbean Plate Tectonics as ppt* and pdf* files. It is regularly updated in order to keep the scientific community informed about the progress of the project.

1. Summary of major past achievements of the project

During the first two years (2000-2001) some important results were already evident:

Origin of the Present-day Caribbean Plate. The concept that the present-day Caribbean Plate is allochthonous from the Pacific produce models that explain many aspects of the evolution of the Caribbean. Some advocates of the autochthonous models have reconsidered their points during the meetings in Stuttgart and Leicester. However, the allochthonous models still present major problems pending adequate solution.

The Galapagos hotspot and Caribbean plateau. There are two fundamental points of view regarding the role of the Galapagos hotspot in the geology of the Caribbean, which were the subject of extensive debate in Stuttgart and Leicester. One group holds that the Galapagos hotspot has nothing to do with the ProtoCaribbean crust or the Caribbean Plateau basalts, because the hot spot was always positioned west of both of them, and, consequently, was not the source of the so-called Caribbean plateau basalts. The other interpretation holds that the Galapagos hotspot actually produced the Caribbean plateau basalts and the ridges within the Nazca and Cocos plates. Pindell's new unpublished palinispastic reconstructions say that it is impossible that the Galapagos hotspot produced the Caribbean plateau basalts. Trace element and isotopic geochemistry, however, do not rule it out.

Subduction reversal in the Caribbean. The polarity of subduction of the Caribbean plate in Cretaceous time has been an intriguing topic since Mattson in 1979 proposed that a reversal in subduction direction occurred during plate development. A summary of the evidence relevant to a reversal and the possible timing of the event is given by Jolly et al (1998). Most models seemingly require a change in subduction direction. For example, Pindell proposed a flip in the polarity of the arc at about 120 Ma. However, several researchers consider that the arc's subduction flip required by Pindell's model about 120 Ma ago is problematic for several reasons. Those investigating the origin of the plateau basalts disagree because a thick buoyant oceanic plateau would

be very difficult to subduct, and would therefore significantly affect the subduction polarity reversal. They cite the arrival of the buoyant and thick Caribbean plateau at the eastward dipping subduction zone as a mechanism for the flip, in a situation analagous to that seen in the Solomon Islands with the attempted subduction of the Ontong Java oceanic plateau. However, Pindell's latest unpublished model suggests that the 120 Ma polarity reversal occurred before the bulk of the plateau was formed, on the basis of the following pieces of evidence:

a. Abundant evidence for a large tectonic event around that time.
b. Unconformities in many arc-related sequences at ca. 120 Ma.
c. P-T paths from high-pressure metamorphic rocks.
d. Change in geochemical character from PIA to CA in many circum-Caribbean arcs.
e. The earlier the flip occurred, the easier would occur tectonically. At 120 Ma, the arc would have been short and straight and there was a powerful potential mechanism available (the acceleration of the opening of the Atlantic. At 75 Ma, the arc was ~2000km in length, and may have been very highly arcuate in shape, which would require huge internal deformation as the convex side changes from the SW to the SE. However, in the discussion at Leicester it was conceded that there is growing evidence for an earlier pulse of plateau magmatism around 130-120 Ma. If that is the case, an earlier plateau could have formed and caused the postulated subduction flip, and the later plateau building events (78, 90 Ma) could have represented the last pulses of magmatism. Other authors also disagree with the subduction reversal because this flip does not explain the geochemical evolution of the Cretaceous arc magmatism in Cuba (Iturralde-Vinent, A. Kerr), neither the tectonics of north central Cuba. Iturralde-Vinent has postulated a major change in the geometry of the convergent plate boundary between latest Campanian and Paleocene, involving deformation and almost complete extinction of arc volcanism, modification of the trend of the arc axis, and a major change in the orientation and geochemistry of the arc.

Alleged Albian-Campanian arc in Central America. Another subject that did not find agreement is the existence of an active Albian-Campanian island arc in Central America, and its evidence in the Nicoya Complex. According to Calvo and Bolt there is an arc-derived volcaniclastic calcalkaline section in Costa Rica, but several other (K. Hoernle, A. Astorga) stated that their geochemical and geological investigations in the Nicoya Complex do not confirm its presence. An Albian-Campanian island arc as part of present-day southern Central America is a major issue concerning the geology of the Caribbean plate, because the presence of a Central American mid-Cretaceous arc will reduce the rate of relative eastward movement of the Caribbean plate respect to North

and South America, and would have a strong bearing on the palinspastic reconstruction of the circum-Caribbean fold-belts.

Tectonic position of the Cuban Southwestern terrains (CSWT). Many early plate tectonic models of the Caribbean ignored the CSWT, but fortunately, they have been taken into account in more recent versions. However, as demonstrated by the lively discussion at the Havana meeting in March 2001, the geology of the CSWT is still too poorly known to be interpreted without ambiguity. More field and laboratory research focused on the petrology and internal structure of the Socorro (Grenvile), Escambray, Purial and Pinos metamorphic terrains, as well as on the stratigraphy and tectonic position of the Placetas and Rosario belts (terrains) are urgently required before a fair interpretation of the origin of these geologic units can be reached. Available P-t path studies, isotopic dating and geochemical data for the Escambray and Purial are still insufficient.

The Great Arc vs Multiple Arc concept. Pindell's Caribbean models show a single "Great Arc" evolving from Cretaceous to recent as the leading edge of the Caribbean plate progressively occupy the space created by the separation of North and South America. Another concept is that there were multiple arcs that evolved step by step from Cretaceous to Recent. The Multi Arc concept evolves from the following ideas:

a. The occurrence of several magmatic and stratigraphic gaps within the Greater Antilles- Lesser Antilles volcano-sedimentary sections and the presence of unconformities at different time intervals on the various islands.
b. Modification of the geochemistry of the arc magmatism after some of these gaps, especially in Cuba. However this does not apply to all of the tectonic breaks in Puerto Rico.
c. Modification of the orientation and geographic distribution of the arc magmatic axis after each gap, but specially after the earliest Cretaceous boninite and IAT arc, and after the Cretaceous arc.

The Geometry of the Arcs. During the meetings in Rio de Janeiro, Stuttgart, and Cuba the geometry of the arc was the subject of consideration. A debate arose concerning the characteristics of the Greater Antilles- Aves Ridge- Lesser Antilles Cretaceous-Paleogene volcano-sedimentary complexes and the fact that the components of the original arcs (backarc, axial arc, front arc, subduction suture) are not evident in any cross-section of the present-day islands. The issue is that the arcs have been deformed by combined thrusting, extension along the axis, and were subsequently subdivided into distinct terrains that were the subject of rotation and eastward transportation. Consequently, the original geometry of the arcs are no longer represented by today's outcrops and their elements can only be found along specific islands of the chain.

