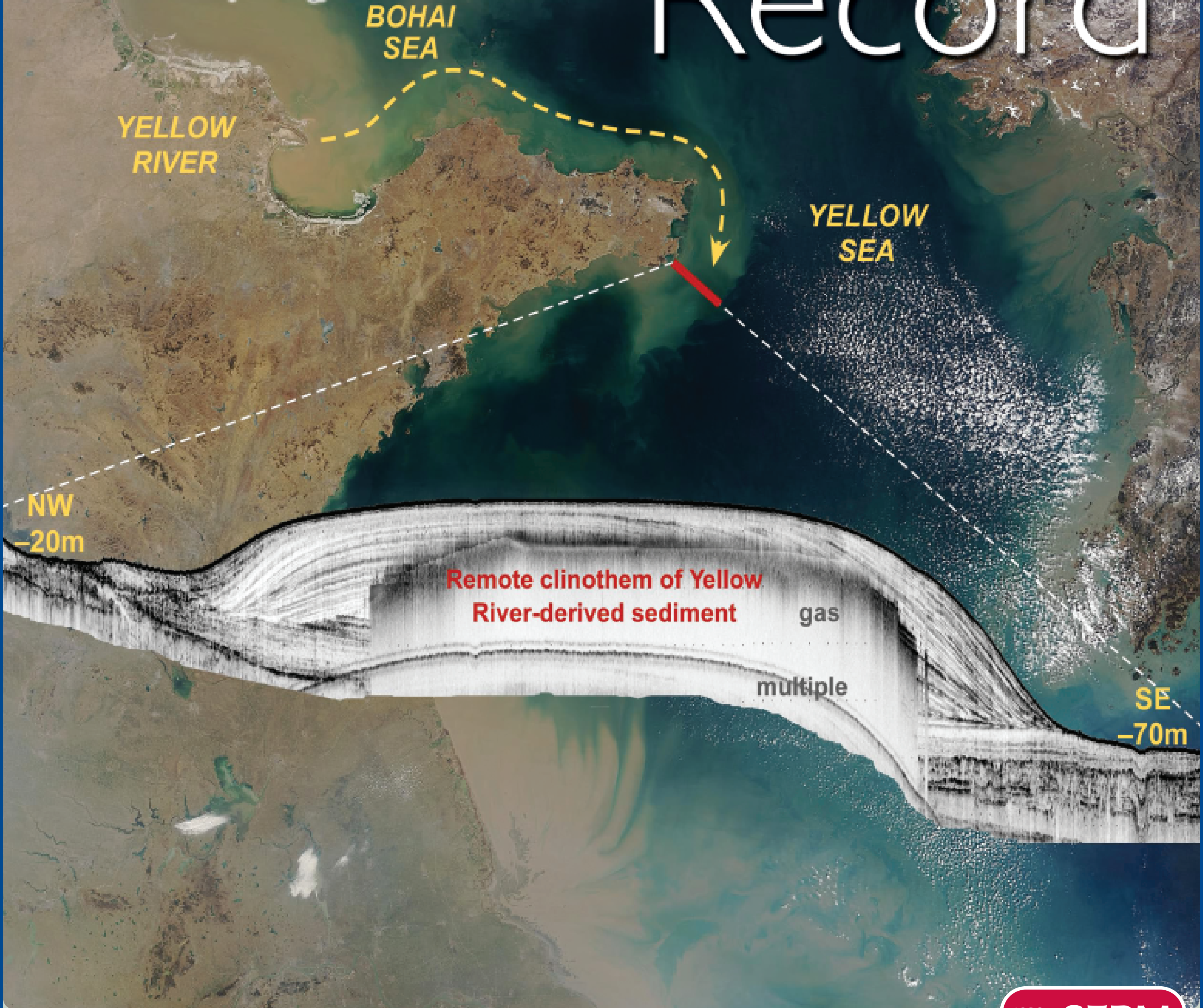
Volume 7, No. 4
December 2009

The SEDIMENTARY Record

A publication of SEPM Society for Sedimentary Geology
with the Sedimentary Geology Division of GSA



INSIDE: FATE OF SEDIMENTS DELIVERED TO THE SEA BY ASIAN LARGE RIVERS: LONG-DISTANCE TRANSPORT AND FORMATION OF REMOTE ALONGSHORE CLINOTHEMS

