OUTLINE OF THE GEOLOGY OF MEXICO pdf

1: GEO ExPro - Gulf of Mexico

Zoltan de Cserna, "An outline of the geology of Mexico", The Geology of North Americaâ€"An Overview, Albert W. Bally, Allison R. Palmer This chapter provides a brief introduction to the geology of Mexico for members of the international geological community unfamiliar with the geology of the.

Gulf of Mexico William E. Galloway, Institute for Geophysics, The University of Texas at Austin The Gulf of Mexico Basin has proved to be a highly successful hydrocarbon province, and the vast untapped volume of both oil and gas ensures that the basin will continue as a major player for decades to come. This article appeared in Vol. Despite its maturity, the Gulf remains one of the most active and successful exploration provinces in North America, attracting numerous domestic and international exploration companies. Giant oil discoveries offshore and expanding tight-sand and shale gas plays onshore maintain the momentum of discovery that will underpin production well into the 21st Century. By geologic age, the young Cenozoic fill has proven the most prolific host, yielding Bboe. Next are Cretaceous units, with more than 85 Bboe. Last, but still significant, is the Jurassic section, the oldest rocks in the basin, with 15 Bboe discovered reserves. Current estimates are that another Bboe remain to be discovered. A large variety of plays The oil and gas fields are geographically dispersed. In the United States, the northern margins of the GOM in the East Texas and North Louisiana salt basins, the coastal plain from South Texas to Alabama, the broad continental shelf, and the continental slope are all prolific petroleum provinces. In Mexico, major provinces include the Burgos basin to the north and the coastal plains and shelves of Veracruz and Tabasco states. Exploration plays of the past decade include both geologically young off-shore and old inland targets. A swath of oil discoveries along the breadth of the modern lower continental slope from Louisiana to the U. The play has a potential to yield several billion barrels of oil. At the other extreme, modern drilling and completion technologies have opened an expanding array of unconventional tight sand and shale gas reservoirs in Jurassic and early Cretaceous strata across the northern, inland, part of the basin, beneath North Louisiana and East Texas. Geologic framework of the Gulf of Mexico petroleum basin illustrates A. Original distribution of significant thickness of Louann Salt. The salt is absent over oceanic crust. Jeffry Horowitz Geologic elements What are the geologic elements that combine to create such a large, complex, and long-lived petroleum mega-province? In one sense, the answer is simple: Basin classification schemes that have categorized the Gulf simply as a "passive margin" or large "delta" miss this complexity. I suggest six geologic aspects of the Gulf that have converged to create a "perfect storm" of hydrocarbon productivity. The Gulf of Mexico is a small ocean basin. Its basement consists of several crustal types, including basaltic oceanic crust, highly stretched continental crust and modestly stretched continental crust transitional crust, Fig. Each kind of crust creates different initial basin-floor relief and subsequence response to loading by sediments. Its geologic history extends over million years. Ultimately, large areas of the thin transitional crust and the oceanic crust have subsided to depths exceeding 15 kilometers, creating room for comparably thick sedimentary successions. Oceanographic isolation and arid climate: The Gulf of Mexico has always lain in the hot, arid subtropics. As a small ocean basin peripheral to the Atlantic, the Gulf has experienced extended geological intervals when connection to the world ocean was restricted. The first, and most dramatic result of aridity and restriction was deposition of widespread salt, the Louann, over much of the basin floor Fig. This salt layer formed the foundation onto which subsequent sediment would be deposited. Salt deposition continued for several millions of years, creating a unit as much as several kilometers thick. Later, the arid tropical climate facilitated widespread deposition of limestone on shallow-water platforms whenever clastic sediment supply to the basin was low Fig. Later periods of restricted circulation in the Gulf favored burial and preservation of organic matter in marine sediments, setting the stage for formation of rich petroleum source rocks. Convergence of sediment eroded from the large, structurally active North American plate: During the course of its million-year history the GOM has been the receiving basin for rivers, both large and small, draining much of the North American continent. Initially, remnant Paleozoic mountain belts supplied sediment. As these uplands wore down, topography of the continental interior was repeatedly rejuvenated as the large North American crustal plate moved westward over a mosaic of Pacific Ocean plates. The ancestral Rocky Mountain uplift, Bermuda hot-spot uplift, Laramide Rocky Mountain uplift, and Mid-Cenozoic crustal heating event all created new generations of uplands that in turn shed sediment into the Gulf. In the most recent few million years, climate change has accelerated continental erosion and sediment supply. Development of a well-differentiated shelf, continental slope, and abyssal plain: By the early Cretaceous, about million years ago, subsidence of the basin-center oceanic crust and deposition along the basin margin had created clearly differentiated shelf, slope, and deep basin regimes. The Late Cretaceous central Gulf was on the order of two kilometers deep. A diverse array of sedimentary environments ranging from coastal plain to submarine fan is recorded in Cenozoic sedimentary units. With high rates of sediment supply, much sediment that included sand, bypassed the shelf margin into the deep basin. Through time, the continental shelf deposits of younger units built out over the slope and abyssal plain deposits of older units Fig. Thick successions of basinal, slope, shelf, and coastal plain deposits containing multiple reservoir facies, resulted. Rapid burial of older, commonly muddy sediment caused build up of fluid pressure within the thick basin fill. This geopressurization decreased mechanical strength of the sediment, facilitating structural deformation. It also generated strong pressure gradients that directed fluids up and out of the deep basin towards