Polarity of the Paleogene Sierra Maestra-Cayman arc. Pindell,Mann and other Caribbean plate tectonic modelers hold the position that the subduction zone of the Paleogene arc was located north of the arc and with a dip to the south. Another group (Iturralde-Vinent, Sigurdson) presented evidence that the Paleogene subduction zone dipped north and was located south of arc. Recent geochemical, geochronological and paleontological research in the area by G. Kyzar favor the subduction from the south model and the fact that the Paleogene arc developed after a Maastrichtian gap in the magmatic activity and with a distinct orientation with respect to Cretaceous volcanism.

3. Achievements of the project this year 2002

3.1 List of countries involved in the project (countries active this year)*

In the present time there are about 200 scientist involved in the project, with participants from the following countries: Canada*, USA*, Mexico*, Guatemala*, Nicaragua, Costa Rica*, Panama*, Perú*, Venezuela*, Colombia*, Argentina*, Trinidad & Tobago*, Barbados*, Puerto Rico*, Jamaica*, Dominican Republic*, Cuba*, Poland, Hungary, Italy*, Germany*, France*, Spain*, United Kingdom*, Japan, New Zealand.

3.2. General scientific achievements

Back in Río 2000, during the opening statements during the first meeting of the project M. Iturralde-Vinent raised the following points:

- In the present time, there are many interpretations of the Caribbean, most of them hard to reconcile
- This situation is the consequence of poor coordination of efforts, and due to working as isolated individuals --or small groups of individuals.
- If we want to understand the origin and evolution of the Caribbean, is urgently needed actual interaction and exchange of data, and sharing the expertise each one has developed working in different arenas.
- Consequently, the aim of this project is to improve communication within the Caribbean PT community, and jointly explore common grounds for the interpretation of the origin and evolution of the Caribbean region.

In order to achieve this goals, we have created an egroup system of communication [carib@yahoogroups.com] and a web site with a section named FORUM to provide a place to post and share interesting results [www.ig.utexas.edu/CaribPlate/CaribPlate.html]. Also we have organized meetings in Río de Janeiro, Leicester, Stuttgart, Boston, Austin, as well as field meetings in Cuba, Guatemala and Barbados.

Therefore, after three years, one can ask if the situation is now any better than before the beginning of this project. The answer is **Yes** and **No**.

Yes, because several working groups have emerge, and new local research projects have emerge, providing a ground for the exchange of data, ideas and expertise. Also, because there have been a more active exchange of data and interpretations among the Caribbean geologists.

Yes, because recent versions of the Caribbean plate tectonic models include more information and focus on problems that were not properly addressed in the past. This do not means that problems have been solved, but as new data became available, and this data are discussed in debate sessions of the projects, they are improving the quality of the models and our own understanding of the origin and evolution of the Caribbean.

No, because there is yet a long way to go. Nowadays there are many key problems awaiting solution, problems that have a strong bearing in the way we understand Caribbean origin and evolution. Nevertheless, progress have been made so now we know better where to focus our research and what are the questions which should be answered. This means that we have develop a method of presenting data and debate which works well.

During the meetings celebrated in these 3 years there have been presented talks suggesting very different tectonics models for the Caribbean. We have been able to organize intense and sometimes very hot debates about supporting data and conceptions. But no consensus have been reached.

This confrontation is very useful, and demonstrate that still remain many unsolved problems in local areas of the Caribbean. Therefore, without better knowledge on these key areas, we will be unable to produce a tectonic model that will be acceptable for the majority of the scientific community.

Allow me therefore to summarize some of the problems that have been debated in previous meetings of IGCP Project 433, some of them as old as the beginning of the project. These problems are of two categories:

1) General, concerning the basic tenants of the plate tectonic reconstructions 2) Local, related to the interpretation of particular areas.

General Problems

1. The early opening of the Caribbean and Gulf of Mexico: an issue of time and space.

2. The autochthonous vs. allochthonous origin of the Caribbean plate

2. The problem of time and space in the reconstruction of tectonic terranes

Local Problems

4. The nature, historic position and palinspastic reconstruction of tectonic terranes as Chortis, Andean, Peñón-Dagua, Guaniguanico, Escambray, Pinos.

5. The nature and historic position of ophiolites and related terrains

6. The conception of a single Great Arc vs. Multiple Arc evolution of the volcanic terranes.

7. The polarity and polarity flip of the volcanic arcs

8. The time span of the arcs' magmatic activity

The problem of the early opening of the Caribbean and Gulf of Mexico: an issue of time and space

Paleontologic data and biogeographic interpretations strongly suggest that probably since Hettangian, more certainly since Pliensbachian, there was a periodic marine biotic exchange between the western Tethys and the eastern Pacific across central Pangaea.

This fact is hard to reconcile with the present models for the time and rate of the break-up of Pangaea. A possible solution is that this biotic exchange may have taken place along the latest Triassic--Jurassic rift valley system within present-day North America. This situation has to be further explored.

Autochthonous vs. allochthonous origin of the Caribbean plate

During every meeting there have been strong debates regarding this problem with authors placed on both ends. In the last meeting in Barbados James Keith championed the autochthonous position, but there are other authors which also follow this point of view, meaning that the allochthonous do not satisfy yet all the expectations.

Generally the allochthonous conception have gain spin in the last years, but many problems remain to be solve within this type of models. Most of these problems are strongly related to the availability of hard data about some local areas in the region.

For example James Keith raised a group of questions regarding the allochthonous origin of the Caribbean Plate. Follow some of the points raised by James (FORUM www.ig.utexas.edu/CaribPlate/CaribPlate.html):

1. Jurassic rift directions on the Maya Block conform with regional extensional strain in North and South America and in the intervening area. They show that the Block has not rotated, a requirement of the allochthonous models.

2. The ocean crust in the Gulf of Mexico follows the same extensional trend and broadens somewhat to the east. If the Maya Block had rotated, this crust would broaden markedly to the west, which it does not.- It is geometrically impossible for a 3,000 kilometers long, straight arc to enter the Caribbean and assume its strongly curved configuration without intense compression of the Caribbean Plate, on which it sits. In fact the Caribbean Plate is highly extended.

3. It is geometrically impossible for the Chortis Block to migrate SE-wards into the Central American location at the same time as the CaribbeanPlate is supposed to be migrating northeastwards.

4. Northward transport of the (South America derived) Middle Eocene Scotland Group sands of Barbados was stopped by the Tiburón Rise, on top of which coeval sands occur (DSDP drilling results; drilling 19 km to the north did not find these sands). The Rise lies on the Atlantic Plate. The relationship shows that the Scotland Group accumulated close to its present location and not north of the Maracaibo area.

5. Coeval Maastrichtian - Middle Eocene clastics throughout Middle America record a regional convergence event that cannot be explained by the allochthonous model, which attributes diachronous flysch deposition to entry and passage of the plate.