PLUS: PRESIDENT'S COMMENTS
SUMMARY OF COUNCIL OF SCIENTIFIC SOCIETY PRESIDENTS MEETING

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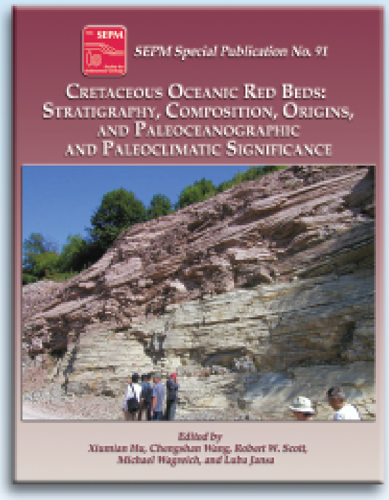
Special Publication #91

Cretaceous Oceanic Red Beds: Stratigraphy, Composition, Origins, and Paleoceanographic and Paleoclimatic Significance

Edited by: Xiumian Hu, Chengshan Wang, Robert W. Scott, Michael Wagreich, and Luba Jansa



The occurrence of marine red beds has been known for at least 140 years, since Stúr (1860) and Gümbel (1861) first described them from the Púchov beds in the Carpathians and the Nierental beds in the Eastern Alps. A few biostratigraphic and sedimentological studies followed, particularly in European countries. However, detailed investigations on paleoceanographic and paleoclimatic implications related to Cretaceous marine red beds were initiated by Prof. Chengshan Wang, Dr. Xiumian Hu, and their colleagues. During the late 1990s they discovered and studied Upper Cretaceous oceanic red beds in the Chuangde section, southern Tibet, which were deposited in the Eastern Tethys Ocean. Subsequently, within the framework of the IGCP 463 and 494, attention has been paid to the global distribution, correlation, and significance of the oxidation of these deposits for paleoceanographic reconstructions, and their relationships to the distinctly different, interbedded mid-Cretaceous black shales.

This collection of papers resulted from two collaborative research projects funded in part by UNESCO/IUGS International Geosciences Project IGCP 463 and IGCP 494. The IGCP 463 "Upper Cretaceous Oceanic Red Beds: Response to Ocean/Climate Global Change" (2002–2006) was led by Prof. Chengshan Wang (China University of Geosciences, Beijing, China), Prof. Massimo Sarti (Universitá Politecnica delle Marche, Italy), Dr. Robert Scott (University of Tulsa and Precision Stratigraphy Associates, USA), and Prof. Luba Jansa (Dalhousie University, Canada). The objective of IGCP 463 was to study major paleoceanographic phenomena recorded by sedimentary sequences in the world oceans. Cretaceous deposition changed several times from widespread organic-carbon-enriched shales that indicate a dysoxic to anoxic deep ocean environment, to mostly reddish clays and marls deposited in an oxic marine environment during the Late Cretaceous.

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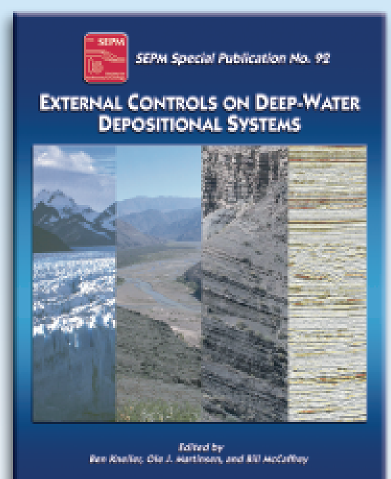
Special Publication #92

External Controls on Deepwater Depositional Systems

Edited by: Ben Kneller, Ole J. Martinsen and Bill McCaffrey



The principal objective of the meeting from which this set of papers arose was to gain an overview of the current state of knowledge of the roles and interplays of external controls on deposition in deep marine environments. By external controls we mean allocyclic or allogenic factors, i.e., those that are unrelated to the self-organization of the depositional system (autocyclic or autogenic); principal among these are climate, sea level, sediment supply, and tectonics. One of the big questions that the meeting sought to address concerned the comparability of the recent high-frequency, high-resolution record with the older, generally lower-frequency stratigraphic record of "deep time"; to what extent are the apparent differences a function of resolution, or of comparisons between a glacial and a nonglacial Earth? In fact, as the papers in this volume illustrate, the variability between individual systems, even in Late Glacial time, and the paucity of constraints on older systems makes these questions difficult to answer, but some useful conclusions can be drawn.

The papers presented at the meeting were organized into themes that included: overviews of glacial sea-level change, and of climate modeling; external controls on large river-fed submarine fans, including the effects of climate and sea level on the fluvial system itself; influences of climate, sea level, and tectonics on a range of smaller modern systems; deep marine processes; the outcrop record of the pre-Pleistocene Earth; the subsurface record of the pre-Pleistocene Earth; and syntheses. The organization of the volume largely reflects this structure.