the shallow sand bodies of the basin margin. An ongoing history of structural deformation: Generalized regional geologic cross section of the northern GOM. Major structural domains are numbered. Jeffry Horowitz Although originating as a divergent margin basin with an axial spreading center, the Gulf was never tectonically quiescent. Compressional and thermal events caused by the convergence and subduction of Pacific plates beneath North America directly effected the western Gulf margin. There, compressional folds and a foreland trough overprinted the early Gulf deposits and controlled deposition. Differential pressure gradients created as sediment began to load the Louann caused the salt to flow, creating a range of syndepositional structures including simple rollers, turtles, and salt domes, and complex salt canopies Fig. In much of the basin, salt was eventually completely expelled from its original position, creating a weld between unrelated rocks. Secondary salt bodies and canopies were themselves loaded and the salt further displaced up and basinward. Thick, isolated sediment pods fill "mini-basins" created by localized salt evacuation from shallow canopies. Stress regimes developed within prograding continental margins created zones of extensional "growth" faulting along shelf margins and compressional anticlines and reverse faults along the slope base Fig. At the landward limit of Louann Salt, the whole basin fill slipped basinward, creating a regional fault zone known as the Mexia-Talco in Texas. Both salt and geopressured mudstone provided mechanically weak zones that accommodated horizontal movement and deformation. The long-term result was the wholesale emigration of salt from its depositional location on the floor of the basin upward and basinward into younger strata and even to the seafloor. Along the way a network of remnant faults and welds traverse the entire sediment wedge from its base to top, forming potential conduits for fluid migration. The petroleum system elements Source Rocks Many petroleum basins rely on only one or two principal source rock intervals to generate most of their contained hydrocarbons. Importantly, the bulk of the source rocks lie within the lower portion of the basin fill. Hydrocarbon Generation The long depositional history and large size of the GOM has resulted in a great diversity of regional burial histories. Mesozoic source rocks of the landward basin margin were buried slowly by younger Cretaceous and relatively thin early Cenozoic sediments Fig. Basinward, beneath the modern coastal plain and shelf, rapid burial of source rocks led to generation in the early to middle Cenozoic. Beneath the late Cenozoic outer shelf and continental slope depocenters, deep burial brought source rocks into oil and gas kitchens only within the last few million years. The overall pattern of basinward advancing deposition illustrated in the regional dip cross section Fig. The result was multiple petroleum systems whose peak generation times spanned the 65 million years of the Cenozoic and continue today. Migration It has long been recognized that the principal GOM source rocks lie far beneath the center of mass of reservoired hydrocarbons. Large-scale upward migration of thousands of meters is commonly required, especially in the Cenozoic reservoirs that contain the bulk of the oil and gas. Here, structures created by the long history of gravity tectonics acting on the salt and overpressured mudstone have played a critical role. Faults, salt bodies, and welds created pathways that extend through source rocks many kilometers into overlying Cenozoic sediments Fig. The long history of formation and reactivation of these growth structures provided condiuts that were ready and available when pulses of peak generation provided a charge of movable hydrocarbons. Reservoirs The long history of deposition in the Gulf, with multiple rock types ranging from dolomite and limestone and highly cemented sandstone and mudstone to unconsolidated sand and mud, and depositional environments from carbonate platforms and reefs to deep-marine submarine fans has provided a multiplicity of potential reservoirs. Petroleum has been found and produced from every major stratigraphic unit from the Jurassic Norphlet age eolian siltstones and Smackover age shallow-water limestones directly above the Louann to Pleistocene turbidite sands of the modern continental slope Fig. Porosity types range from simple intergranular pores to secondary leached pores in deeply buried, highly cemented sandstones. Jurassic and Cretaceous carbonate reservoirs commonly exhibit fracture porosity. As conventional reservoirs have been exploited onshore, effort has successfully shifted to unconventional reservoirs, including fractured chalk Austin , tight sand Cotton Valley-Hosston , and shale Bossier. Here, source rock and reservoir can be intimately mixed. The pattern of Cenozoic continental margin progradation due to the high rate of sediment supply placed a succession of reservoir systems one on top of the other. Unlike many basins, storage space for sediment on the basin margins was quickly filled by rapid sediment supply through multiple rivers. Coastlines prograded to and over the shelf edge much of the time, transporting sand directly to the upper slope and into the deep basin. Sandy submarine fans were overlain and buried by continental slope turbidites. Slope sands were commonly trapped and ponded within intra-slope basins and troughs created by salt evacuation and extensional faulting. In turn, delta and shore-zone sand bodies prograded across the shelf and over the continental slope succession. Many of these depositional systems, such as submarine fans and coastal barrier bars, created naturally isolated reservoir systems that efficiently retain hydrocarbons. Syn-depositional and post-depositional structural deformation further disrupted sand-body continuity, enhancing retention potential. The high rates of sediment supply and rapid subsidence resulted in vertically stacked sand bodies with depositional patterns repeated tens of times over kilometer-thick successions; multistory reservoir systems are a characteristic feature of GOM Cenozoic petroleum fields. The thick, repetitious sand successions provide immense available pore volumes. Thus, Gulf reservoirs are commonly under-filled. The widespread development of overpressure further increases productivity of many reservoirs. Seals are abundantly interleaved with potential reservoir facies.

