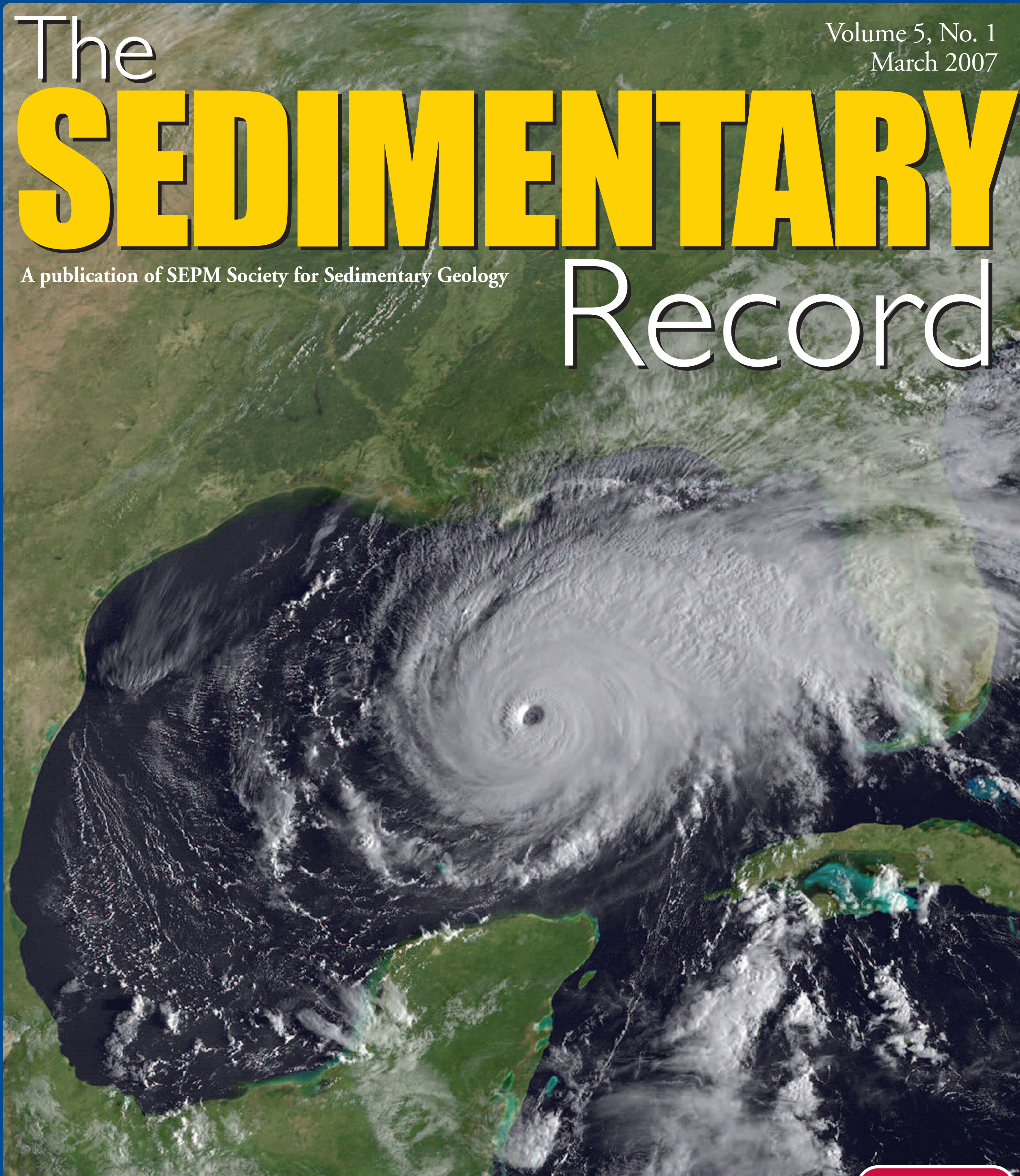
Volume 5, No. 1
March 2007

The SEDIMENTARY Record

A publication of SEPM Society for Sedimentary Geology



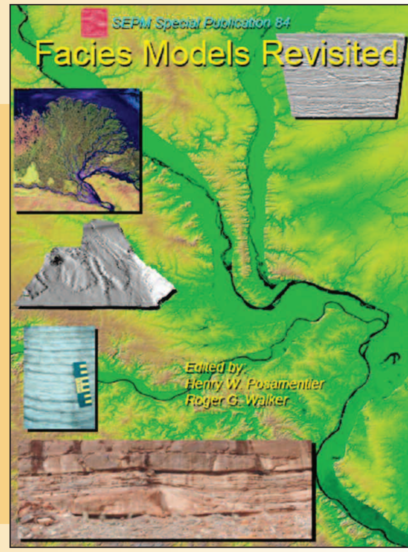
INSIDE: THE EFFECTS OF HURRICANES KATRINA AND RITA ON THE SEABED OF THE LOUISIANA SHELF

PLUS: IV LATIN AMERICAN CONFERENCE OF SEDIMENTOLOGY

PRESIDENT'S COMMENTS

1926 SEPM Society for Sedimentary Geology

SEPM BOOK STORE



SEPM Special Publication #84, CD E-Book

Facies Models Revisited

Edited By: Henry W. Posamentier and Roger Walker

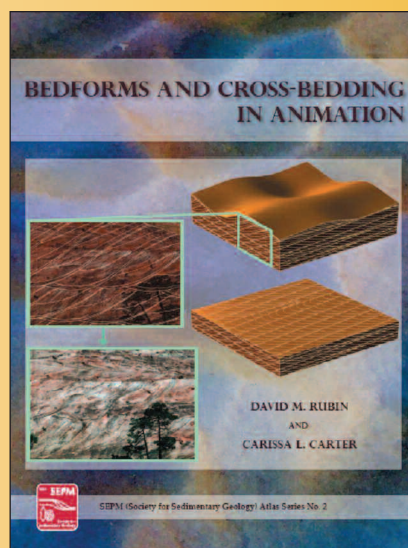
- Facies Models Revisited: Introduction - Roger G. Walker
- Eolian Facies Models - Nigel P. Mountney
- Fluvial Facies Models: Recent Developments - John S. Bridge
- Estuarine and Incised Valley Facies Models - Ron Boyd, Robert W. Dalrymple and Brian A. Zaitlin
- Deltas - Janok P. Bhattacharya
- A Reexamination of Facies Models for Clastic Shorelines - H. Edward Clifton
- Facies Models Revisited: Clastic Shelves - John R. Suter
- Deep-Water Turbidites and Submarine Fans - Henry W. Posamentier and Roger G. Walker

SEPM Member Price: $65.00

SEPM Atlas Series #2, DVD E-Book

Bedforms and Cross-Bedding in Animation

By: David M. Rubin and Carissa L. Carter



The key to interpreting cross-stratified deposits is reconstructing the shape and motion of bedforms that deposited the bedding (a problem of pure geometry). This reconstructed history of bedform shape and motion can then be used to interpret the history of flow, sediment transport, and depositional processes (problems of physics, fluids, and sedimentology). Computer visualization is ideal for the geometrical aspects of this work, because visualizing the geometry of layers deposited by complicated bedforms that change shape and change motion can be difficult—if not impossible.