<u>The nature, historic position and palinspastic reconstruction of tectonic terranes as Chortis, Andean, Peñón-Dagua, Guaniguanico, Escambray, and Pinos</u>

CHORTIS: During the meeting in Guatemala, there were several presentations to show that the basement of Chortis and the Mexican terranes are quite different, a fact difficult to reconcile with the alleged original position of Chortis in contact with the Mexican terranes. But in Austin P. Emmet presented new data about Chortis. Asked If there is direct evidence for the alleguedly large displacements along the Motagua-Polochic fault zone according to his research in Honduras he expressed that: "Today there are no (or not yet) evidence for the alleguedly large displacements along the Motagua-Polochic fault But I hope that some evidence, perhaps indirect, may be forthcomming from my work. But as I see it, the big questions with regard to Chortis are:

a) Where did the Chortis block start out (let's say, prior to the Middle Jurassic time)?
b) Is there any direct evidence (paleomagnetic? correlation of basement terranes? pre-Cretaceous stratigraphic continuity?) to place Chortis unambiguously within a pre-Cretaceous reconstruction? I hope so, but I haven't done the work to demonstrate this (yet). I know that the same middle Jurassic (Bajocian) ammonites are found in Agua Fria strata in Honduras (Ritchie and Finch, 1985) as are found in Colombia (Bartok and others, 1985) and that lots of workers put these two 'blocks' close together in reconstructions for that time period (Dickinson and Lawton, 2001; Cediel and others, in press <AAPG volume in press on Caribbean>).
c) Since the early Cretaceous, what do stratigraphic facies relationships suggest regarding the relative positions of previously adjacent terranes (southern Mexico, Chortis, Colombia/N. South America)? Clearly this is also a question of paleomagnetic records within these strata (it might be true that the Jur-Cret-early Tert strata of Chortis have been significantly undersampled to be able to say with confidence what a polar wander pathway for the block should look like; is there more than one block?).
d) Is there any other explanation for the evolution of the Swan transform and Cayman trough basins that do not require large displacements along the M/P fault system????
P. Emmet also pointed out, concerning the different basement of Chortis and Mexican terranes the following: "I am quite sure that there are at least a few provinces within the Chortis block in which the basement characteristics are lithologically, mineralogically and magnetically distinct from one another. I do not have a problem visualizing how these distinct basement types might have evolved across an area the size of Chortis (collage tectonics along a convergent pre-Cretaceous margin?) and so I would imagine that the major basement heterogeneities predate the mid-Jurassic rifting of NOAM / SOAM and the dismemberment of Chortis and perhaps some other basement blocks (Maya, etc). It would seem reasonable to me to think that these basement heterogeneities might be correlated across a number of basement blocks in order to reconstruct the pre-Cretaceous location of the Chortis block. It must be kept in mind, however, that the magnetic character of basment may be easily overprinted later by igneous intrusions or by the tectonic emplacement of magnetic rocks (ophiolites). The most interesting observation from the country-wide aeromagnetic data base of Honduras (not illustrated in the data shown in my presentation to UTIG of 20 Sep 02 which focused only on the most eastern part of the country) is the distinction between highly magnetic basment in the north and weakly magnetic basement in the south. Clearly, it is problematic to distinguish the impact in the magnetics of the numerous igneous intrusions and volcanic flows in the north (Horne, 1976b; Manton and Manton, 1984) from the magnetic signature due only to the high(er) grade metamorphic basement (Horne

and others, 1976a; Manton, 1996), as compared to the lower grade pelitic schists in the south (Fakundiny, 1970). But I suspect that careful work on documenting and distinguishing the basement rocks of the Chortis block would enable a comparison to the basement rocks of southern Mexico and/or Colombia in order to test proposed reconstructions. I don't think that this has yet been rigorously done."

CUBAN SOUTHWESTERN TERRANES: Despite the fact that we believe that these are allochthonous terranes, their original position is a matter of very different interpretations. There is no way of rebuilding the early configuration of Pangeae if we do not solve this problem. This is an issue that now is a matter of research by dating and Pt path of metamorphic rocks, so we will soon have best data to address this problem.

PEÑON-DAGUA-SIQUISIQUE TERRANES: Their original position is a matter of very different interpretations and are poorly constrained yet. But the position of both the Siquisique and Penon-Dagua must be resolved in order to understand the evolution of the Caribbean.

Time and space constraints during the reconstruction of tectonic terranes

There is a regular problem in the treatment of time and size regarding the evolution of tectonic terranes in many plate tectonic reconstructions of the Caribbean region. For example, the size of the Jurassic and Cretaceous basins represented by the stratigraphic sections of the Guaniguanico terrane, went through a process of extension during the Mesozoic, and were compressed and piled as a stack of thrust sheets during the Early Cenozoic. Therefore, the present size of the Guaniguanico terrane can not be extrapolated to the Mesozoic. BUT, is a common method to keep present-day size when the terrane is re-located to its alleged original position. The same is true for the Escambray and Pinos terranes.

The nature and historic position of the Caribbean ophiolites

To understand the origin of the Caribbean, it is necessary to identify the nature and provenance of the ophiolites and related igneous complexes within the area. Latest petrological research has produced new data which strongly complicate our original views. In Cuba, the so called northern ophiolite probed to be a tectonic mixture of several different tectonic units. The same complex picture arose in Guatemala, Dominican Republic and Puerto Rico. New data, being published in recent years, also follow the same trend of discovering complexity where simplest models were applied.

For example, a growing amount of data strongly suggest the occurrence of back arc magmatic rocks in the Cuban northern ophiolites, but also there are indications of the presence of suprasubduction magmatic rocks

probably arc related. At the same time, there are indications of a minimum of two ocean crustal elements, probably due to two distinct stages of oceanic spreading. These issues have to be properly addresses in the future, as they have no place in present plate tectonic models.

The conception of a single Great Arc vs Multiple Arc evolution of the volcanic terranes

If there is a single arc evolving from Cretaceous to Recent, why there are important unconformities and interruptions of the magmatic activity, why many reorientations of the axis of the arc? This is a problem that has not been properly addresses, and has been pending since the beginning of the project. This matter will be the subject of attention in several forthcoming meetings.

The polarity and polarity flip of the volcanic arcs

The polarity of the Paleogene arc in eastern Cuba have been proposed to be both North dipping and South dipping. But the North to South dipping model is just ignored and not properly debated by those with a different interpretation. We will dedicate a field workshop to address this issue.

The time span of the arcs' magmatic activity

In general, arcs last just few tens of millions of years, for example in the western Pacific. The same picture arose if we measure the time elapsed between unconformities within the Cuban arc. The same unconformities found in Cuba during the Aptian-Albian, Santonian-Campanian, Maastrichtian-Paleocene and Middle Eocene have been described in Hispaniola, Puerto Rico and Jamaica. More attention has to be paid to these unconformities and their bearing in the evolution of the arcs. Also, data have been provided regarding the possibility of change not only in polarity, but also in trend of the axial part of the arc. The present set of "single arc" models do not fully account for these changes in orientation.