2: Caribbean Islands Map and Satellite Image

The geography of Mexico describes the geographic features of Mexico, a country in the Americas. Mexico is located at about 23Â° N and Â° W [1] in the southern portion of North America. [2] [3] From its farthest land points, Mexico is a little over 3, km (2, mi) in length.

In the nearly horizontal sandstones and shales that underlie San Juan Basin, the Chaco River flows, when it flows at all, alternately in broad valleys and narrow canyons. To one of these latter the name Chaco Canyon is applied almost exclusively, and here, in a stretch of about 12 miles, there are numerous ruins of prehistoric villages, the largest of which is Pueblo Bonito. Chaco Canyon, after its excavation, was partly refilled with sand and silt during a period of alluviation common to most streams of the southwestern United States. On the flat floor of the canyon, resulting from this alluviation, the prehistoric peoples lived and left evidence of their long-time occupation in hearths, scattered charcoal, potsherds, and other relics. These remains extend to a depth of 21 feet below the present surface of the alluvium. An ancient type of dwelling known as a pit house has been found at a depth of 6 feet below the surface, but the typical Pueblo III type of construction has not been surely identified below 4 feet. Alluviation in Chaco Canyon and generally throughout the Southwest has more recently been interrupted by the formation of an arroyo or steep-sided gully in which the floods of the stream are now wholly confined. The Chaco Canyon arroyo is presently 20 to 30 feet deep and from to feet wide, yet a military expedition of did not mention the gully, if it then existed. In an arroyo 16 feet deep and 60 to feet wide was reported. Available evidence indicates that the arroyos of other streams were mostly formed in the decade to and that the process is still going on. The beginning of the Chaco arroyo appears to have been somewhat earlier and the date may, with some assurance, be placed in the decade to A study of the deposits that make up the valley fill indicates that Chaco River never had a permanent low-water flow. No signs of irrigation ditches or other diversions of flowing water have been found in the alluvial deposits. It seems probable, therefore, that the prehistoric inhabitants of the canyon practiced floodwater farming, a form of agriculture still in use in the region. For this type of farming wide-spreading floods are a prerequisite, and the beginning of erosion, with formation of an arroyo that confines the floods and lowers the water table, puts an end to agriculture of this type. The main body of the valley fill is of unknown depth. Only the upper 30 feet is exposed and of this the uppermost 21 feet contains relics of man. Pottery made by the ancient people varies in texture and design according to locality and age. Differences between the kinds of pottery typical of different stages in human culture are not wholly known, nor has a definite chronology of the stages been determined, but broad distinctions can be made between the older and younger civilizations. Collections of potsherds can therefore be used as fossils in studying the stratigraphy of the valley alluvium. Generally, only a few potsherds are found at any one place and many of these are indeterminate, hence of no diagnostic value. On the basis of these fragments, therefore, we may draw the inference that people of the Pit House period were the principal inhabitants of Chaco Canyon during the time required for deposition of those 15 feet of alluvium. Potsherds collected from the zone of valley fill less than 6 feet below the surface are generally of Pueblo III type. This fact, together with ruins whose foundations are partly buried in alluvium, indicate that Pueblo III people occupied the valley during the period represented by the last 6 feet of alluviation. In the bank of the arroyo near Pueblo del Arroyo there is exposed a buried channel which extends to a depth of 15 feet below the present surface. At this point the channel is a well-defined ancient arroyo that had been refilled and then buried under an additional 2 feet of sediment in the interval between abandonment of Pueblo Bonito and American Army penetration of Chaco Canyon in Potsherds removed from the gravel lenses of that buried channel included fragments of the latest Pueblo Bonito types. The channel, therefore, must have been refilled late in the occupancy of Pueblo Bonito or after its abandonment. By means of test pits in which similar pottery was found, we traced this buried channel for about 1, feet across the plain fronting Pueblo Bonito and later discovered remnants of it both up and down the canyon. This buried channel clearly represents a period of dissection and arroyo formation for the full length of the valley and, assuming that the dissection occurred late in the occupancy of Pueblo Bonito, an adequate cause exists for abandonment of the canyon by aboriginal farmers whose floodwater fields were destroyed by confinement of the floods within this channel, and by concurrent events. Our examination of the main valley fill suggests alternate dissection and alluviation of Chaco Canyon: If this alternation represents a true cycle, we may expect the present arroyo to run its course and then be refilled and perhaps covered over. However plausible it may be to attribute formation of the present arroyo to destruction of the vegetative cover by overgrazing, the previous dissection and subsequent alluviation were in no way affected by domestic animals. It seems probable, therefore, that the ultimate cause of this periodic change in the regime of streams is climatic. A slightly increased rainfall would increase the vegetative cover and thereby both reduce the violence of floods and protect the soil from erosion. Any decrease in rainfall would produce a reversed effect. Although the deposits of Chaco Canyon contain no definite evidence of a more humid climate during the two periods of their deposition, it seems likely that an increased humidity did exist and was a factor in development of the distinctive Chaco culture. The subsequent change to more arid conditions was doubtless of less effect until it culminated information of the twelfth-century arroyo that unexpectedly became a dominant feature of this study.

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3: Smithsonian Miscellaneous Collections: The Geology of Chaco Canyon, New Mexico (Summary)

A Brief Summary of the Geologic History of Northern Mexico. Introduction. A library research was conducted at the Denver Earth Resources Library and the US Geological Survey library in Denver, Colorado.