Included on DVD:

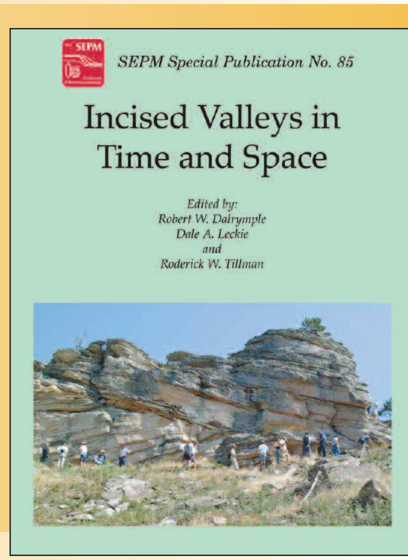
- Interactive Interface for dynamically sub-setting examples of bedforms and cross-bedding
- Computer Animations showing the construction of cross-bedding
- Rose Diagrams of the constructions and surfaces
- High resolution outcrop photos
- Morp movies matching outcrops to computer models
- Complete PDF file of SEPM CSP No. 1, 2nd Edition
- Special Features: MATLAND Computer Code (PDF)
  Ripples to Rocks on Mars (movie)
  Sonar Movies (Colorado River and Flume)
  Ripples in a Flume (movie)
  Migrating Linear Dunes (Animation)

SEPM Member Price: $45.00

SEPM Special Publication #85

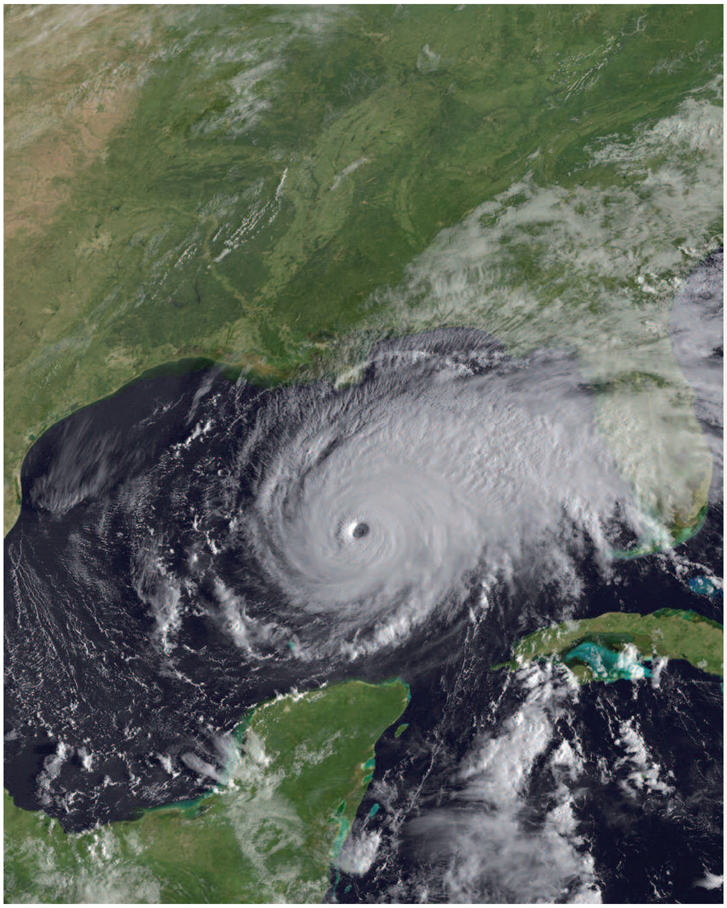
Incised Valleys in Time and Space

Edited By: Robert W. Dalrymple, Dale A. Leckie and Roderick W. Tillman



This volume grew out of two SEPM-sponsored events, an SEPM Research Conference that took place in Casper, Wyoming, in 2002 (see Dalrymple, 2002, for a synopsis of the meeting), and an SEPM Research Symposium that was held at the AAPG/SEPM Annual Meeting in 2003. Several other papers have been added to broaden the range of examples presented. The theme of the volume, *"Incised Valleys in Time and Space"*, has been chosen because of the comparison of valleys of different ages and in different settings is a valuable approach to understanding the role of the many factors that interact to create the valley and to emplace the subsequent valley-filling deposits. Each example, whether modern or ancient, represents a real-world experiment that lacks the temporal and spatial scaling issues that inhibit the application of laboratory experiments. Of course, the dependent and independent variables cannot be "controlled" in natural systems, but our ability to deduce the approximate values of these quantities (e.g., subsidence, sediment supply, climate) is increasing continually, such that semiquantitative and even quantitative estimates can be made in some cases.

SEPM Member Price: $85.00



Cover Photo: Hurricane Rita in the Gulf of Mexico on 22 September 2005, shortly after strengthening to a Category 5 storm. The image shown comprises visible cloud cover from NOAA's GOES-12 satellite overlaid on a true-color background from NASA's MODIS land imager (produced by NASA-GSFC with data from NOAA GOES).

CONTENTS

The Sedimentary Record (ISSN 1543-8740) is published quarterly by the Society for Sedimentary Geology with offices at 6128 East 38th Street, Suite 308, Tulsa, OK 74135-5814, USA.

The Sedimentary Record is provided as part of membership dues to the Society for Sedimentary Geology.

www.sepm.org

The Effects of Hurricanes Katrina and Rita on the Seabed of the Louisiana Shelf

Miguel A. Goni, Yvan Alleau
College of Oceanic & Atmospheric Sciences, Oregon State University, Corvallis, OR 97331

Reide Corbett, J.P. Walsh, David Mallinson
Department of Geological Sciences, Coastal Resources Management, East Carolina University, Greenville, NC 27858

Mead A. Allison
Dept. of Earth & Environmental Sciences, Tulane University, New Orleans, LA 70118

Elizabeth Gordon, Steven Petsch
Department of Geosciences, University of Massachusetts Amherst, Amherst, MA 01003

Timothy M. Dellapenna
Dept. of Marine Sciences, Texas A & M University at Galveston, Galveston, TX 77553

ABSTRACT

The legacy of hurricanes Katrina and Rita on land has been one of human devastation and long-term damage to the infrastructure of communities along the northern Gulf of Mexico. In addition, these hurricanes had major impacts on offshore regions of the shelf and slope. A multi-institution, rapid-response effort investigated the immediate effects of the storms on the seabed off the Louisiana coast. These studies revealed intense reworking of surface sediment layers during the storm passage and re-deposition of materials following the hurricanes over a broad area of the shelf and slope. The pattern of deposition varied significantly along the region between the Mississippi and Atchafalaya rivers, depending on both the characteristic of the shelf and the paths of the storms. Geochemical tracers indicate the origin of the materials in the post-hurricane layers was predominantly local sediments mobilized by the intense wave activity during the storms. The combined impact of the hurricanes was a massive disturbance of benthic communities throughout the region, including marked erosion of the seabed in the shallower regions of the shelf and elevated deposition of sediments in the deeper regions. The total amounts of sediment, carbon and nitrogen re-deposited following the storm far exceeded the combined annual inputs of these materials by the Mississippi/Atchafalaya Rivers. The characterization of these storm deposits provides an opportunity to investigate the history of hurricane activity in the recent past based on the sedimentary record preserved in this region.

HURRICANES KATRINA AND RITA

Hurricane Katrina originated as a tropical storm on August 24, 2006 over the central Bahamas, becoming a Category 1 hurricane on August 25 as it made initial landfall on the southeastern coast of Florida. After crossing the Florida peninsula on a westward path, Katrina quickly regained hurricane status, intensifying into Category 3 status and doubling in size on August 27, 2006. By August 28, Katrina had become a Category 5 storm with peak winds of over 280 Km/h. Early on August 29, Katrina started to move northward, making landfall on August 29, 2006 as a large Category 3 hurricane near Buras, Louisiana. Maximum sustained winds measured during landfall reached 140 Km/h at the atmospheric station located at Grand Isle, LA, with wind gusts of up to 200 Km/h. The station at Southwest Pass, LA, measured sustained winds of 130 Km/h.

Storm surge measurements during the peak of the storm were compromised due to the widespread failure of tide gauges. However, high mark observations indicate the maximum storm surge (7-9 m) was measured along the Mississippi Coast near St. Louis Bay, with lower surges (3-6 m) measured along the eastern Louisiana coast and the New Orleans area. Katrina generated large, northward-propagating swells, with significant wave height measurements that ranged from 9 to 17 m at a buoy 64 nautical miles south of Dauphin Island, Alabama. Storm-related precipitation ranged from 20 to 30 cm of rain along a swath that extended from southwestern Mississippi to eastern Louisiana. The economic and environmental damages associated with Katrina have been widespread, accounting for over $40 billion of insured losses, with preliminary estimates of total damage over twice that figure (summarized from Knabb et al., 2006a).

Just as the region was starting to recuperate from the effects of Katrina, Hurricane Rita moved west-northwest over the Turks and Caicos and the Southern Bahamas on September 18, 2006. Rita became a tropical storm on September 19, becoming a hurricane on September 20 as it approached the Florida Keys. As Rita entered the Gulf of Mexico, its strength increased, quickly intensifying to a Category 5 hurricane by September 22 with estimated peak winds of 290 Km/h. As it moved west-northwest, Rita weakened to Category 3 status up to the time of landfall on the morning of September 24, 2006. Rita came ashore in western Louisiana near the Louisiana/Texas border, just west of Johnson's Bayou (LA) and east of Sabine Pass (TX). Rita brought 185 Km/h winds to the region near the landfall area, while 130 Km/h winds were measured over wider areas of Texas and Louisiana.