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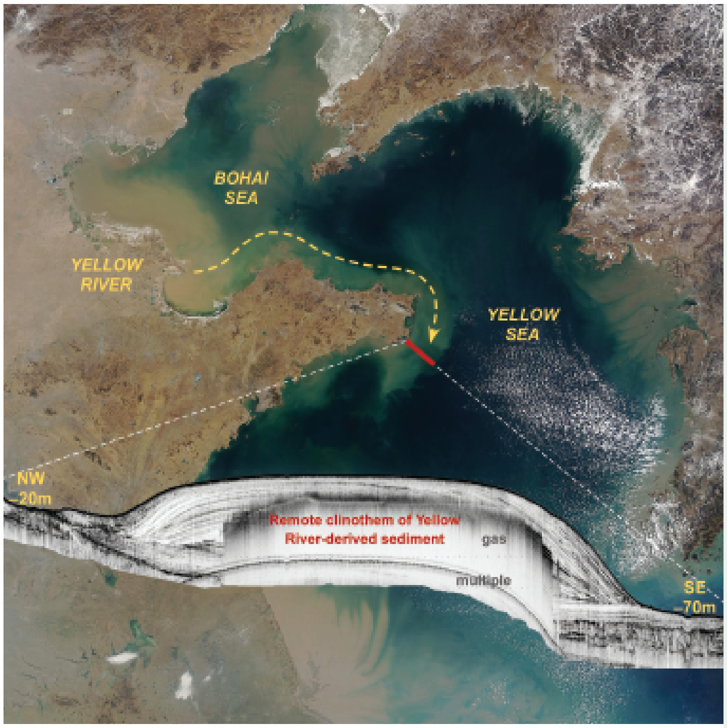

Cover photo: A winter-season satellite image of the Bohai and Yellow Seas showing the suspended sediment plume of the Yellow River extending east and south along the coast of the Shandong peninsula (image from NASA Visible Earth). The inset is a subbottom sonar profile showing where the plume terminates at a remote deltaic mud lobe (up to 40 m thick) that is forming through the alongshore transport and midshelf deposition of Yellow River-derived sediments.

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The Sedimentary Record (ISSN 1543-8740) is published quarterly by the Society for Sedimentary Geology with offices at 4111 S. Darlington, Suite 100, Tulsa , OK 74135-6373, USA.

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

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Fate of sediments delivered to the sea by Asian large rivers: Long-distance transport and formation of remote alongshore clinothems

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ABSTRACT

Recent studies show that the global flux of river-derived sediment reaching the coasts and oceans is about 15-19 x 10^9 tons per year. New sediment budgets for the major Asian river systems (e.g., Yellow, Yangtze, Mekong, Ganges-Brahmaputra, etc.) suggest that 30-50% of their sediment load has been retained in the lower channel reaches to form an extensive subaerial delta plain, while the rest is discharged to the sea. Of the sediment load reaching the ocean, about half has been found to accumulate near the river mouth as a proximal subaqueous delta clinothem. However, the remaining sediment is found to be transported up to 600-800 km alongshore, ultimately being deposited as a shore-parallel middle-shelf clinothem. These clinoform deposits are generally <100 km in across-shelf width, 20-40 m thick nearshore, and pinch-out gradually seaward at 40-90 m water depth. A secondary nearshore depocenter can usually be found along the shelf away from the river mouth, with mud-lobe accumulation up to 40-50 m thick locally. Except for a few systems with shelf-indenting canyons (e.g., Ganges-Brahmaputra and Indus), most of Asian river-derived sediments are trapped on the inner and middle shelf, unable to reach the deep ocean (i.e., >150 m) despite having been transported hundreds of kilometers from their mouths.

INTRODUCTION

Rivers are the major carriers delivering large amounts of land-derived freshwater, sediment, and natural elements to the global ocean. Collectively, the world's rivers annually discharge about 35,000 km^3 of freshwater and 20-22 x 10^9 tons of solid and dissolved sediment to the ocean (Milliman and Meade, 1983; Milliman and Syvitski, 1992). As a result rivers, especially large ones, play an important role in controlling the physical and biogeochemical features of estuaries and ocean margins (McKee et al., 2004; Meybeck et al., 2006; Bianchi and Allison, 2009). Recent analyses using large-scale watershed models suggest that, under pre-human conditions, worldwide rivers could have carried about 15.5 x 10^9 tons of sediments to the sea annually (Syvitski et al., 2005; Syvitski and Milliman, 2007). New estimates based on historical gauging data from thousands of rivers (Milliman and Farnsworth; in press) show that this number could be closer to 19 x 10^9 tons of suspended sediments per year. Of this total sediment flux, ~70% or ~13 x 10^9 tons is believed to discharge from the eastern and southern Asian Pacific and oceanic margins alone (Milliman and Meade, 1983; Milliman and Syvitski, 1992; Ludwig et al., 1996; Milliman, 1995).