The northwest coastal plain is the name given the lowland area between the Sierra Madre Occidental and the Gulf of California. Pico de Orizaba is the third highest peak in North America and highest in Mexico. Basins in blue drain to the Pacific, in brown to the Gulf of Mexico, and in yellow to the Caribbean Sea. Grey indicates interior basins that do not drain to the sea. The northeast coastal plain extends from the eastern slope of the Sierra Madre Oriental to the Gulf of Mexico. A low east-west range divides the altiplano into northern and southern sections. These two sections, previously called the Mesa del Norte and Mesa Central, are now regarded by geographers as sections of one altiplano. Various narrow, isolated ridges cross the plateaus of the northern altiplano. The southern altiplano contains numerous valleys originally formed by ancient lakes. One other significant mountain range, the Peninsular Ranges , cuts across the landscape of the northern half of Mexico. Narrow lowlands are found on the Pacific Ocean and the Gulf of California sides of the mountains. Several important mountain ranges dominate the landscape of southern and southeastern Mexico. Mountains in this range average 2, meters in elevation. The range averages kilometers wide, but widens to kilometers in the state of Oaxaca. The Sierra Madre de Oaxaca begins at Pico de Orizaba and extends in a southeasterly direction for kilometers until reaching the isthmus of Tehuantepec. Peaks in the Sierra Madre de Oaxaca average 2, meters in elevation, with some peaks exceeding 3, meters. Finally, the Meseta Central de Chiapas extends kilometers through the central part of Chiapas to Guatemala. The average height of peaks of the Meseta Central de Chiapas is 2, meters. Mexico has nearly rivers, two-thirds of which empty into the Pacific Ocean and the remainder of which flow into the Gulf of Mexico or the Caribbean Sea. Despite this apparent abundance of water, water volume is unevenly distributed throughout the country. Most of the Mexican landmass rests on the westward moving North American plate. The Pacific Ocean floor off southern Mexico, however, is being carried northeast by the underlying motion of the Cocos Plate. The westward moving land atop the North American plate is slowed and crumpled where it meets the Cocos plate, creating the mountain ranges of southern Mexico. Rather than one plate subducting, the Pacific and North American plates grind past each other, creating a slip fault that is the southern extension of the San Andreas fault in California. Motion along this fault in the past pulled Baja California away from the coast, creating the Gulf of California. Continued motion along this fault is the source of earthquakes in western Mexico. Mexico has a long history of destructive earthquakes and volcanic eruptions. In September , an earthquake measuring 8.

4: Permian Basin Overview - Maps - Geology - Counties

The Geology of the Gulf of Mexico is fascinating. It has some of the most rapid sediment deposition in the world due to the mighty Mississippi. This tremendous dump of sand and shale over the past million years also loaded the underlying Louanne Salt and mobilized it to form gigantic, fantastical shapes below the sea bed.