A significant storm surge, ranging from 2 to 5 m was observed in southwestern Louisiana, as far east as Vermillion (LA). Rita also produced smaller storm surge (1-2 m) in regions of southeastern Louisiana that were highly impacted by Hurricane Katrina a month earlier. Storm-related precipitation amounted to 13 to 23 cm in many regions of Mississippi, Louisiana and eastern Texas. Storm-associated damage to insured property was estimated to be over $5 billion, with total damage estimates accounting for about $10 billion (summarized from Knabb et al., 2006b).

RAPID RESPONSE EFFORT

In the days following the landfall of Katrina, plans were drawn to mount a rapid response field effort to investigate the effects of the hur-

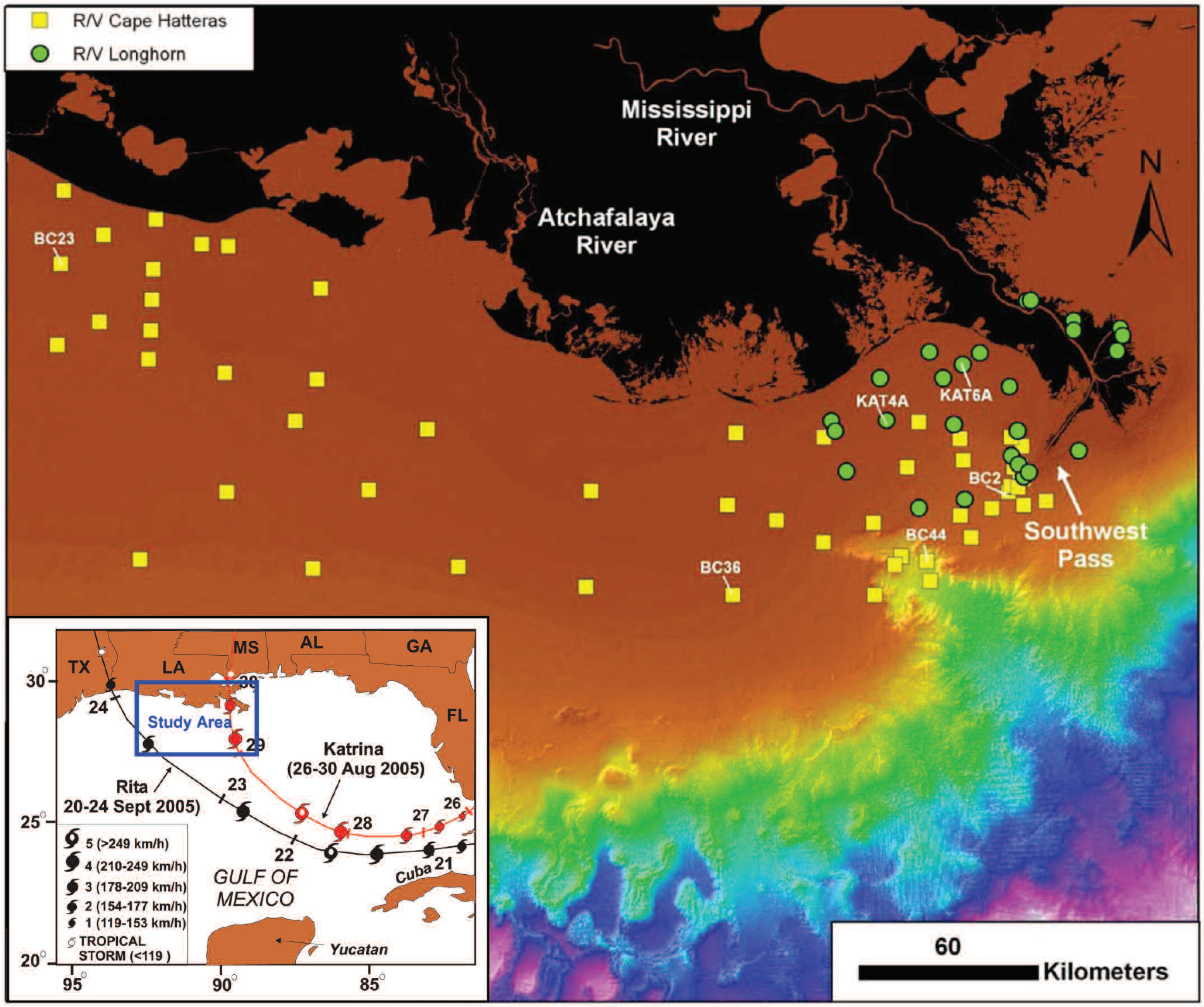


Figure 1. Map of the study area showing the location of the coring stations along the Louisiana margin. The insert shows the path and strength of Hurricanes Katrina and Rita.

ricane on the continental shelf environment. Two ships, the R/V Cape Hatteras and R/V Longhorn, were identified as being available with funding from the National Science Foundation and the Office of Naval Research, respectively. Cruise plans had to be altered in several occasions, when Hurricane Ophelia affected the departure of the R/V Cape Hatteras from the South Atlantic Bight and when Hurricane Rita came into the Gulf of Mexico. Ports of departure had to be changed in the aftermath of Hurricane Rita because of major coastal flooding in all of western Louisiana including LUMCON's facilities at Cocodrie (LA) from which the research cruises were originally scheduled to depart.

On September 26, 2005, scientific teams from East Carolina University (Corbett, Walsh and Mallison) and Oregon State University (Goni) boarded the R/V Cape Hatteras in Pensacola (FL), the only available major port open in the central part of the Gulf. Researchers from Tulane University (Allison), Texas A&M (Dellapenna) and University of Massachusetts, Amherst (Gordon), boarded the R/V Longhorn at Galveston on Sept 29. Investigators aboard the R/V Cape Hatteras focused their efforts on the shelf and slope off the Mississippi Southwest Pass, along the mouth of the Mississippi Canyon and west towards the Atchafalaya River shelf region offshore from the Chenier Plain (Fig. 1). The research group aboard the R/V Longhorn sampled and collected data from the inner regions of the Mississippi Bight and coastal marshes on the west and east of the bird foot delta.

A multi-beam swath bathymetry system was installed aboard the R/V Hatteras and used to map the seabed off Southwest Pass to investigate the slump morphology of this region (Walsh et al., 2006). A chirp sub-bottom profiling system was towed from the R/V Longhorn and used to map the subsurface seabed within the Mississippi Bight. In addition, both ships were fitted with various coring equipment, box corers, a multi-corer and Kasten corers that were used to sample the seabed at over 80 different locations (Fig. 1). Once retrieved, sediment cores were X-rayed, described, and sub-sampled for a variety of purposes.

Sediment samples were collected to measure the activities of natural radionuclides (^{210}Pb, ^{7}Be, and ^{234}Th), porosity, grain size and various geochemical parameters. These latter included

Table 1. Estimates of total mass accumulation of sediment, organic carbon and nitrogen on the seabed due to the combined Rita and Katrina events in contrast to annual inputs by rivers and regional primary production.

	Sediment	Organic Carbon	Nitrogen
Rita/Katrina Accumulations (g)	$1.16 \times 10^{15} \pm 1.56 \times 10^{14}$	$1.36 \times 10^{13} \pm 2.46 \times 10^{12}$	$1.56 \times 10^{12} \pm 2.5 \times 10^{11}$
Annual Inputs (g/y)			
Combined Mississpi/Atchafalaya Rivers	2.16×10^{14}	3.62×10^{12}	3.96×10^{11}
Regional Net Primary Production		$1.05 \times 10^{13} \pm 3.82 \times 10^{12}$	$1.74 \times 10^{12} \pm 6.36 \times 10^{11}$
Non-Hurricane Accumulations (g/y)	1.18×10^{14}	1.17×10^{12}	1.40×10^{11}

Seabed accumulation rates account for the porosity values measured in storm and non-storm deposits.
Estimates of annual inputs (river discharge and primary productivity) and of non-hurricane accumulations are from Gordon and Goni, 2004.

weight percent inorganic and organic carbon content (%IC and %OC, respectively), organic carbon:nitrogen ratios (OC:N) and the stable isotopic compositions of organic carbon and nitrogen ($\delta^{13}C$ and $\delta^{15}N$, respectively). Radiocarbon compositions were measured in selected samples to evaluate the age of the organic matter in these deposits. Combined, these compositions were used to evaluate the provenance and composition of sediments and associated organic materials deposited after the storms in order to assess the overall effects of the two hurricanes.