In eastern and southern Asia, about one-third to one-half of river-derived sediments are trapped in the river's low reaches and contribute to extensive floodplain and delta plain development, for example the Yellow (Saito et al., 2000), Yangtze (Hori et al., 2002), Pearl (Zong et al., 2009), Red (Tanabe et al., 2003); Mekong (Nguyen et al., 2000; Ta et al., 2002), Ganges-Brahmaputra (G-B) (Goodbred et al., 2003), and Indus (Giosan et al., 2006). Among the remaining sediments delivered to the ocean, how much is trapped near the river mouth, and how much is able to reach the deep ocean is still not completely clear. This is an important question, since the flux and fate of river-derived material to the oceans play a key role in global environmental change (Bianchi and Allison, 2009), with up to 80% of global organic carbon being preserved in such marine deltaic deposits (Berner, 1982). In this paper we analyze data acquired from Asia's major rivers and deltas (i.e., Yellow, Yangtze, Pearl, Red, Mekong, Ganges-Brahmaputra) that quantitatively define the fate of these large river-derived sediments after being delivered to the coastal ocean.

BACKGROUND AND METHODS

The Himalayas are among the youngest and most active mountain ranges on the planet, with high relief, steep gradients, frequent tectonic activity, intensive Monsoon rainfall, and highly erodable rocks (Clift et al., 2008). Coupled with the seasonal melting of its ~15,000 glaciers and abundant monsoonal rainfall, the Himalaya and surrounding plateaus give rise to seven of the world's largest river systems and account for ~ 30% of the global fluvial sediment flux to the sea (Fig. 1; Milliman and Meade, 1983). Following the worldwide stabilization of sea level ~7000 yr BP, most modern river deltas began to form near their present locations (Stanley and Warne, 1994). We, therefore, focus on riverine sediment transport and depositional processes on the shelf starting from this middle Holocene sea-level highstand, delineating the distribution of river-derived sediments across the delta plain, subaqueous delta, alongshore clinoform, and portions possibly escaping to the slope or deep canyons. These sediment budgets are derived from extensive geological and geophysical surveys off those river mouths in the Bohai, Yellow, East China, and South China seas, using a high-resolution EdgeTech 0512 subbottom Chirp sonar profiler operated at 0.5-6 kHz.

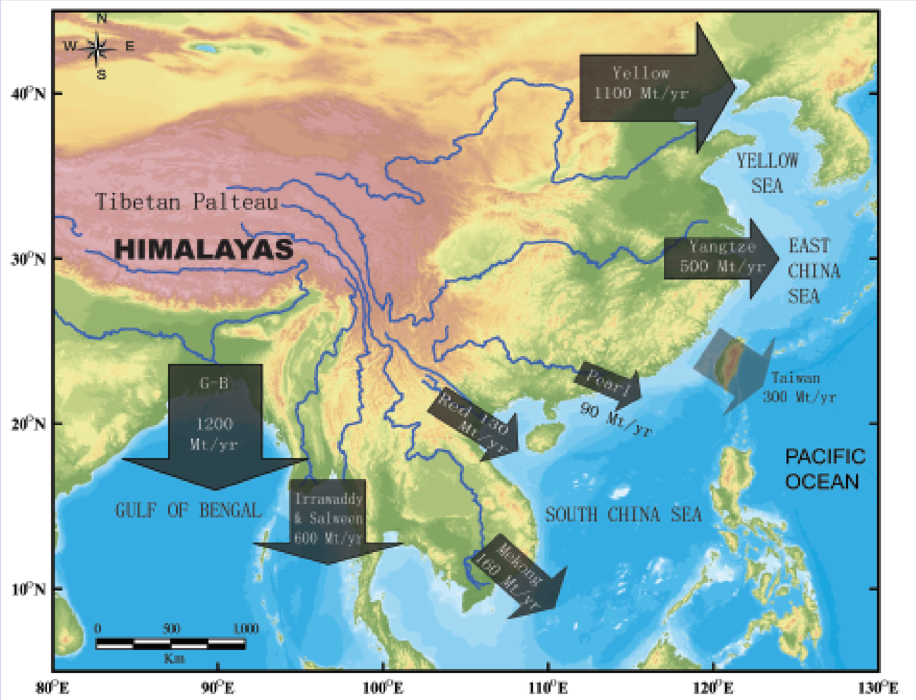

Figure 1. Distribution of the large Asian rivers and their historical annual sediment loads to the sea (Mt = million tons) (data from Milliman and Meade, 1983; Milliman and Syvitski, 1992; Robinson et al., 2007). Sediment fluxes from small mountainous rivers are not included here, such as the annual 300 Mt sediment discharge from Taiwan rivers (e.g., Kao et al., 2008; Liu et al., 2008).