The purpose of this study was to identify the geologic setting of the Copper Canyon area of western Mexico. Fortunately, even though quantity of literature was lacking, a reasonable interpretation of the area can be formulated. Primarily, northern Mexico can be divided into four physiographic provinces; each with their own unique geology. Even though the area contains canyons deeper than the Grand Canyon, it has a limited geologic history of only a few tens of millions of years versus over a billion years of geologic history for the rocks of the Grand Canyon. With the exception of the rocks at the very bottom of the canyons, the rocks of the Copper Canyon area consist primarily of explosive volcanic ash flows, ash falls, and mudflow breccias deposited approximately 20 to 40 million years ago. These areas from east to west are: Ages of the rocks range from Precambrian 1. The province also covers most of Nevada, the western half of Utah and Idaho and the eastern parts of Oregon and Washington. These sediments are usually early Cretaceous limestone, shales, and sandstones with occasional exposures of Paleozoic marine rocks. The valleys have filled with sands and shales and can be tens of kilometers long and up to 10 kilometers wide. Some of the valleys have no outlet to the sea and are referred to as bolsones. West of Chihuahua the province is referred to as Altas Llanuras since each valley is progressively higher. The Sierra is the most extensive physiographic province in Mexico covering approximately , square kilometers. Cenozoic volcanic rocks, mostly tilting to the east, characterize the province. These rocks can be divided into a lower andesitic unit about 70 to 40 million years old and an upper rhyolitic unit about 40 to 20 million years old. Rhyolite is the fine-grained equivalent to granite, which has a high percentage of silica and aluminum. Andesite is of intermediate composition lying somewhere between granite and magnesium- and iron-rich basalt. Both volcanic units are up to 1 kilometer thick. The Lower Volcanic Sequence and underlying sedimentary rocks have localized ore deposits related to mineral-rich volcanic intrusions emplaced between and 40 million years ago. Ore bodies are probably present throughout the province but are only visible in the bottoms of the canyons since the overlying Upper Volcanic Sequence provides a thick cover and obscures detection. Andesitic and rhyolitic rocks tend to be deposited during explosive volcanic events resulting in fiery ash flows, thick ash falls, and destructive mudflows; similar to what was seen with the eruption of Mt. The resulting rock tends to have ash-sized grains with pebble- to boulder-sized fragments scattered throughout. The larger fragments are debris that the flow picked up along the way or are bomb-like projectiles ejected from the volcano with the ash. Usually the thicker layers of flows and larger clasts are found nearest the volcanic centers. For example, a meter thick ash flow with fragments up to 1-meter in diameter, interpreted to have been deposited inside a volcanic caldera, can be found at Basaseachic Falls Schmidt, Lava flows are not common with these types of volcanoes. The volcanic centers of the andesitic Lower Volcanic Sequence were located near the oceanic trench that was lying just off the west coast of North America. Through time, as the North American continent overran the Pacific tectonic plate, the volcanic centers moved farther to the east Fig. About 40 million years ago, the mid-Pacific spreading center was finally subducted beneath the continent and compression of the continent ceased. Three things happened during this time. First, the continent started to stretch out from east to west forming the Basin and Range, the Parallel Ranges and Valleys, and the Gulf of California. Secondly, the volcanic centers, now spewing out massive quantities of rhyolite, rapidly regressed back toward the west coast. And finally, the entire area started to be uplifted. With uplift and tilt, erosion began. Dissection of the volcanic sequences was especially severe along the western margin of the Sierra Madre Occidental. This removal of section eventually formed the deep canyons of the Barrancas Del Cobre. The canyon walls are almost exclusively composed of the stacked layers of rhyolitic ash and debris of the Upper Volcanic Sequence. Younger Precambrian rocks in the Parallel Ranges and Valleys Province include dolomite, limestone, sandstone, and shale Stewart et al. Unlike the Sierra Madre Occidental province, ore-bearing volcanic intrusives are not covered by Late Tertiary volcanics and are more readily identified at the surface. The Coastal Plain This 75 kilometer wide geographic province between San Blas and Topolobampo is characterized by a mostly flat section of Tertiary and Quaternary gravels and alluvium. In a few places, most notably around the deep water harbor of Topolobampo, the flat plain is punctured by low hills of basalt breccia and intrusive volcanics. Geology of Northern Sonora: R, and Knowling, R. Nevada Bureau of Mines, Geological Report 33, p. Roldan Quintana, and R. Physical stratigraphic, biostratigraphy, paleocurrent studies, and regional relations: Paper , 36 p. Elmo Brown is an independent and consulting geologist located in Denver, Colorado. He presently explores in many of the basins of the western United States in search of hydrocarbons. Having traveled to Cerocahui and having stayed at the Paraiso del Oso, Elmo was asked to write a little summary of the area. It was his pleasure to do so.

5: US Map Collections for All 50 States

Outline of original Gulf of Mexico basin extending beneath modern land areas. Salt beneath land areas in Texas, Louisiana, Alabama and Florida were deposited in the earlier, much larger Gulf of Mexico Basin (Salvador,).