HURRICANE-CAUSED EROSION AND DEPOSITION

Although incomplete due to the failure of many instruments, wind, wave and storm surge records all indicate extreme conditions on the shelf during the heights of the storms. Under these conditions, massive mobilization of large amount of sediments took place, followed by the deposition of storm layers throughout the study area. Based on radionuclide profiles and careful examination of X-rays, we were able to estimate the thickness of the storm layers, which are illustrated in Figure 2. In several cores, estimates of seabed erosion are possible due to the absence of post-storm deposition and the existence of pre-hurricane cores (Fig. 3, KAT6A). These estimates indicate that up to 8 cm of sediment were eroded from the seabed as a result of both storms. However, these are conservative estimates since storm incision was impossible to quantify due to the lack of markers within the sediment column at most sites. The sites where there was net erosion but no deposition were all located in the inner Mississippi Bight region and most likely resulted from the passage of Hurricane Katrina across the region. Wave energy was likely to have remained high for a long period in this region and perhaps there was no direct source of re-suspended material available to be deposited in the days following storm passage.

Most sites cored yielded sediments that upon X-ray and radionuclide analyses showed clear storm layers (e.g., Corbett et al., submitted). A majority of the sites in the eastern part of the study area clearly showed two storm layers, the deeper one associated with Katrina and the surface unit being the result of Rita (Fig. 2). In contrast, all sites off the Atchafalaya River mouth showed only one distinct storm layer, which we assigned to Hurricane Rita. In both cases the pattern of hurricane deposits is the result of interactions between storm waves and the seabed. We believe that at depths shallower than about 20 meters, both hurricanes caused re-suspension of surface sediments followed by deposition after energetic conditions subsided. In the shallow regions of the shelf, including those located within the Mississippi Bight (Fig. 3, KAT4A) and along the Atchafalaya Shelf (Fig. 3, BC23), wave conditions during Rita were high enough to completely remove the sediments deposited following Katrina. In fact, several of these cores display a clear erosional surface associated with this process (Fig. 3, BC23). In these regions only a single storm layer associated with Hurricane Rita survived.

In the deeper region of the Mississippi and Terrebonne shelf (depths >30 m) two storm deposits are evident (Fig. 3, BC2). In a few cores off the Mississippi Delta, we can in fact detect three storm layers. ^{210}Pb profiles indicate the third deepest layer was initially

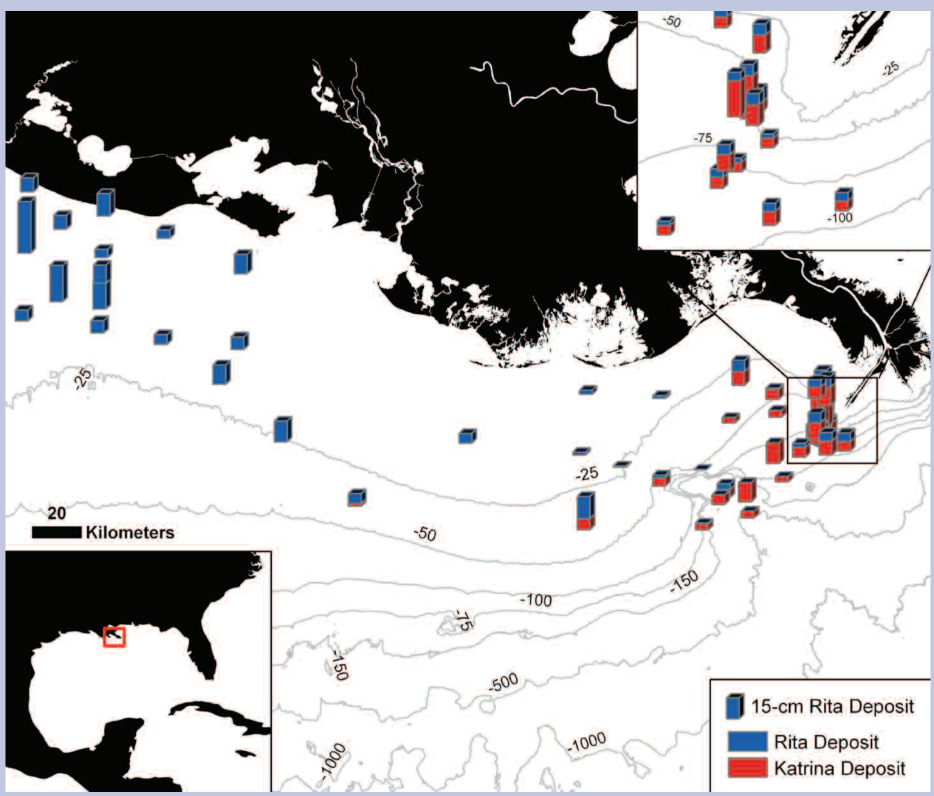


Figure 2. Map illustrating the thickness of sediment deposits associated with Hurricanes Katrina and Rita.

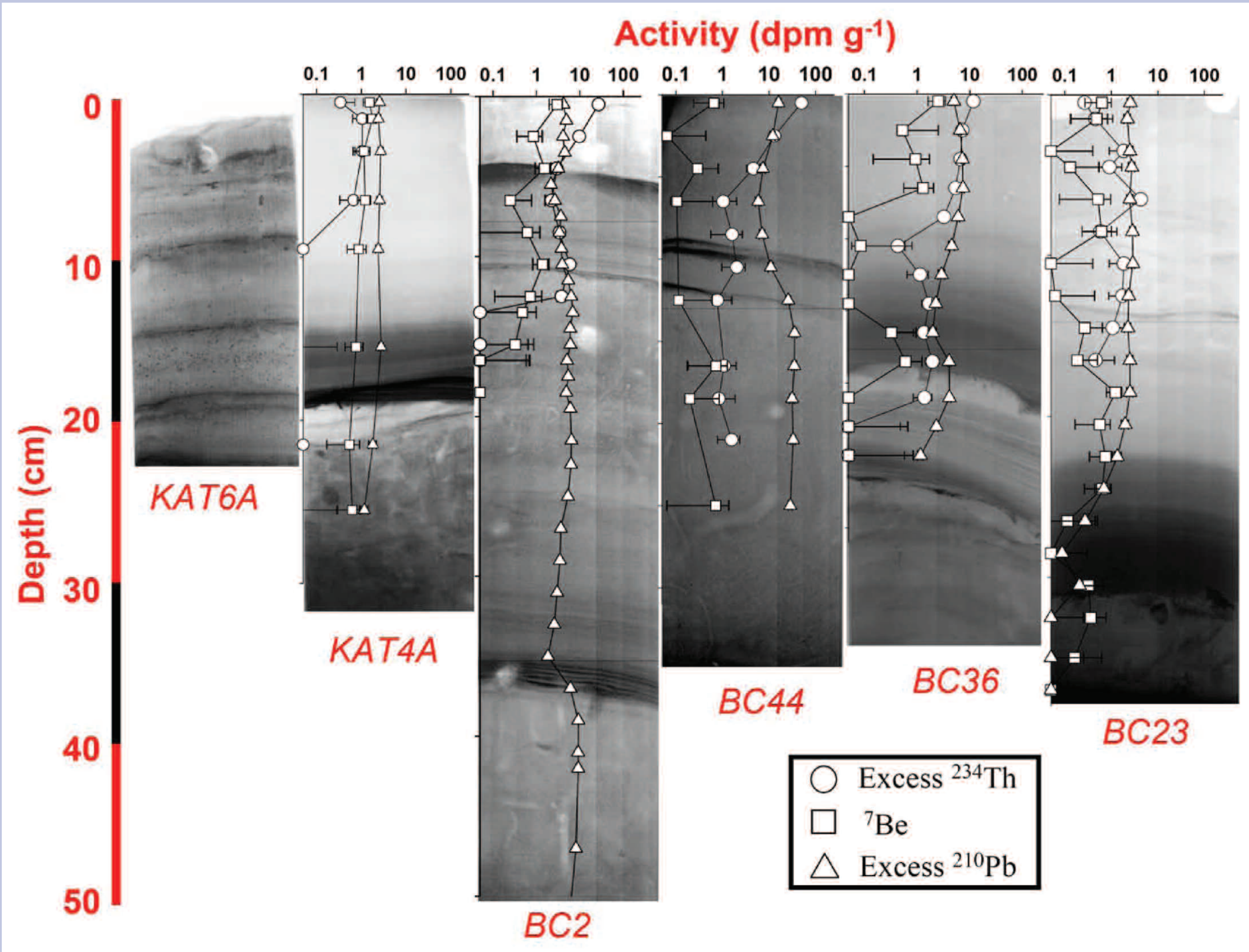


Figure 3. X-radiographs of representative cores from sites along the Louisiana margin collected after Hurricanes Katrina and Rita. Included in the graphs are available data on the radionuclide inventories measured. Profiles of excess ^{234}Th, ^{7}Be and excess ^{210}Pb are included.