RESULTS AND CASE STUDIES

The Yellow River

The Yellow River, which presently discharges into the western Bohai Sea, is widely recognized as one of the highest sediment loads on Earth, about 1 x 10^9 t/y (Milliman and Syvitski, 1992) (Figs. 1, 2). However, most of its fluvially derived sediment (>90%) appears to temporarily remain trapped within the modern deltaic system (Wright et al., 2001; Wright and Friedrichs, 2006). Yet extensive geological and geophysical surveys conducted in the North and South Yellow Sea reveal a prominent mud wedge that extends southward from the eastern tip of the Shandong Peninsula, some 350 km east of the present-day river mouth (Milliman et al., 1987; Alexander et al., 1991; Liu et al., 2004).

More recent high-resolution Chirp surveys conducted near the eastern tip of Shandong Peninsula reveal a unique, omega-shaped ("Ω"), distal subaqueous deltaic lobe that is locally up to 40 m thick and overlies the transgressive surface in the Yellow Sea (Fig.2). This distal clinothem is oriented along-shelf and has been deposited since the middle Holocene sea-level highstand, primarily by resuspended Yellow River sediments transported downdrift by coastal currents interacting with local waves, tides and upwelling (Yang and Liu, 2007). Over the past 7000 years, quantitatively analyzed sediment distribution in the Bohai and Yellow seas indicate that nearly 30% of the Yellow River-derived sediment has been resuspended and transported out of the Bohai Sea into the North and South Yellow Sea (Liu et al., 2002; Liu et al., 2004). Overall, modern Yellow River-derived sediments just reach 75m water depth in the central South Yellow Sea, about 700 km from the river mouth (Fig. 2); and so a very small fraction of the modern riverine sediment could escape the shelf or reach the Okinawa Trough.

The Yangtze River

Historically the Yangtze River discharged 500 x 10^6 tons of sediment to the sea annually (Fig.1). Over the last two decades, multiple geological and geophysical studies have been carried at the Yangtze river mouth and adjacent inner shelf to examine the fate of its fluvial sediment (e.g., DeMaster et al., 1985; McKee et al., 1983; Milliman et al., 1985, etc). Recent high-resolution seismic profiling and coring in the inner shelf of the East China Sea has revealed an elongated (~800 km) subaqueous deltaic deposit extending from the modern Yangtze River mouth south toward the Taiwan Strait (Fig. 3). This alongshore-distributed clinoform appears to overlie a