Dunn, and Stanley D. Petersburg, FL Figure 1. The northern Gulf of Mexico basin is also dominated by one of the largest river deltas in the world â€” the Mississippi. Note the indentation in the NE section, which is commonly named the De Soto Canyon on most maps and charts. Here, we do that with a special emphasis on the De Soto Canyon, a feature in the northeastern Gulf of Mexico of particular interest to scientists. One of the overlooked narratives of the disaster is why there is so much oil and gas in the Gulf of Mexico in the first place, since it is the center of huge investments in exploration and production. Only the Arabian-Iranian Province supplies more. But, offshore drilling is a very fast-moving target worldwide, with reserve and production numbers changing monthly. The key factors are: Oil and gas can form in trace amounts in many places, but economically-viable accumulations are realized only where these factors combine to form an ideal environment. The Early Days â€” to million years ago Ma The Gulf of Mexico, formed by the process of sea-floor spreading, and is considered a true ocean basin1. It formed as part of the complex breakup of the mega-continent Pangea starting about million years ago Ma , when a 6,km long ragged crack split Pangea into two supercontinents, Laurentia consisting mostly of what is now North America and Gondwana consisting of what is now South America and Africa Fig. Simplified cartoon illustrating early ocean basin separating North America Laurentia from Africa Gondwana. This water body was initially called the Tethys Sea and with further widening became the North Atlantic Ocean modified from Redfern, ; Hine, Prior to actual breakup, numerous long, narrow-rift basins formed due to extension and stretching of continental crust creating topographically low valleys surrounded by uplands, sometimes mountains, and bounded by large normal faults that were active during the Triassic and Early Jurassic periods, but are no longer active today Fig. Along the eastern continental margin of North America, they became filled with alluvial fans, deltas, rivers, and lakes, and shallow mud flats famous for their three-toed dinosaur footprints, but not filled with seawater. Some of these basins today control modern topography and drainage such as those in the lower Connecticut and Hudson River valleys. Other basins have been completely filled with non-marine sediments or buried and have little to no modern topographic expression. Distribution of early rift basins along the eastern margin of North America formed when Pangea began to split apart. Outline of original Gulf of Mexico basin extending beneath modern land areas. During this early extension and before the Tethys Sea the proto-Atlantic Ocean formed between Laurentia and Gondwana, a significant rift basin formed across South Georgia. Rifting ceased in this area but seafloor spreading continued to propagate around the peninsula Florida, splitting Laurentia from Gondwana and forming the Tethys Sea, where the southern and western parts became the Caribbean Sea and North Atlantic Ocean. This seaway separated the Florida Platform from SE North America, allowing carbonate sediments to accumulate in great abundance in Florida without being negatively influenced or even buried by continental sediments being shed off the rapidly eroding southern Appalachian Mountains. The movement of these blocks of highly-stretched and extended transitional crust continental crust intruded by oceanic crust-like rocks eventually created a broad, deep basin still not yet permanently connected to the open ocean or filled with seawater. The primary early connections were to the Pacific Ocean to the west and the proto-Caribbean and Atlantic Ocean to the south and east respectively. The original Gulf of Mexico basin was much larger than the basin of today, extending north nearly to Oklahoma and west to west Texas Fig. Most of the original geologic basin filled along the margins with sediments to form land, leaving only a smaller portion of the original basin. As mentioned, the Gulf of Mexico basin also includes the Florida and Yucatan Platforms and their huge, now submerged, shelves. Seawater poured into the developing Gulf of Mexico basin from the Pacific Ocean through small gaps in the Mexican terrain that would open and close with changes in local tectonics and global sea level. Due to the arid environment of this region, the seawater introduced during these multiple flooding events evaporated to form halite NaCl deposits up to 4-km thick. Eventually, the ocean crust formed by continued seafloor spreading, split the salt deposits into two provinces and the entire basin became permanently filled with open-marine, normal salinity seawater Fig. Sediments from the surrounding land mass began to accumulate on top of the salt called the Louann Formation and a huge physically-connected carbonate complex