deposited after Hurricane Ivan in 2004 (Corbett et al., 2006) and was left intact after the passage of Katrina and Rita. These deposits show no evidence for erosional surfaces below the base of the storm layers, indicating wave energy at these depths was not high enough to resuspend materials from the seabed. In contrast, we found no evidence for storm deposits in the deeper regions of the shelf off the Atchafalaya River, suggesting materials resuspended during the storms were not transported across shelf in this part of the Louisiana shelf. The broad, flat bathymetry in this region of the shelf likely limited cross-shelf transport through gravity flows. In contrast, the steep bathymetry off the Mississippi River shelf region probably facilitated cross-shelf gravity flows, which is the process most likely responsible for the storm deposits found in this region (e.g., Allison et al., 2005).

COMPOSITION OF HURRICANE DEPOSITS

Short-term (^{7}Be and ^{234}Th) and long-term (^{210}Pb) radionuclide inventories are presented in Figure 3 and are discussed in detail elsewhere (e.g., Walsh et al., 2006; Corbett et al., submitted). Briefly, these data show elevated ^{234}Th activities and lower but measurable ^{7}Be activities in both Rita and Katrina deposits. The low ^{7}Be/^{234}Th ratios of the post-hurricane deposits are consistent with a predominant resuspension source, which results in the exposure of sediment particles to seawater and promotes the adsorption of ^{234}Th prior to deposition (Corbett et al., 2004). The low ^{7}Be activities are consistent with a minor input of fresh river sediments, which are typically enriched in this cosmogenic isotope due to high-drainage basin to estuarine surface area (Baskaran et al., 1997; Sommerfield et al., 1999). This interpretation is supported by the fact that both Rita and Katrina caused minor increases in the discharge of both the Mississippi and Atchafalaya rivers (Corbett et al., submitted), which at this time of the year are at their lowest stage. Furthermore, the elemental (OC:N) and stable carbon isotopic (δ^{13}C) ratios of surface sediments deposited following the passage of both hurricanes show remarkable agreement with the compositions measured in surface sediments from the region prior to the storms (Fig. 4). Again, these findings support our contention that the source of the hurricane deposits was locally resuspended sediment. There is little evidence for a significant input of allochthonous sediment and organic matter, such as might be exported from the erosion of coastal marshes and bayous.

The geochemical profiles of two representative cores are illustrated in Figure 5. Other core profiles have been discussed in previous

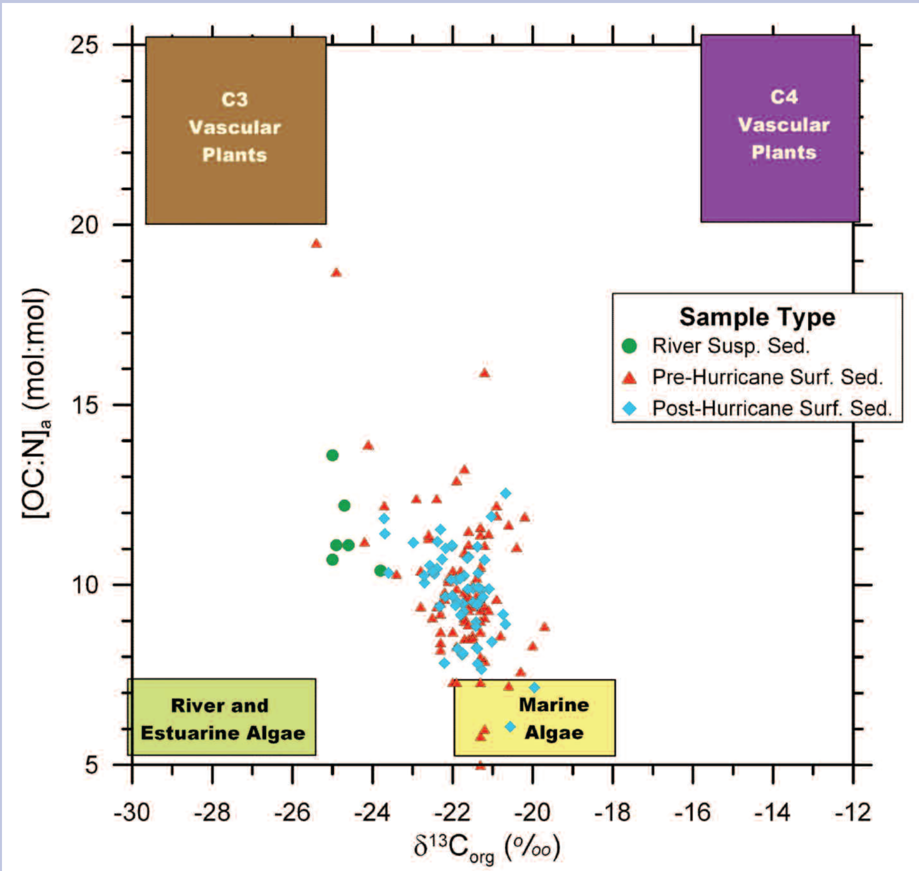


Figure 4. Plot of the stable isotopic composition of organic carbon ($d^{13}C_{org}$) versus the atomic organic carbon:nitrogen ratio ($[OC:N]_a$) of pre- and post-hurricane surface sediments from the Louisiana margin. Included in this graph are compositions of suspended sediments collected from the mouths of the Atchafalaya and Mississippi rivers prior to the hurricanes (Gordon and Goni, 2003), the compositions of surface sediments collected from the Louisiana margin prior to the hurricanes (Goni et al., 1998; Gordon et al., 2001; Gordon and Goni, 2004), along with the composition of surface sediments collected after the hurricanes (this study).

publications (e.g., Corbett et al., 2006); but in general they all share common features. For example, the Hurricane Rita deposits found on the top of BC36 and BC23 cores display fining up sequences with well developed basal layers. These latter layers, which are characterized by low %OC values, low [OC:N] ratios and high [IC:OC] ratios, were deposited during the waning periods of the storm when wave energy subsided. They are enriched in coarse debris, including shell fragments with high carbonate content. The finer sediments deposited on top of the coarser sediments, on the other hand, are much more clay rich. These finer deposits are quite uniform and display relatively high %OC and [OC:N] ratios and lower [IC:OC] ratios.

The Katrina deposit in BC36 shows compositions that suggest part of the deposit may have been eroded during Rita's passage. For example, x-rays indicate relatively coarse material, which is consistent with the relatively low %OC values, low [OC:N] ratios and high [IC:OC] ratios. In that respect, the Katrina deposit at this time resembles more closely the basal layer of the Rita deposit directly above than the fine sediments in place near the sediment water interface. At its height, Rita probably led to bottom shear stresses that exceeded the levels necessary to resuspend seabed materials at 30 m water depth.

It is interesting to note the chemical differences in the Rita deposits between BC36 and BC23. The latter displays much more uniform compositions, lower [OC:N] ratios and enriched $\delta^{13}C$ values (particularly in the top 10 cm). In addition, the Rita layer in BC23 shows two distinct sub-layers, divided by a lense of fine sand (e.g. Fig 3), which suggest there were two post depositional events in this region of the Louisiana Shelf. The differences in %OC, [OC:N], [IC:OC] and $\delta^{13}C$ values all suggest differences in the specific sources of materials deposited (e.g., Gordon and Goni, 2004). Overall, however, the compositions of these sediments are remarkably similar to those of pre-storm deposits (Fig. 4), indicating the major source of sediment and POC in the storm layers is local materials that were resuspended and redistributed following the passage of the hurricanes (Corbett et al., 2006).