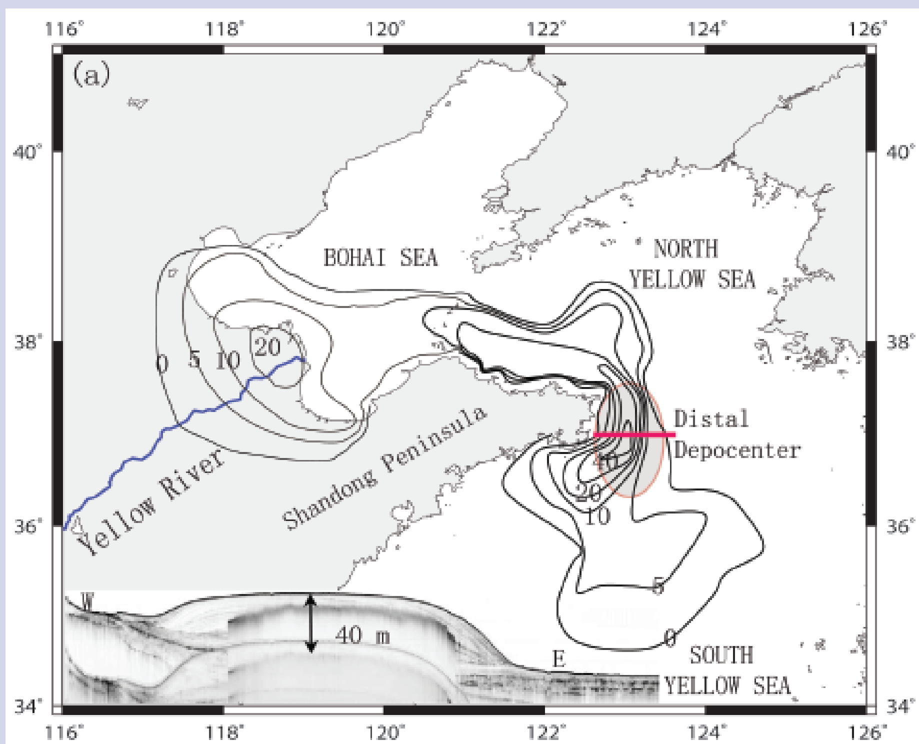

Figure 2. Isopach map of Yellow River-derived sediment discharged to the sea (isopachs in meters). A select seismic profile (red line) across the remote nearshore depocenter is also shown. (data from Liu et al., 2002; Liu et al., 2004; Yang and Liu, 2007).

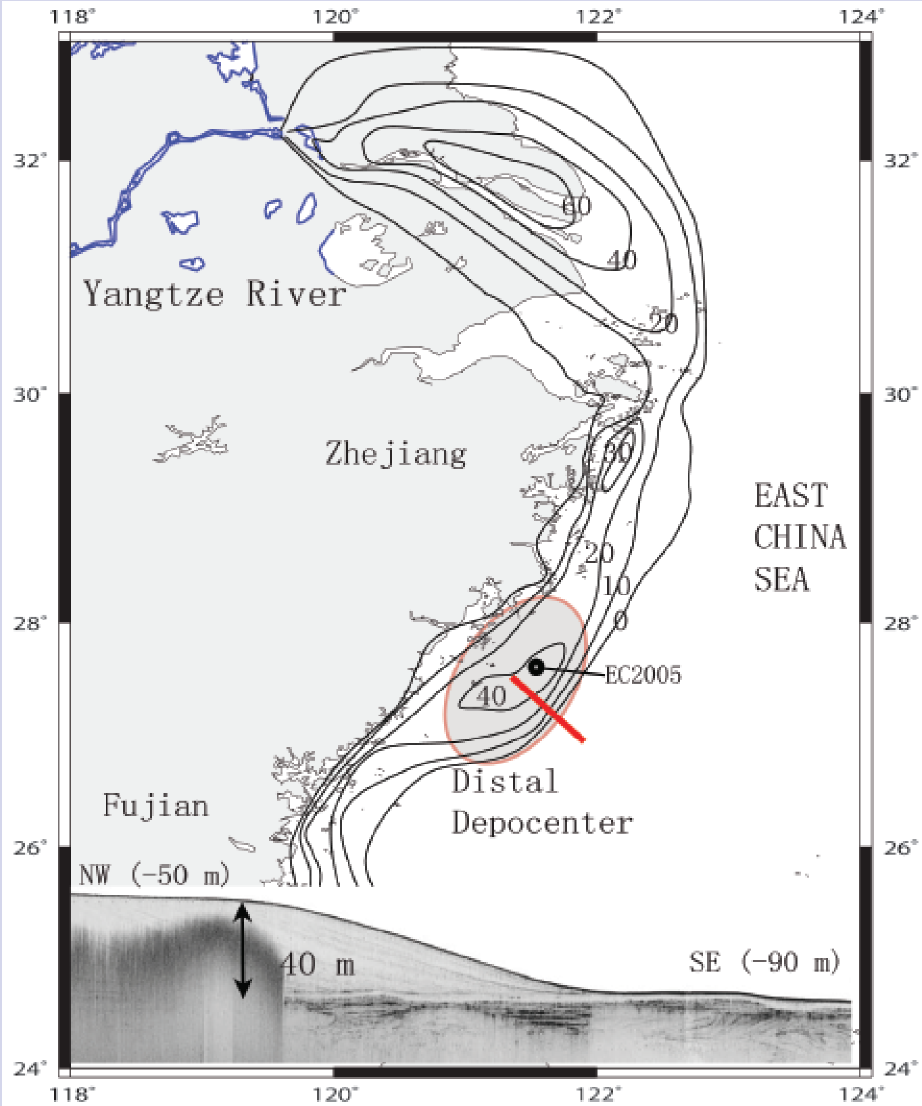

Figure 3. Isopach map of Yangtze River-derived sediment discharged to the sea (isopachs in meters). A select seismic profile (red line) across the remote nearshore depocenter is also shown (data from Liu et al., 2006; Liu et al., 2007). A deep sediment core (EC2005) drilled in 2005 has verified the mud's thickness and age (Xu et al., 2009b).

transgressive sand layer, thins offshore from ~40 m thickness at 20-30 m water depth to < 1-2 m between 60-90 m water depth. The across-shelf distribution is <100 km (Fig. 3). Clay mineral, geochemical, and grain-size analyses indicate that the Yangtze River is the primary source for this longshore-transported clinoform deposit (Liu et al., 2006; Xiao et al., 2006; Xu et al., 2009a; 2009b).