Questions to be addresses in future meetings:

Concluding, some of the problems that remain to be solved, or at least require further discussion and agreement, are:
(A) Is there one or several plateau basalts events in the Caribbean?
(B) If the Galapagos Hot Spot is unrelated to the origin of these plateau basalts, then how did the plateau basalts form?
(C) Is the thick Caribbean crust a result of a mantle plume, the result of plate superposition by subduction, or are there other causes?
(D) Is there a section of Lower Cretaceous volcanic arc rocks in southern Central America?
(E) What and where are the relicts of the original ProtoCaribbean crust?
(F) Are these relicts present within or adjacent to the ophiolite belts

along the plate boundaries?
(G) Are the Aptian-Albian, Santonian-Campanian, Campanian-Maastrichtian, Lower Paleocene and Middle-Late Eocene unconformities in the volcanic arc sections of a single or of different origins?
(H) Is the prominent unconformity in the Aptian-Albian volcanic arc sections of regional extent and is it related to a change in arc polarity?
(I) Is there a single volcanic "Great Arc" since the Aptian-Albian to the Present, or there were several arcs evolving as in circum Pacific region?
(J) Are the Cuban Cretaceous and Paleogene volcanic arcs a single back arc (main Cuba)-axial arc (Sierra Maestra) couple as proposed by Pindell?
(K) Are they instead two distinct arcs, as suggested by geochemistry, petrology and classic regional geology?
(L) Is there any true axial arc section in the Paleogene rock suites of Hispaniola and Puerto Rico-Virgin Islands?
(M) Are the Paleogene igneous rock suites in Hispaniola and Puerto Rico-Virgin Islands of back arc or front arc instead of axial arc?
(N) Did the Yucatan basin actually open during the Paleogene?
(O) Did this proposed Paleogene event fracture and subdivide the Cuban volcanic arc igneous suites into two branches so that now one suite is the main Cuban island arc (back arc setting) and the other Sierra Maestra-Cayman ridge arc (axial arc setting)?
(P) Are the Cuban Southwestern allochthonous terranes (Guaniguanico, Pinos and Escambray) deformed crustal sections of the ancient margin of North America?
(Q) If so, where were their original locations and do they actually represent ancient basins that are now deformed and superimposed as a stack of thrust units?
(R) Why do some models show these terranes as being of the same size in both the Mesozoic and the Present?
(S) How and when were these terranes emplaced to their present position?
(T) Where they just dragged, according to the allochthonous model, as crustal fragments in front of the leading edge of the Caribbean Plate?

In fact, it is possible to add many more questions, but this can be a never ending exercise. We need, in future years, to start discussing some of these issues within the egroup, and by this method, bring our debate to a new level and to reasonable conclusions.

During the business meeting in Barbados, scheduled as the Annual Meeting for this year 2002, two major issues were evaluated: The need to start working on the preparation of the final memoir of the Project. In this regard, potential contributors are requested to start thinking about their papers in three lines:

1. Historical evaluation of Plate Tectonics in the Caribbean,

2. Caribbean Plate Tectonic Models,

3. Papers contributing with hard data bearing on the understanding of the Caribbean geological evolution.

The second subject was to remember to all project's members to recognize IGCP Project 433 membership in their papers. Unfortunately, even some major contributors to the project forgot to add this line in their abstracts and papers.

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3.3. List of meetings with approximate attendance and number of countries

Field workshop on the Motagua Fault Zone, Guatemala, January 28-February 1, 2002

Participants: The persons and institutions attending the meeting were Agostino Zuppetta, Alex Vaides Delgado, Allan Cosillo, Antonio Garcia Casco, Armando Orellana, Aroldo Perdomo, Byron Mota, C. Carbone, Carlos A. Dengo, Carlos Hermosilla E., Carlos Tobar, Cecila Pall, D. Cutrupia, Eddy Sanchez, Edgar Pérez, Elisa Padoa, Emanuele Lodolo, Ericka Muralles, F. Lentini, Dengo's family, Fernando Ortega, Gabriela Walker, George Harlow, Gianfranco Principi, Giuseppe Giunta, Guillermo Scheel, Anna Miller, Hans G. Ave Lallemant, Hugo Berganza, Jades, S. A. 1, Jaime Godoy Chajón, Jaime Requena, Jay Ridinger, Jorge Luis Avalos, Jorge Romero, José Escribá, Joshua Rosenfeld, Juan Carlos Amado, Juan Carlos Galindo, Julia Alvarez, Julio Luna, Lee P. Mosheim, Luca Pandolfi, Luigi Beccaluva, Luigi Solari, Luis Arturo Wug, Luis Chiquin, Luis Estrada, Luz Helena Hernandez, Malberto Pinzón, Manuel Chavarría, Manuel iIurralde Vinent, Manuel Lemus, Manuel Mota, Maria Edna Vidaurre, Mario Martinez G., Mark Gordon, Mary Lou Ridinger, Massimo Gillardi, Mauricio Chiquin, Michele Marroni, Miguel Angel Carballo, Mirella Archila, Napoleon Rodriguez, Natanael Martinez, Nestor Diaz, Omar Flores, Otto Bohnemberger, Otto Galicia, Otto Garcia, Pedro Corona Chavez, Percy Denyer, Roberto Arimany, Ronald Collins, Russell Seitz, S. Carbone, S. Mazzoli, Sam Bonis, Sergio Moran, Stephen Maynard, Uwe Martenz, Wilmer Tení Pop, Director de Hidrocarburos, Director de Minería, Pietro Porcarelli Embassador of Italy and Massimo Gilardi director of the Italian Institute of Cultur, and executives of CEMPRO S.A., and Conred S.A..

Annual Business Meeting and Field Workshop on the Eastern Margin of the Caribbean Plate, Barbados, June 16-23, 2002

This meeting was well attended by about 47 participants from Barbados (3), Puerto Rico (5), Cuba (4), Jamaica (5), Venezuela (3), United States of America (10), United Kingdom (1), Germany (2), Spain (2), France (2), and more than 20 other interested scientists who attended the presentations and debate.

Participants: James Pindell, Antonio Garcia Casco, Klaus Stanek, John Weber, Manuel Iturralde-Vinent, Edward G. Lidiak, John F. Lewis, Grenville Draper, Reinaldo Rojas, Ramona Rodríguez, Kustrini Sukar, Walter Maresh, James Keith, Leslie Barker, Trevor Jackson, Peter Scott, Wilson Ramirez, Jans Schellekens, Daniel Leo-Davila, Pablo Lleranti, Simon Mitchell, Jose A. Martínez, Hernan Santos, Leonardo Cruz, E. Deville, A. Mascle, M. Martínez Colón, Christian Tevssier.