REGIONAL IMPACT OF HURRICANES

The massive resuspension and re-deposition of sediments caused major disruption of benthic ecosystems. In shallower regions, large seabed incision was followed by deposition of highly sorted materials, leading to significant disruption of benthic biota. In deeper regions, the hurricanes led to the deposition of several cm-thick layers of sediment and associated materials in regions where long-term accumulation rates are typically low (a few mm per year; Goni and Gordon, 2004). Hence, hurricane-induced deposition of sediment and organic matter in these areas was orders of magnitude higher than the steady-state annual accumulation rates determined prior to the storms (e.g. Corbett et al., submitted). In these environments, stochastic events such as these hurricanes may indeed dominate input fluxes and be responsible for the bulk of clinoform growth and organic matter burial (e.g., Goni et al., 2006).

Overall, the total storm-induced accumulation of sediments throughout the study area was five times greater the annual supply of sediment by the combined Mississippi and Atchafalaya rivers and is 10 times greater than the annual, long-term accumulation during non-storm periods (Table 1). In the case of organic carbon, total accumulation after both storms is the same order of magnitude as the combined annual inputs from the Mississippi/Atchafalaya River and the estimated primary productivity over this region of the shelf. The total storm accumulation of OC on the seabed is one order of magnitude higher than the non-storm estimate. A similar picture arises in the case of nitrogen (Table 1). All of these calculations illustrate the massive impact of the 2005 storms on the biogeochemistry of the seabed throughout a larger region of the northern Gulf of Mexico.

FUTURE WORK

An area of on-going and future research is the investigation of the fate of the hurricane deposits. Bioturbation and physical mixing are likely to alter and erase the biogeochemical and sedimentological signatures of these deposits, especially those located in the shallower regions of the shelf. On the other hand, as illustrated by Fig. 3, BC2, storm deposits appear to be preserved in deeper sites. Hence,

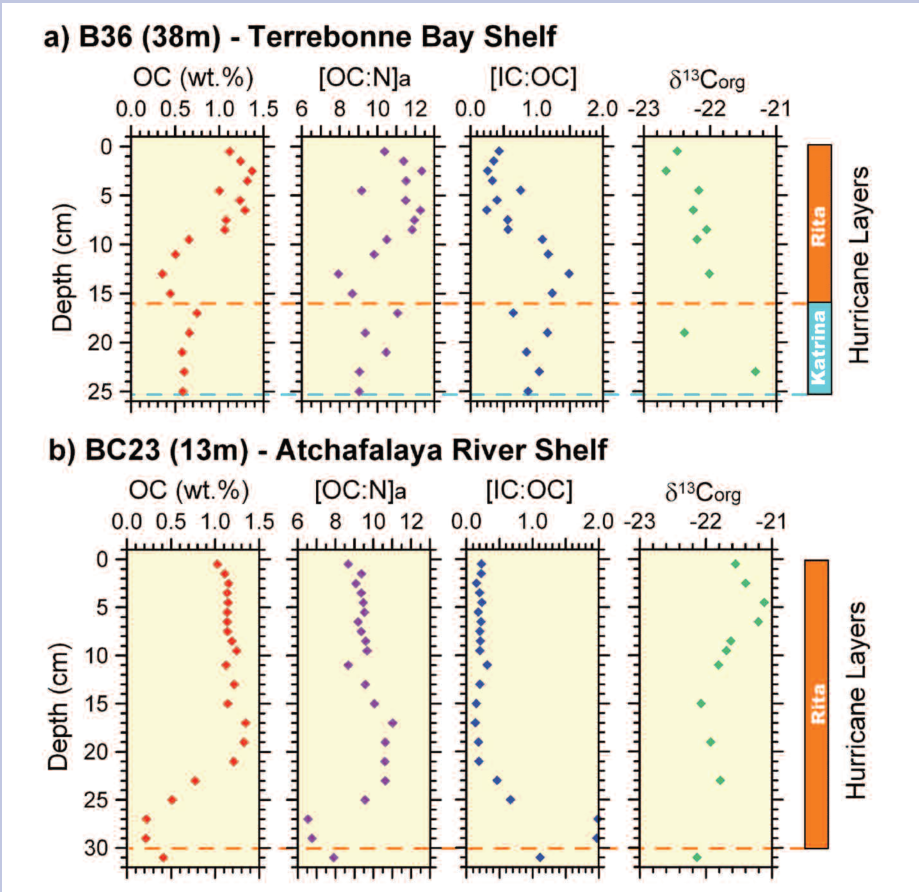


***Figure 5.** Profiles of several geochemical properties, including weight percent organic carbon content (%OC), atomic organic carbon:nitrogen ratios ($[OC:N]_a$), inorganic carbon:organic carbon ratios ([IC:OC]) and stable isotopic compositions of organic carbon ($d^{13}C_{org}$), of two representative cores from the eastern (Terrebonne Bay Shelf) and western (Atchafalaya River Shelf) regions of the study area. The depths of the hurricane layers, which were determined by visual inspection of the x-rays and the distribution of ^{7}Be and ^{234}Th, are indicated with the bars at the right of the profiles.*

it is possible that deeper regions of the shelf and slope may contain long-term records of hurricane deposition. The sedimentological and geochemical compositions of the Ivan, Katrina and Rita deposits provide us with information needed to identify similar hurricane-derived layers in the sedimentary record. However, as illustrated by differences among the various hurricane deposits (e.g., Fig. 3), it will be very challenging to use these records to reconstruct hurricane intensity. For example, although Katrina was a more intense hurricane that came ashore much closer to the core site than Ivan, the latter produced a much thicker storm deposit (Corbett et al., 2006). We speculate that while wave energy off Southwest Pass during Katrina greatly exceeded conditions during Ivan, there was much more unconsolidated sediment available for resuspension in 2004, when Ivan struck the region, than in 2005. It is likely that periods of high hurricane frequency may have resulted in multiple, smaller storm deposits, whereas singularly thick deposits may characterize periods of infrequent storms.

ACKNOWLEDGMENTS

Funds for this research were provided by NSF to MAG, RC, JPW, DM, EG and SP, whereas ONR funded the efforts of MA and TD. We thank the captains, crew and port operations personnel for the R/V Cape Hatteras and R/V Longhorn for their help and perseverance that allowed us to complete the rapid response efforts. Christina Loewy and Chris Reade helped complete the geochemical analyses of these samples. We thank the science crew aboard the R/V Cape Hatteras (M. Dail, C. Loewy, K. Marciniak, K. Ryan, C. Smith, A. Stevens, B. Sumners and T. Tesi) for their invaluable contributions to the coring efforts.

REFERENCES

ALLISON M. A. SHEREMET A., GONI M. A. AND STONE G. W., 2005, Storm Layer Deposition on the Mississippi-Atchafalaya Subaqueous Delta Generated by Hurricane Lili in 2002: Continental Shelf Research, v. 25, p., 2213-2232.

BASKARAN, M., RAVICHANDRAN, M., BIANCHI, T.S., 1997. Cycling of 7Be and 210Pb in a high DOC, shallow, turbid estuary of southeast Texas: Estuarine Coastal Shelf Science, v. 45, p., 165-176.

CORBETT, D.C., MCKEE, B., DUNCAN, D., 2004. An evaluation of mobile mud dynamics in the Mississippi River deltaic region: Marine Geology, v. 209, p., 91-112.

CORBETT, D. R., MCKEE, B., ALLISON, M., 2006, Nature of decadal-scale sediment accumulation on the western shelf of the Mississippi River delta: Continental Shelf Research, v. 26, p., 2125-2140.

CORBETT D.R., WALSH J.P., GONI M.A., MALLINSON, D., submitted, Effects of great hurricanes on the seabed: A tale of two storms on the Mississippi-Atchafalaya Shelf: Coastal Shelf Research.

GONI M. A., RUTTENBERG K. C., AND EGLINTON T. I., 1998, A reassessment of the sources and importance of land-derived organic matter in surface sediments from the Gulf of Mexico: Geochimica et Cosmochimica Acta, v. 62, p., 3055-3075.