Total sediment volume of the clinothem is estimated to be about 4.5 x 10^{11} m^3, which represents about 32% of the total Yangtze-derived mud to the sea; the rest is believed to have been trapped in Yangtze's estuary and deltaic system (Liu et al., 2007). The East China Sea's strong tides, waves, coastal currents, winter storms, and offshore upwelling appear to have each played a role in trapping most of these Yangtze-derived sediments on the inner shelf and transporting them southward (Gao, 2007; Liu et al., 2007). The center of this remote deposition has been located on the inner shelf about 400 km south of the river mouth (Fig. 3). Subsequent drilling of this distal depocenter (Fig. 3: site EC2005) has verified its thickness, Holocene age, and Yangtze River sediment origin (Xu et al., 2009a; 2009b).

The Pearl River

The modern Pearl River estuary and delta was developed near its apex at about 6800 yr BP when the local sea level reached its present level (Zong et al., 2009). Most previous studies have focused on the delta plain and estuary (e.g. Owen, 2005; Zong et al., 2006), but to better understand the fate of Pearl River sediment discharged to the sea, we have acquired high-resolution Chirp sonar profiles from the inner shelf of the South China Sea. Combined with onshore borehole data (Zong et al., 2009) we have established a general isopach map of Holocene-age Pearl River-derived mud on the shelf (Fig. 4). Preliminary analysis indicates that the majority of Pearl River sediments are trapped inside the estuary, although sediments that do escape to the shelf are transported alongshore but have not yet formed a large remote nearshore depocenter (Fig. 4).

The Mekong River

The Mekong River, one of the largest rivers in Southeast Asia, flows southward from the Tibetan Plateau to the South China Sea through the Indochinese Peninsula. It has a wide, low-lying delta (Fig. 1), which is the third largest in the world (Nguyen et al., 2000). The river's current sediment discharge is about 160 x 10^6 tons/yr. Compared with other rivers, the Mekong River has a smaller drainage area than the Yangtze, Mississippi, or Ganges-Brahmaputra, but its sediment yield is about twice that of the Mississippi and nearly equal to that of the Yangtze. Recently, the subaerial Mekong River delta has been intensively studied (Nguyen et al., 2000; Ta et al., 2002).

Our recent geophysical and geological surveys off the modern Mekong river mouth in the South China Sea and Gulf of Thailand indicate the majority of the Mekong River derived sediment to the sea has been transported away from the river mouth and deposited along the shore and around the tip of Camau Peninsula (Fig. 5). Near Camau a remote nearshore depocenter is developing about 300 km downdrift of its Mekong River sediment source. In contrast, along the eastern side of the Mekong delta, even close to the river mouth, there is very limited across-shelf transport of modern sediments (<20-km from shore).

Ganges and Brahmaputra Rivers

The Ganges-Brahmaputra (G-B) river annually discharges ~1200 x 10^6 tons of fluvial sediments to its delta plain and the Bay of Bengal. Initial Holocene development of the delta begins ~ 11,000 yr BP under enhanced monsoon rainfall and slowing postglacial sea level (Goodbred and Kuehl, 2000; Goodbred et al., 2003) (Fig.1). High-resolution seismic reflection profiles also reveal a large subaqueous delta with characteristic clinoform stratigraphy, which is estimated to trap about 30% of the G-B derived sediment (Kuehl et al., 1997). Different from the south and southeast Asian river systems, the Bengal shelf is incised by a major canyon, the Swatch of No Ground,