Workshop at the University of Texas: Contributions to the Caribbean Plate Tectonics, September 20, 2002

Participants 38 (USA, Cuba, Venezuela, Trinidad and Tobago): Scot Krueger, Stefan Boettcher, Steve Creaney, Bolaji Famakinwa, Ian Norton, Michael Sullivan, Pete Emmet, Ian Dalziel, Lisa Gahagan, Sean Gulick, Paul Mann, Kirk McIntosh, Tom Shipley, Harm van Avendonk, Wulf Gose, Samarjit Chakraborty, Alejandro Escalona, Mochammad Fachmi, Martha Jaime, Robert Rogers, Armando Sena, Sean Sullivan, Songul ILDIS, Kathleen Howard, Kilic, Cem O., Cari Breton, Lesli Wood, André Droxler, Lanette Marcha , Alastair John, Jinny Sisson, Armando Altamira, Dan Fernández, Mike Murphy, Sonya Punch, Isabel Serrano, Charlotte Sullivan, Yahya Ciftai, M. Iturralde-Vinent

3.4. Educational, training or capacity building activities

N/A

3.5. Participation of scientists from developing countries

In every meeting of the project the participation of scientists from developing countries is encouraged and supported by the project, specially when one of the leaders is from a developing country. We believe that there have been important participation, specially because we have been able to celebrate the meetings in developing countries, simplifying the assistance of local geologists as in Guatemala and Barbados. Scientists,Ph.D and MSc students are participating from 11 developing countries.

3.6. List of most important publications

At the end of this report are listed almost 100 publications, including abstracts and extended abstracts of the meetings in Barbados and Austin, as well as abstracts of publications and reference to published papers without abstracts. Three important contributions in this year are the field guide to the Motagua Fault Zone in Guatemala, the Abstract Volume of the Barbados' Conference, and an AAPG Memoir in press.
A comprehensive list of publications and abstracts is included as the second part of this report.

3.7. Activities involving other IGCP projects or the IUGS

The project leaders participated in a join IGCP meeting in Boston, during the annual meeting of GSA in 2001.

4. Activities planned

4.1. General goals

The next two years 2003-2004 of the project are aimed toward tightening the relationships among the Caribbean scientists in order to upraise the level of communication and exchange of data and ideas concerning the problems of the understanding of the origin and evolution of the Caribbean.

From now on we start to introduce specific questions in the egroup, so to encourage and widened the exchange between the project egroup members. These questions will be generally related to the subject that will be the center of debate in the forthcoming meetings.

We will also be working in the production of a memoir that must cover the various subjects that have been under debate these years, and present the most important models which address the plate tectonic evolution of the area from an updated perspective and considering different points of view.

4.2. Specific meetings and field trips (please indicate participation from developing countries)

In all the following meetings there will be participants from developing countries, partially supported by IGCP Project 433, partially by other sources. In each of these meetings and workshop there will be addresses the questions of local and general character raised above.

1. **LA HABANA, CUBA. March 24-28, 2003.** IGCP P433: A single vs multiple arc interpretation of the Caribbean. Field trip to th e Ophiolites and Cretaceous and Paleogene arc terranes in eastern Cuba. Field workshop of IGCP Project 433. Dr. M. Iturralde-Vinent (iturralde@mnhnc.inf.cu) will be coordinating this meeting of the project. For more information visit www.scg.cu.

2. **FREIBERG, DE. May , 2003.** IGCP P433: Contribution of Petrology and Geochronology to the Plate Tectonic Interpretation of the Caribbean. IGCP Scientific meeting. Dr. Klaus P. Stanek (stanek@geo.tu-freiberg.de) will be coordinating this meeting of the project. For more information about the Colloquium visit www.geo.tu-freiberg.de/dynamo/lak2003.

3. **GRANADA, SPAIN, September, 2003.** IGCP P433: Contribution of Iberian-Latinamerican projects to the Interpretation of the Caribbean origin and evolution. Conveners: A. García Casco, J. Proenza, M. Iturralde-Vinent. The date is still pending definition.

7. Attach any information you may consider relevant

7.1. REPORT OF THE BARBADOS MEETING

The 16 Caribbean Geological Conference took place in Barbados, British West Indies, between June 16 and 23, and included field trips, workshops and scientific meetings. As part of the Conference, IGCP Project 433 organized a Field Workshop and Business Meeting, which will be briefly described in the following paragraphs. We all agreed that the conference in Barbados was a great opportunity for exchange and debate, we learned from the field trips and scientific presentations, and especially enjoyed the hospitality and wonderful landscape of the island. The purpose of this report is to describe briefly the scientific results and progress made at this conference.

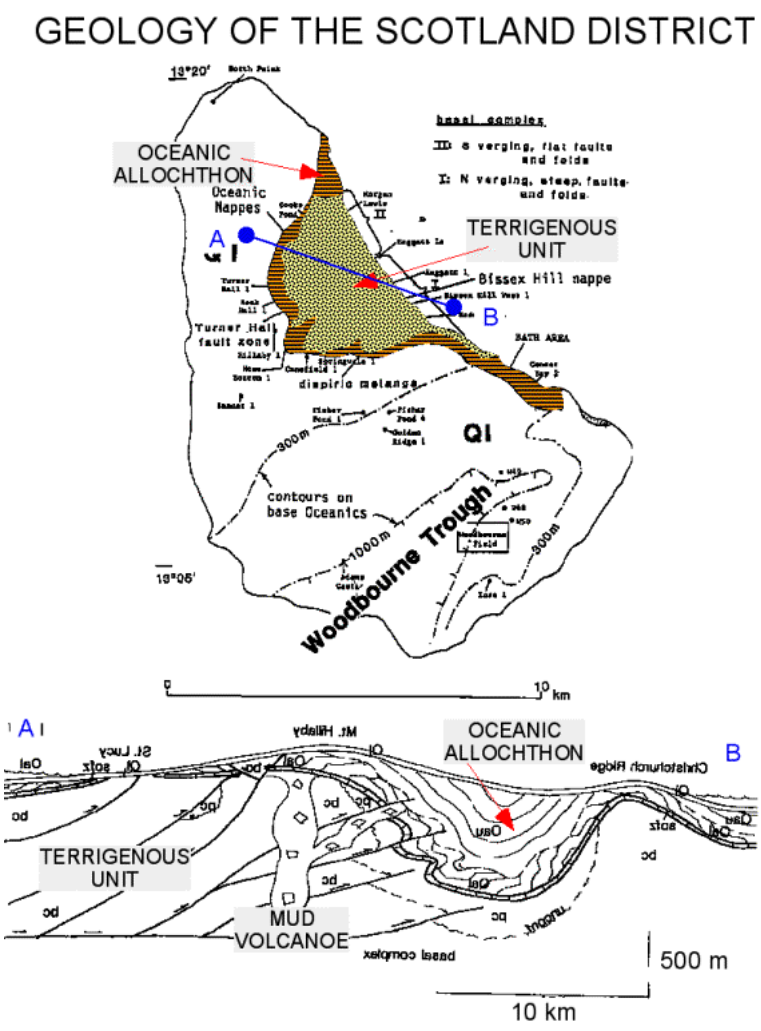
Field trip to the Scotland District: Exposed example of an accretionary prism.

Field trip leader Robert C. Speed, Northwestern University, Department of Geological Sciences, Evanston, Illinois 60208, USA.