GONI M. A. GORDON E. S., MONACCI N. M., CLINTON R., GISHEWHITE, R., ALLISON M., KINEKE G., 2006, The effect of Hurricane Lili on the distribution of organic matter along the Inner Louisiana Shelf (Gulf of Mexico, USA): Continental Shelf Research, v. 26, p., 2260-2280

GORDON E. S., GONI M. A., ROBERTS, Q. N., KINEKE, G. C., AND ALLISON, M. A., 2001, Organic matter distribution and accumulation on the inner Louisiana Shelf: Continental Shelf Research, v. 21, p., 1691-1721.

GORDON E. S. AND GONI M. A., 2004, Controls on the distribution and accumulation of terrigenous organic matter in sediments from the Mississippi and Atchafalaya River Margin: Marine Chemistry, v. 92, p., 331- 352.

KNABB, R. D., RHOME, J. R. AND BROWN, D. P., 2006a, Tropical Cyclone Report, Hurricane Katrina, 23-30 August 2005: National Hurricane Center, p. 1-43 (http://www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf).

KNABB, R. D., BROWN, D. P., AND RHOME, J. R. (2006b) Tropical Cyclone Report, Hurricane Rita, 18-26 September 2005: National Hurricane Center, p. 1-33. (http://www.nhc.noaa.gov/pdf/TCR-AL182005_Rita.pdf).

SOMMERFIELD, C.K., NITTROUER, C.A., ALEXANDER, C.R., 1999. 7Be as a tracer of flood sedimentation on the northern California continental margin: Continental Shelf Research, v. 19, p., 335-361.

WALSH J. P., CORBETT D. R., MALLINSON D., GONI M., DAIL M., LOEWY C., MARCINIAK K., RYAN K., SMITH C., STEVENS A., SUMNERS B., AND TESI T., 2006, Mississippi Delta mudflow activity triggered by recent Gulf hurricanes: EOS Transactions, v. 87, p., 477-478.

Accepted January 2007

IV Latin American Congress of Sedimentology
XI Argentinean Meeting of Sedimentology
San Carlos de Bariloche, Argentina • November 20-24, 2006

The 4th Latin American Sedimentology Congress was held in Bariloche, Argentina, November 20-24, 2006. Organized by the Argentine Association of Sedimentology, 276 sedimentologists and stratigraphers from 13 countries, including Argentina, Venezuela, Brazil, Ecuador, Uruguay, Switzerland, England, Wales, Spain, China, India, and the USA participated in the Conference. Of those attending 95 were students. SEPM co-sponsored the meeting, and was able to provide support for 5 Ph.D., and 20 Masters students attending the Congress. The organizers, led by Dr. Daniel Poire, put together a program that represented a strong cross-section of sedimentary geology research currently conducted in the region. Short courses included isotopic chemostratigraphy, and clays and sedimentary environments. Keynote papers were presented by a diverse international group, on topics that ranged from sandy braided stream processes, questions of scale invariance (J. Best, university of Leeds), Northern Patagonia lake deposition (E. Chapron, ETH Zurich), paleogeography of lower Paleozoic basins in western Gondwana (C. O. Limarino, University of Buenos Aires), syntectonic growth strata in a variety of tectonic settings (O. R. Lopez-Gamundi, Hess Corporation), evaporate-carbonate systems (J. F. Sarg, Colorado School of Mines), and millennial-scale cycles in the sedimentary record (M. Tucker, University of Durham). Four special sessions presented current work on (1) recent and fossil lakes; (2) taphonomy and paleoecology; (3) estuaries: present and past; and (4) Neoproterozoic events in southwestern Gondwana. Sixteen thematic sessions, over the five day conference, covered the broad range of sedimentology and paleontology, and served to highlight active research in the region, and the rich sedimentary history of South America. Siliciclastic themes included all the major environments (fluvial/alluvial, lacustrine, Aeolian, shoreline and shelf, slope and deep sea), and volcaniclastics. Carbonate-evaporite sedimentation and diagenesis was covered in one thematic session, and in addition to taphonomy and paleoecology, an ichnofacies session attracted strong attendance. Sessions were also well attended, on basin analysis, tectonics and sedimentation, and sequence stratigraphy. Sessions on environmental sedimentology, mineral resources, and hydrocarbon reservoirs and source rocks brought societal and economic significance to the conference. A four day post-conference field trip provided participants the opportunity to observe the geology and superb outcrops of the Neuquen basin, the most extensively studied petroleum basin in Argentina. The Mesozoic-aged Neuquen basin comprises a mixed siliciclastic, carbonate, and evaporite system that ranges from fluvial and aeolian environments to shallow marine and deep marine sequences and reservoir rocks.

Rick Sarg
Colorado School of Mines

SEPM BOOK STORE

Joint Publication - Geological Society of London
and SEPM Society for Sedimentary Geology

Seismic Geomorphology: Applications to Hydrocarbon Exploration and Production

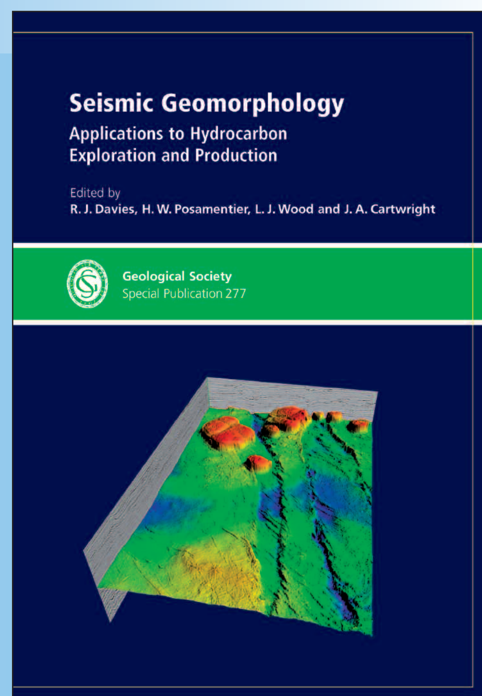
Edited by: R. J. Davies, H. W. Posamentier, L. J. Wood, and J. A. Cartwright

We are poised to embark on a new era of discovery in the study of geomorphology. In recent years an entirely new way of studying landscapes and seascapes has been developed through the use of 3D seismic data. Just as CAT scans allow medical staff to view our anatomy in 3D, seismic data now allows Earth scientists to do what the early geomorphologists could only dream of - view tens and hundreds of square kilometres of the Earth's subsurface in 3D and therefore see for the first time how landscapes have evolved through time. This volume demonstrates how Earth scientists are starting to use this relatively new tool to study the dynamic evolution of a range of sedimentary environments.

288 p., ISBN: 978-1-86239-223-6

This is a cooperative publication of SEPM and GSL, published under the GSL Special Publications Series. SEPM will handle all sales within North America and GSL will handle all sales elsewhere. The book can be purchased from the online bookstores - for North America: www.sepm.org or outside on N.American: www.geolsoc.org.uk.

List Price $140.00 **SEPM/GSL Member Price $70.00**



PRESIDENT'S COMMENTS

Engagement

As I write this, three quarters of my time as President of SEPM has passed and I've begun to look back on the events and accomplishments of the past year. The dramatic increases in the number of pages that we will publish in both the *Journal of Sedimentary Research* and *PALAIOS* are notable highlights that will allow the Society to serve its members and the discipline better. The initiative to revamp the membership structure of SEPM, to assist members in the developing world to participate more easily in the international sedimentary community, and also to assist retired members to continue their affiliation with SEPM at a reduced price (as an "Emeritus Member"), is ongoing; it is my intention to make formal proposals to SEPM Council at its upcoming meeting in Long Beach.

One of the highlights of my year as President has been my visit to some of the SEPM Sections. So far, I've met with the Rocky Mountain and Gulf Coast Sections, and I'll be attending an Eastern Section meeting later this winter. These visits to see what's going on at the grass-roots level have been enjoyable. It is clear that these regional groups are alive and well. They provide a vital service to the local sedimentary community, allowing people to gather in a more intimate manner than is possible at the large, annual meetings. Some of the Sections are very active with their own, independent publishing programs and regularly scheduled, well-attended meetings and/or field trips. Global SEPM is eager to assist all of the Sections in any way possible and is willing to work cooperatively with them. Sections are not always aware that global SEPM will give the Section a cash contribution of $2 for each member of the Section that is also a member of global SEPM. If any of you who are reading this are not a member of a local Section, I encourage you to join. Even if someone is not a member of global SEPM, they may still join a Section. If there is no local Section, as is the case in many of the far-flung countries where SEPM has members, and you'd like to start one, contact Howard Harper for details. However, creating a formal Section may not be necessary. SEPM is very willing to a lend a helping hand if a small number of individuals want to form an informal group for a purpose that is in keeping with SEPM's mission.