continued to grow Yucatan-Florida-Bahama Platform. Continued infilling of the Gulf of Mexico basin from the North American continent explains why oil traps associated with salt structures are found well inland todayâ€"these traps originally evolved underwater within the earlier Gulf of Mexico basin see Figs. The South Georgia Rift Basin also was partially filled with saltâ€"particularly the western end that was connected to the larger Gulf of Mexico developing basin. It was this salt deposit that formed the highly visible diapirs that form topographic highs in the deeper portion of the modern De Soto Canyon. Cross section of the Louann Formation, showing Jurassic salt deposits, which rose into domes in some places because of their low density. Wilhelm and Dwing What is the De Soto Canyon? Illustration showing that the Apalachicola Embayment is actually part of the western end of the South Georgia Rift Basin. Smith and Lord, Based upon the presence of salt structures in the Apalachicola Embayment, most geoscientists think that the De Soto Canyon is fundamentally an indention in the trend of the west Florida and north Florida shelf. The Appalachian Mountains are thought to have been as high as the Himalayas when they were first formed. Given that the Himalayas are over 8,m high and the present day Appalachians are barely 2,m high this suggests that approximately 6,m of rock were eroded, transported, and re-deposited over the past Ma. These sediments formed the Mesozoic-Cenozoic continental margins of the southern United States, including much of peninsular Florida. This filling during sea-level lows allowed existing river deltas to migrate from South Georgia to North Florida. Today, one can drive from Florida up through Georgia on roads built on a flat coastal plain that covers the once km wide x km long x 1-km deep basin. But is it really a canyon? A submarine canyon, traditionally defined in geological oceanography, is a steep-sided sometimes near vertical walled , narrow feature incised into a submarine slope. It can extend landward onto the continental shelf and seaward to depths of several kilometers. It is, rather, an expansive, gently-sloped, geomorphic indentation in the modern shelf and shelf-slope system that is structurally controlled from below and represents the last unfilled segment of a huge Jurassic rift 3. The De Soto Canyon also marks the long-term physical transition from the continental, siliciclastic sedimentary regime dominated by rivers along the north to the carbonate sedimentary regime dominated by shallow pre mid-Cretaceous and deeper water benthic and planktonic input post mid-Cretaceous to the south. Perhaps a more accurate term for this geologic feature is the De Soto Embayment. Multibeam image of numerous small downslope channels distributed within the broader De Soto Canyon indention Source: Submarine canyon complex along the base of the southwest Florida Platform. These are headward-eroding, high-relief, steep-sided features that fit the classic definition of submarine canyon NOAA National Ocean Survey map; Hine, We are still experiencing an Icehouse Earth, although at an interglacial stage having just come out of a the Last Glacial Maximum ending about 18 ka 18 thousand years ago when sea level was about m lower than present-day sea level. This transition and the nature of infilling resulting from many high frequency, high amplitude sea-level fluctuations that rarely occurred on the Greenhouse Earth is largely unknown3. However, the imagery shown in Figure 9 clearly reveals erosive events creating a complex series of channels small canyons that accommodated transfer of sedimentary material from the upper slope or even the outer shelf to the base of the De Soto Canyon embayment. When and under what conditions this sedimentary transfer occurred creating this incised channel network is not known. Possibly, during sea-level highstands, infilling was not channelized and finer-grained sediments accumulated whereas during sea-level lowstands and stillstands, infill was coarser-grained and more channelized. But, existing published, deeper penetrating seismic data and unpublished industry-based data do not indicate that the De Soto Canyon is a long-term erosional feature that is incising landward. Rather, it is a broad sedimentary basin that has undergone long-term infilling prograding seaward only interrupted by short-term, relatively small-scale erosional events. Endnotes 1Other large bodies of water such as Hudson Bay, while geographically large, are not considered ocean basins because they did not form by seafloor-spreading tectonics. Acknowledgments We thank Dr. Felicia Coleman for the wonderful review, which greatly helped to change the geologic prose to one more understandable for the general reading public. We thank Tracy Ippolito for additional editing, her patience, and her help while we generated this document.