The island of Barbados is the only emergent peak of the Barbados ridge complex. It lies above the active subduction zone between the Caribbean and South American plates. In the Scotland District is exposed two fault bounded deformed units: 1) the mid-middle Eocene to late Oligocene oceanic allochthon and, 2) the Early to Late Eocene terrigenous unit. The oceanic allochthon was emplaced from west to east above the western (inner) front of the accretionary prism in the Middle Miocene. It is composed of well-bedded yellowish pelagic marls with gray intercalations of volcanic ash that do not contain terrigenous sediments. The sole of this tectonic section is a distinctive zone of deformed rocks. The terrigenous unit is interpreted to be an entirely submarine turbidite fan deposit, composed of non-amalgamated sandstones, amalgamated sandstones and multi-layers of mudstone and sandstones. The section is quartz rich, with conglomerates containing a wide collection of rocks eroded from the South American continent, but there is no volcanic ash in this unit. Inactive mud volcanoes cut through previous units, and are mainly represented by a mass of poorly sorted fragments of older rocks.

Members of IGCP Project 433 participated in this very interesting field trip which started at Chalky Mount, a hill 175 meters above sea level, and ended at the sea shore, after an exercise of walking and climbing along a poorly forested and rugged landscape. One of the many interesting features observed was that most of the accretionary section consists of terrigenous and pelagic sediments and that only the oceanic unit contains some distal volcanic material, even though it was deposited in a fore arc environment. In comparison, all of the Cretaceous volcanic arc deposits of Cuba contain a large amount of volcanic material, whereas in the Cuban Paleocene-Early Eocene arc sections volcanic material occurs as far away as 200 km from the volcanoes, and only in those sections located more than 300 km away, do pure sedimentary rocks dominate and with only isolated horizons of volcanic ash. This trip was a unique opportunity to see an exposure of a true accretionary prism, with the guidance of a person who knows this area in great detail. The excellent field guide to this and others areas of the Lesser Antilles is available from the organizers of the Conference.

Some members of the IGCP Project also visited St. Vincent Island after the meeting, to see a volcanic island and its active volcano.



SCIENTIFIC MEETING: The status of the debate about the Caribbean Plate Tectonic Interpretation

Conveners: Manuel A. Iturralde-Vinent and Edward Lidiak

There were two kinds of oral and poster presentations: theoretical ones about the plate tectonic modeling of the Caribbean, and those providing new data and interpretations from different parts of the region. A third and very important part of the scientific meeting was a very active Open Debate about the latest version of the plate tectonic model of J. Pindell and his collaborators.

In the introductory words to the meeting, M. Iturralde-Vinent presented an evaluation of the status of the Project, based on an updated version of the 2001 Project Report

(www.ig.utexas.edu/CaribPlate/CaribPlate.html). In the following presentations and debate, most of these issues were revisited and discussed in greater details.

Presentations

Manuel Iturralde-Vinent
Introductory words: Status of the Debate about the Caribbean Plate Tectonic Interpretations

JAMES, Keith
A simple Synthesis model for the Evolution of the Caribbean

PINDELL, J., KENNAN, L., MARESCH, W., STANEK, K., DRAPER, G.
Evolution of the Northern Portion of the Caribbean Plate: Pacific to Bahamian Collision

STANEK, K., MARESCH, W., GRAFE, F., GREVEL, C., MILLAN, G.
Tectonics, Petrology and Geochronology of Escambray Complex, Central Cuba

PINDELL, J., KENNAN, L.
A critical assessment of Caribbean tomography in light of Caribbean kimematic evolution.

GARCIA CASCO, A., ROLDAN TORRES, R., MILLAN, G., ITURRALDE-VINENT, M., NUÑEZ, K., PEREZ de ARCE, C., FONSECA, E., MORATO, D., QUINTANA, O.
Diversity of Tectonic Settings of Formations and Metamorphism of Basic Rocks From the Northern Serpentinite Belt of Cuba: A Preliminary Statement and Consequence

MARESCH, W., GERYA, T., KREBS, M., SCHERTL, H-P., DRAPER, G.
The Serpentinite Melanges of the Rio San Juan Complex Dominican Republic and the Dynamics of Subduction Zones

LIDIAK, E.
The Role of Radiogenic Isotopes in Deciphering the Evolution of the Plate Tectonic Interpretation

LEWIS, J.
Is there a Regional Albian Unconformity in the Greater Antilles?

PINDELL, J., ROSENFELD, J.
Key Moments in the Evolution of the Gulf of Mexico

CRUZ, L., TEYSSIER, Ch., WEBER, J.
Structural Styles, Deformation and Exhumation of Ductile Crust in Convergence: The Eastern Caribbean Plate Boundary

ROJAS, R.
Stratigraphic distribution of rudists genera in the American province

ITURRALDE-VINENT, M.
Early evolution of the Gulf of Mexico and the Caribbean

LIDIAK, E., JOLLY, W.
Water Island Formation, US Virgin Islands: A New Look at the Original Primitive Island Arc (PIA) Suite of the Caribbean

SUKAR, K., PEREZ, M., LLANES, A., ULLOA, M., RODRIGUEZ, R.
Oceanic Plagiogranites of Cuba

The Debate

The position in favor of an in situ origin for the Caribbean Plate was championed by K. James, with the presentation of a "Simple synthesis model..." and a discussion of arguments for and against the far-field origin of the Caribbean Plate (his model will be available at the project's web page). His interpretation uses as a present day analog the North Atlantic Ocean around Iceland. Some of the points against the allochthonous model raised by J. Keith are the following:

- Jurassic rift directions on the Maya Block conform with regional extensional strain in North and South America and in the intervening area. They show that the Block has not rotated.

- The ocean crust in the Gulf of Mexico follows the same extensional trend and broadens somewhat to the east. If the Maya Block had rotated, it this crust would broaden markedly to the west, which it does not.- It is geometrically impossible for a 3,000 kilometer long, straight arc to enter the Caribbean and assume its strongly curved configuration without intense compression of the Caribbean Plate, on which it sits. In fact the Caribbean Plate is highly extended.

- It is geometrically impossible for the Chortis Block to migrate southeastwards into the Central American location at the same time as the Caribbean Plate is supposed to be migrating northeastwards.

- Northward transport of the (South America derived) Middle Eocene Scotland Group sands of Barbados was stopped by the Tiburón Rise, on top of which coeval sands occur (DSDP drilling results; drilling 19 km to the north did not find these sands). The Rise lies on the Atlantic Plate. The relationship shows that the Scotland Group accumulated close to its present location and not north of the Maracaibo area.

- Coeval Maastrichtian - Middle Eocene clastics throughout Middle America record a regional convergence event that cannot be explained

by the allochthonous model, which attributes diachronous flysch deposition to entry and passage of the plate.

During two later talks, most of James' arguments were debated by J. Pindell, who opposed the autochthonous interpretation. The discussion concerning an in situ vs allochthonous origin of the Caribbean continued for about two hours in the "Open Debate" session where J. Pindell was asked to made a detailed presentation of his model, and it was the subject of many critical comments and questions.

During this debate, it became clear, at least to some of us, that the allochthonous origin for the Caribbean Plate explains more aspects of the evolution of the Caribbean, but at the same time, as Iturralde-Vinent indicated in the introductory words to the session, this type of model still contains many unsolved problems and issues that need to be properly addressed.