SEPM's Research Groups provide a somewhat similar function to the Sections, but allow people with a common thematic interest (as opposed to geographic proximity) to get together to discuss cutting-edge ideas. Research Groups typically meet at either the AAPG/SEPM Annual Convention in the spring, or at the GSA Annual Meeting in the fall. They also commonly serve as the breeding ground for Research Conferences and Special Publications. If you are interested in any of the topics for which there are Research Groups (check out the list on the new-look SEPM website), join up to get your name on their mailing list (there is no cost), and participate in their next meeting. If there isn't a Research Group in your field, we encourage you to propose a new one.

Just as we encourage our members to become active in the larger sedimentary community within SEPM, SEPM itself is becoming ever more engaged with the larger scientific community. SEPM began life as a Division of AAPG, but has been an independent organization since 1987. It remains closely associated with AAPG and holds its annual meeting jointly with AAPG. It might be noted, however, that SEPM is not a formal partner with AAPG in the holding of its meeting and grains only minimal revenue from it. SEPM has little influence on the organization of that meeting, and has no say in the choice of venue or dates. We are, however, a major contributor to the technical program, with SEPM sponsored or co-sponsored sessions typically comprising about 50% of all technical sessions.

In recent years, SEPM has been broadening its contacts with other organizations. Since 1999, SEPM has been a formal "Affiliated Society" of the Geological Society of America. This allows our members to propose and host sessions at GSA meetings, and gives SEPM and its members a window into a different part of the larger geological community. Since 2002, SEPM has also begun to work with the Geological Society of London to host joint Research Conferences. There have been three so far. All have been a scientific and financial success, and Special Publications will be forthcoming from all of them. In addition, SEPM has been a member of the American Geological Institute (AGI) for many years, and is a member of the board of the GeoScienceWorld journal-distribution consortium. SEPM has recently joined the Council of Science Society Presidents (CSSP), an organization whose members consist of the Presidents and Past Presidents of organizations spanning the entire spectrum of the sciences, including science teachers. It deals with issues that transcend any one science, including issues dealing with scientific publishing, research ethics, the teaching of science, intelligent design, energy policy and so on. Earth scientists have an important role to play in this influential body.

In new developments, at the recent GSA meeting in Philadelphia SEPM was accepted as a formal member of the North American Commission on Stratigraphic Nomenclature, the body that oversees the North American Stratigraphic Code, and will be allowed to appoint two voting members. The next big debate for this group is whether, or not, to formalize sequence stratigraphy. SEPM is also moving to develop closer formal ties with the Sedimentary Geology Division of GSA, and has been approached by one of the smaller paleontological organizations about the possibility of becoming affiliated with SEPM, with a status similar to that of the North American Micropaleontological Society (NAMS). It appears that SEPM is slowly developing into a hub for sedimentary activities, not only within North America but globally.

As I close this, my last, President's Comments column, I would like to take this opportunity to thank the many people who give of their time and energy to make SEPM such a great organization. Of course those who serve on Council are the most visible, but there are many others who are less obvious but no less important. The vitality of our Sections and Research Groups stems from the efforts of their leaders. These hard-working volunteers have our heartfelt thanks for all that they do to keep the grass-roots face of our Society flourishing. The members of the Headquarters and Business Committee with whom I've worked over the last two years are also thanked for their concern for the financial well-being of SEPM. Their careful management of the Society's finances makes it possible for SEPM to do what it does on an ongoing basis. Finally and definitely NOT least, I want to thank the hard-working and dedicated Headquarters staff who make everything happen: Howard Harper, Executive Director, who is an efficient and clear-headed leader; Theresa Scott, Associate Director and Business Manager, who has been with the Society longer (16 years!) than any of the other staff; Michele Woods, our always cheerful Manager of Membership Services; Bob Clarke, who oversees our diverse book publishing activities; and Edythe Ellis, the Administrative Assistance who keeps the office running. The Managing Editors of our journals, Melissa Lester (JSR) and Jill Hardesty (PALAIOS), who work under the direction of the Editors, also deserve our thanks for their unheralded efforts. Thank you everyone!

Bob Dalrymple, President
<dalrymple@geol.queensu.ca>

SEPM ACTIVITIES AT THE LONG BEACH ANNUAL MEETING

All meetings listed below will be at the Westin Hotel unless otherwise noted

Sunday, April 1:	SEPM Council Meeting	8:00 am-5:00 pm	Melbourne
	Exhibit Ice Breaker (Convention Ctr)	5:00 pm-7:30 pm	
Monday, April 2:	AAPG/SEPM Student Reception	6:00 pm-9:00 pm	Hyatt Regency
	Research Group—NAMS/Chronos/Micro	7:00 pm-10:00 pm	
	Research Group—Sequence Stratigraphy	7:00 pm-10:00 pm	
	Research Group—Deep Water Turbidites	7:00 pm-10:00 pm	
	Research Group—Carbonate Research	7:00 pm-10:00 pm	
Tuesday, April 2:	Luncheon & Business Mtg (by ticket)	11:30 am-1:30 pm	Salon A
	Foundation Reception (by invitation)	6:00 pm-7:00 pm	Ocean Ballroom
	President's Reception & Awards Ceremony	7:00 pm-9:00 pm	Salon A

A SPECIAL THANKS TO THE LONG BEACH SEPM ANNUAL MEETING ORGANIZING COMMITTEE

Paul M. (Mitch) Harris—SEPM Vice-Chair
Morgan Sullivan—SEPM Technical Program & Oral Session Chair
Frank Corsetti—SEPM Poster Session Chair
Kenn Ehman—SEPM Field Trip and Short Course Chair
Jean C. Hsieh—SEPM Awards Chair

Come by and visit the SEPM Exhibit Booth at the Long Beach Convention Center

Booth #1765

THANKS TO ALL OF THE SEPM ANNUAL MEETING SPONSORS

Bankers Petroleum (US) Inc.
Chevron Corporation
ConocoPhillips
Core Laboratories
EBY Petrography
ExxonMobil
J. P. Oil & Gas
Priority Oil & Gas
Shell E & P
Venoco Inc.

SHORT COURSES

#1 Deep-water Reservoirs of California: From Core to Reservoir Characterization, Modeling and Production—David Miner (Aera Energy), Tom Mooney (Chevron), and Don Lowe (Stanford Univ) - OPEN

#7 Sequence Stratigraphy for Graduate Students—Vitor Abreu and Jack Neal (ExxonMobil) - OPEN - EXXONMOBIL

#8 3-D Seismic Interpretation for Geologists—Bruce Hart (McGill Univ) - OPEN - CONOCOPHILLIPS

#9 Applied Ichnology: The use of trace fossils in sequence Stratigraphy, exploration and production geology—George Pemberton (Univ of Alberta) & James MacEachern (Simon Fraser Univ) - OPEN

FIELD TRIPS

#10 Baja California—Volcanic Arcs and Related Sedimentation—Cathy Busby (Univ of California—Santa Barbara) - OPEN

#11 Sand Injectites in the Western San Joaquin Valley—Andrew Hurst, Mario Vigorito (Univ of Aberdeen) and Hilde Schwartz (Univ of California—Santa Cruz) - OPEN

#12 Santa Cruz Island—Sedimentation and Deformation of a Tertiary Continental Margin—James R. Boles and Grant Yip (Univ of California—Santa Barbara) - OPEN

#13 Sedimentology and Facies Architecture of Channelized Slope System: Capistrano Formation, San Clemente, southern California—Kirt M. Campion, Anthony R. Spraque (ExxonMobil) and Morgan Sullivan (Chevron) - OPEN

#22 Tectonic Controls of Facies Distribution and Stacking Patterns, Ridge Basin, southern California—Kenneth D. Ehman (Skyline Ridge Inc.) and Morgan Sullivan (Chevron) - OPEN