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Structural and Tectonic Framework, in, R. The Evolution of Continents and Life: University of Florida Press, p. The study is investigating the environmental consequences of petroleum hydrocarbon release in the deep Gulf on living marine resources and ecosystem health. His associates, graduate students, and he have defined the response of coastal and shelf depositional systems to sea-level fluctuations, climate changes, western boundary currents, antecedent topography, and sediment supply. Specifically this includes geologic origin and evolution of submerged paleo-shorelines, reefs relict and active , shelf sand bodies, open marine marsh systems, barrier islands, and back-barrier environments and how they might have interacted with each other in the past. Both legs examined carbonate sedimentation along continental margins. Stan Locker is research scientist of marine geology and geophysics at the University of South Florida. His research interests include sequence stratigraphy and sedimentary processes of continental margins from the deep ocean to coastal environments. Investigations often focus on understanding the response of depositional systems to sea-level change and the resultant sedimentary facies and stratal architecture. Field techniques include high-resolution seismic reflection imaging, side-scan sonar and other acoustic remote sensing methods, integrated with sedimentological data from cores or other sampling. Recent studies have addressed Holocene coastal evolution, climate and sea-level change, hydrostratigraphy, karst deformation of the Florida Platform, continental shelf sedimentation, deep-water and relic reef systems, geostrophic current-controlled sedimentation, and benthic habitat classification. Deep-C was a four-year, interdisciplinary study of deep sea to coast connectivity in the northeastern Gulf of Mexico. Deep-C is no longer an active research project. The information on this website is for historical reference purposes only.

6: Geography of Mexico - Wikipedia

The following outline is provided as an overview of and topical guide to Mexico: The United Mexican States, [1] commonly known as Mexico, is a federal constitutional republic located in North America. [2].

7: Outline of Mexico - Wikipedia

The geology of a large portion of western Mexico, including the entire northern boundary of the Jalisco block, has been compiled at a regional scale. Revision of pre-.

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