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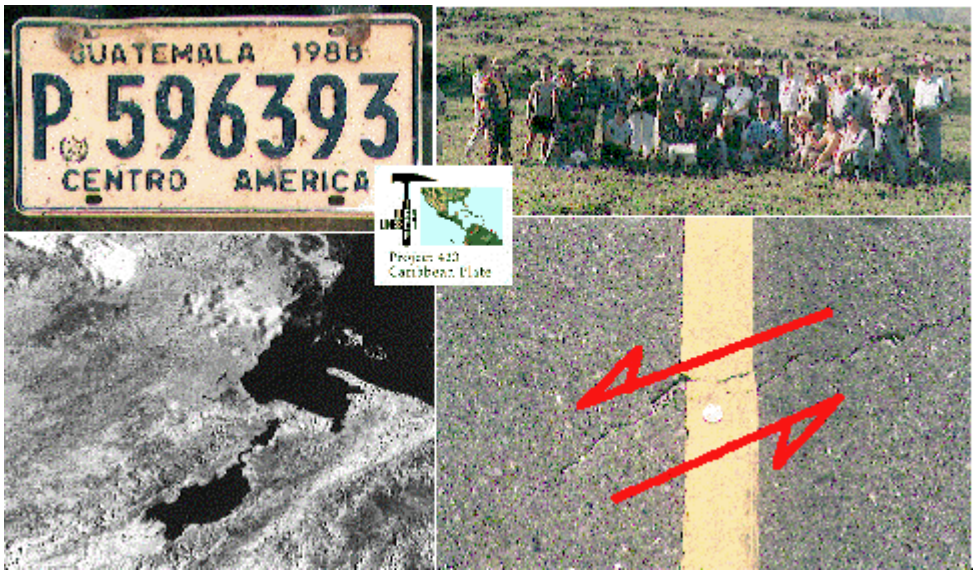
7.2 REPORT OF GUATEMALAN MEETING

Italian-Latinamerican Geological Meeting and IGCP 433 Workshop on the Motagua Suturo zone in Guatemala

The IGCP 433 Workshop and Field trip on the Motagua Suture Zone of Guatemala, was organized by the Italian Caribbean Working Group, the IGCP Project 433 and the Sociedad Geologica de Guatemala. It has taken place on January 28 at the Italian Institute of Culture in Ciudad de Guatemala, followed by a field trip (January 29 - February 1) along the Motagua Suture Zone. Conveners G. Giunta and M. Iturralde-Vinent.



During the workshop, held in honor of Gabriel Dengo, 90 participants attended and several topic papers were presented by researchers from different countries, who addressed the main problems related to the history of the Motagua Fault Zone in Guatemala. The main presentations are the following:

Italian Ambassador (dr Pietro Porcarelli) and Director of the Institute of Culture (dr Massimo Gilardi): Welcome

B.MOTA , Sociedad Geologica de Guatemala: Gabriel Dengo In memorian.

C. DENGO: The human and scientific carrier of Gabriel Dengo.

M .ITURRALDE-VINENT: Evolution of the western plate margin of the Caribbean.

G. GIUNTA, L. Beccaluva et al.: The field trip guide book on the Motagua Suture Zone.

Y. DILEK: Tethyan vs. Cordilleran Ophiolites and Ocean Crust Generation in Subduction-Accretion Systems: An Overview.

F. ORTEGA : Conexiones geológicas entre el Bloque de Chortis y el Sur de México: hechos y conjeturas.

L. SOLARI, J. Keppie, F. Ortega : Pre-Mesozoic tectonics of southern México.

A. LOPEZ : The Motagua suture zone in the ligth of the regional modern stress field: dynamic and kinematic constraints.

M. GORDON, C. Pall-Gordon, H. Avé Lallemant : The Jocotan-Chamelcon fault zone.

G. HARLOW, V. Sisson, S. Sorensen, R. Seitz, H. Avé Lallemant : High pressure in MSZ and jadeitites: implications for emplacement tectonics and geochemical processes.

J. ROSENFELD : The Sierra Santa Cruz tectonics.

Debate conducted by M. Iturralde-Vinent

The field trip to the Motagua Suture Zone was attended by more than 40 specialists. During this days the group was able to visit both sides of the main fault zone, as well as the valley of Motagua where the main fault is located. The Motagua Suture Zone is a singular Mesozoic-Tertiary collisional system where several ophiolitic units occur between the Maya and Chortis continental blocks, to the north and south

respectively. Since the middle Tertiary, a sinistral strike-slip fault system, still active today, has developed (Motagua Fault Zone) which has strongly dismembered the collisional complex, in an W-E direction.

In the Motagua Suture Zone, several Late Jurassic-Cretaceous ophiolitic units have been recognized thrusted northward onto the Maya continental block whereas the South Motagua Fault (SMF) thrust southward onto the Chortis continental block (Sierra de Santa Cruz (SSC), Baja Verapaz (BVP), Juan de Paz (JPZ) and North Motagua Fault (NMF). Ophiolitic boudins outcrop in places along the main strike-slip faults. The whole belt appears significantly affected by metamorphism and penetrative deformations, related to the metamorphic processes in both oceanic environment and/or during exumation and obduction.

Petrographic and geochemical analyses of the most representative ophiolitic lithotypes suggest that pure mid-ocean ridge (MORB) affinity characterizes both SMF and NMF ophiolites; island arc tholeiitic (IAT), in a suprasubduction oceanic setting, and island arc calcalkaline (IAC) affinities prevail in the ophiolitic associations of SSC, JPZ and BVP units, overthrusting onto the Maya block.

1st Day (29/1/2002):
Geological overview of the Motagua Valley and cross-section through the South Motagua Unit.
Route: Ciudad de Guatemala - Sanarate - Sansare - Sanarate - El Progreso - El Rancho - Rio Hondo

2nd day (30/1/2002):
Cross-sections through the North Motagua Unit, and the Juan de Paz Unit.
Route: Rio Hondo - San Agustin Acasaguastlan - Zacapa - Juan de Paz- Rio Dulce.

3rd day (31/1/2002):
Cross-section through the Sierra Santa Cruz Unit.
Route: Rio Dulce- El Estor- Soledad- Rio Cahabon- Oxec mine- El Estor- Rio Dulce.

4th day (1/2/2002): Return from Rio Dulce to Ciudad de Guatemala.

The guide book was published in June 2002 by the international journal "Ofioliti"

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7.3. REPORT OF MEETING IN AUSTIN:

IGCP Project 433: Caribbean Workshop: Towards an Integrated Understanding of Caribbean Tectonics and Stratigraphy - Contributions From Texas

University of Texas Institute for Geophysics, Austin, Texas, September 20, 2002. Conveners: L.M. Gahagan and P. Mann

The purpose of this Caribbean workshop, "Towards an Integrated Understanding of Caribbean Tectonics and Stratigraphy - Contributions From Texas," was to focus on Caribbean research conducted by academic and industry scientists in the state of Texas, to promote communication between these scientists, and to contribute towards the IGCP Project 433 correlation effort. The meeting was well-attended with speakers/visitors from Rice University (Houston), the University of Houston, and the University of Texas at Austin as well as several oil industry representatives. The presentations covered a broad spectrum of topics.
Many of the presenters provided abstracts for their talks after the meeting. These abstracts are included in this report .
Lisa Gahagan started the meeting by presenting a shorted version of Manuel Iturralde-Vinent's overview of IGCP Project 433, "Caribbean Plate Tectonics." She then presented a Powerpoint animation, "Plate Tectonic Evolution of Central America and the Caribbean (90 Ma to Present Day)" of the **PLATES** Project's plate tectonic model for the region. This model has recently been updated by additional magnetic anomaly picks in the eastern Pacific Ocean. In the discussion afterwards, it was pointed out that the evolution of the southern boundary of the Caribbean needed some additional work; Amos Salvador (UT-Austin) stated that the Cretaceous stratigraphy and the presence of the Merida arch straddling the Bocono fault of northern South America does not support an interpretation of large-scale right-lateral motion between the Maracaibo block and the South American craton. Michael Sullivan (ExxonMobil) pointed out that the rate of forward progression of the Great Arc was irregular and needs revision in the animation.

Other highlights of the presentations included:

1) Pete Emmet (Brazos Valley Services) reviewed recent developments with the geology of Honduras and the Nicaraguan Rise. He presented industry data collected in the 1970s showing improved correlations between Cretaceous-age thrusting in Honduras and the offshore Nicaraguan Rise.

2) Jinny Sisson (Rice Univ.) presented thermochronological evidence suggesting that the oblique collision of the Caribbean plate and northern South America did not proceed in a progressive fashion as shown on the

plate animation but instead occurred as an Eocene event followed by a Miocene event felt along the length of the margin.

3) Wulf Gose (UT-Austin) presented paleomagnetic evidence showing large block rotations in the Sierra de Perija of western Venezuela. This study addresses the problem of correlation between the Sierra de Perija and the Merida Andes and the amount of offset on the Bocono fault. Paleomagnetic rotations of blocks in the Sierra Perija indicate modest amounts of strike-slip on the order of 10 km.

4) Sonya Punch (Univ. of Houston) reviewed recent field results from a provenance study of Tertiary sandstone samples collected in Barbados and Trinidad. This study addresses the problem of stratigraphic correlation between the two islands.

5) Stefan Boettcher (ExxonMobil) reviewed industry data from the Trinidad margin of northeastern South America showing the importance of the type of crust for the style of deformation observed in the offshore area.

RELATED PROJECTS IN THE CARIBBEAN AREA

a. Project BTE2002-01011 of the Spanish Ministry of Science and Technology entitled "Metamorphic terranes from the northern Caribbean boundary (Cuba)". Univ. Of Granada (Spain).

b. Caribbean margin of South America. Rice University (USA).

c. Paleobiotas of the Greater Antilles and its Paleogeographic implication, Museo Nacional de Historia Natural (Cuba), Museo de La Plata (Argentina).

d. Geochemistry of Puerto Rico-Virgin Islands, University of Pittsburgh

e. Italian-Caribbean research of the Caribbean margins

f. Ibero-american research in Hispaniola

g. Research of the Puerto Rican tectonics and geochemistry, FIU and Univ. of Puerto Rico

Report of the Italo-Caribbean working group

The aims of the WG in the 2001-02 have been the researches related to the tectonic history of the Caribbean plate margins, in particular through the study of the ophiolitic units involved in that orogenic belts.

In the 2001-02, the group has carried out field works in Guatemala, Cuba, Hispaniola and Venezuela, with a structural and petrological target.

In the January 2002 has been held the IGCP 433 Workshop and 2^ Italian-Latin American Geological Meeting in memory of Gabriel Dengo on *The Motagua Suture-Zone in Guatemala.*

The routine-researches have been carried out in the geological laboratories of the Italian universities of Palermo, Ferrara, Pisa and Firenze.

The next activities will be the more detailed tectonic reconstruction (with at least 2 or 3 field trips)of the main sector of both the northern and southern plate's margins, also in the aims of the final IGCP 433 symposium at the Internacional Geological Congress of Florence 2004.

At the moment, the Italian Caribbean WG is composed as follow:

Giuseppe Giunta (leader) –Univ. Palermo

Luigi Beccaluva (co-leader) Univ. Ferrara

Daniela Cutrupia –Univ. Palermo

Massimo Coltorti, Franca Siena, Carmela vaccaio – Univ. Ferrara

Michele Marroni, Luca Pandolci – Univ. Pisa

Gianfranco Principi, Elisa Padoa, Ivan Aiello – Univ. Firenze

Piera Spadea – Univ. Udine

Emanuele Lodolo – Univ. Trieste

Report of the Ibero-Latinamerican Project on Metamorphic terranes

Proyecto terminado: Evolución metamórfica y trayectorias P- T- t de terrenos acrecionados (Cuba Central) Duración: 1997-2000
Entidad Financiadora: Dirección General de Enseñanza Superior, Ministerio de Educación y Ciencia
Investigador Principal: Antonio García Casco
Entidades Participantes: Universidad de Granada (España)

Proyecto actual "Terrenos metamórficos en el margen septentrional Del Caribe (Cuba)" Duración: 2002-2005
Entidad Financiadora: Dirección General de Investigación, Ministerio de Ciencia y Tecnología
Investigador Principal: Rafael Torres Roldán.
Entidades Participantes: Universidad de Granada (España); Instituto de Geología y Paleontología (MINBAS, Cuba); Museo Nacional de Historia Nacional(Cuba); Servicio Nacional de Geología y Minería (Chile); Universidad de Chile.

Objetivos (de los dos proyectos):

Estudio de la historia metamórfica (presión-temperatura-tiempo) de los dominios litosféricos yuxtapuestos que componen la isla de Cuba, siendo el objetivo mas general su interpretación en términos de los procesos geotectónicos responsables de la evolución del límite entre las placas de Norteamérica y del Caribe. Este estudio comporta investigaciones en un total de 14 terrenos/areas metamórficas (faja Cangre, terreno Escambray, isla de Pinos, terreno Asunción, sierra del Purial, Santa Clara, Holguín, Sierra del Convento, La Corea, Sierra del Rosario, anfibolitas-gneisses Mabujina, anfibolitas-granulitas Iguará-Perea, anfibolitas-harzburgitas Guira de Jauco, anfibolitas Cajálbana).

Resultados del primer proyecto
Reconocimiento geológico y petrológico de todos los terrenos mencionados, con especial énfasis en Isla de Pinos, bloques exóticos de alta P en la melange serpentinitica (Santa Clara, Holguín, Sierra del Rosario, anfibolitas de baja P de la melange serpentinitica (Cajálbana, Iguará-Perea, y anfibolitas Guira de Jauco. Publicación de diversos trabajos científicos.