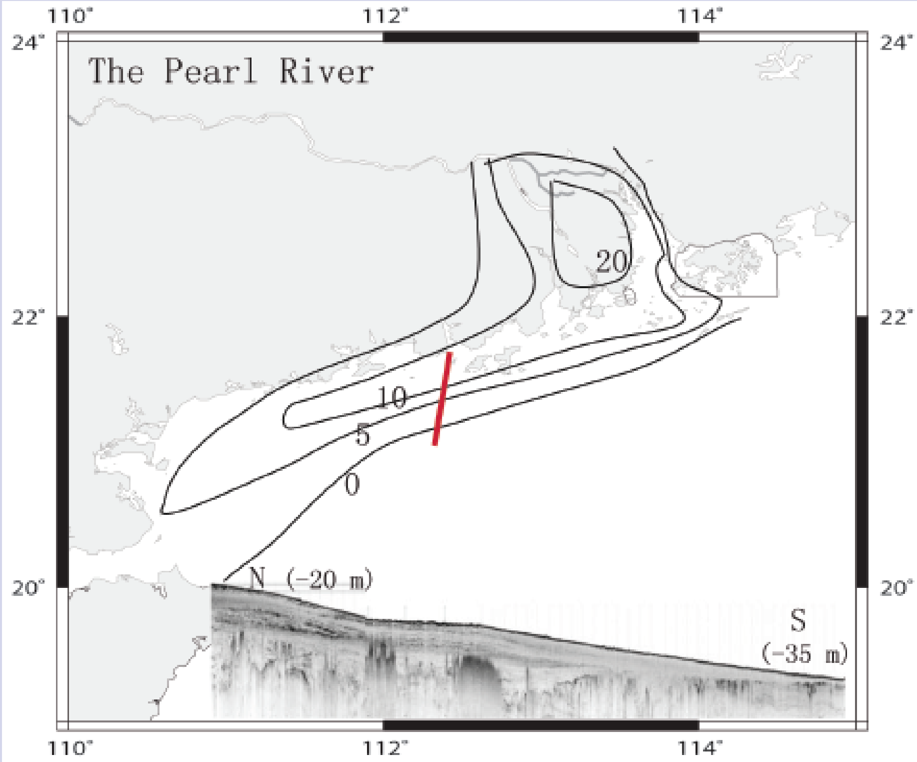

Figure 4. Isopach map of Pearl River-derived sediment discharged to the sea (isopachs in meters). A select seismic profile (red line) across the remote alongshore-distributed sediment is also shown. (onshore data from Zong et al., 2009).

which directly connects the Ganges-Brahmaputra rivers to the Bengal Fan. It is believed that this canyon behaves like a conduit in transporting a large portion of the G-B sediment load to the deep ocean (Hubscher and Spiess, 2005; Kuehl et al., 1997; Kottke et al., 2003).

DISCUSSION AND CONCLUSIONS

Previous studies have found that rapid sediment deposition and centers of accumulation are located offshore of many large river mouths, such as Ganges-Brahmaputra, Mississippi, Nile, Yellow rivers, etc. (Kuehl et al., 1997; Stanley and Warne, 1994; Bornhold et al., 1986). Typically, there is an across-shelf morphology where the subaqueous delta progrades directly off the river mouth, and are characterized by flat topsets, steeper foresets, and gradual bottomset deposits. It is the nearshore oceanographic processes that transport fluvial sediments across the shallow-water topset area to the deep-water bottomsets that result in rapid accumulation on the middle shelf and development of the sigmoid-shaped ("S") clinoform (i.e., Kuehl et al., 1986). Important mechanisms that influence across-shelf sediment transport include wind-driven flows, internal waves, wave-orbital flows, infragravity phenomena, buoyant plumes, and surf-zone processes (Nittrouer and Wright, 1994).

At the same time, more studies of suspended-sediment transport on high-energy continental shelves indicate a strong along-shelf transport with only a minor across-shelf component, e.g. Amazon, Po, Ebro, Eel, Columbia, etc (Wright and Nittrouer, 1995; Driscoll and Karner, 1999; Nittrouer et al., 1996; Cattaneo et al., 2004). The combined effect of oceanographic processes (tidal, wave and current) redistributed most of large river-derived sediments along the shelf, extending hundreds of kilometers from the river mouths and the proximal subaqueous deltas. For example the Amazon River's suspended mud is transported alongshore and accumulates > 1500 km from the river mouth (Nittrouer et al., 1986; Allison et al., 2000).

Our studies here indicate that the sediments of the large Asian large rivers are also transported alongshore great distances from the river mouth, often forming a large-scale alongshore clinothem far from its source (Figs. 2-6). Different from the classic sigmoid shape, the distal clinoforms observed in the Yellow Sea indicate an omega-shape (Ω), with a bidirectional (landward and seaward) dipping convex sedimentary body (Yang and Liu, 2007). Along-shelf sediment transport dramatically modifies the morphology of deltas, subaqueous delta, and mid-shelf deposits and imparts a shore-parallel trend clinoform deposit.

The clinoform deposits described here may contain important sedimentary records for climate and/or environmental changes. For example, since the sediment of a clinoform deposit is derived mainly from the "parent"

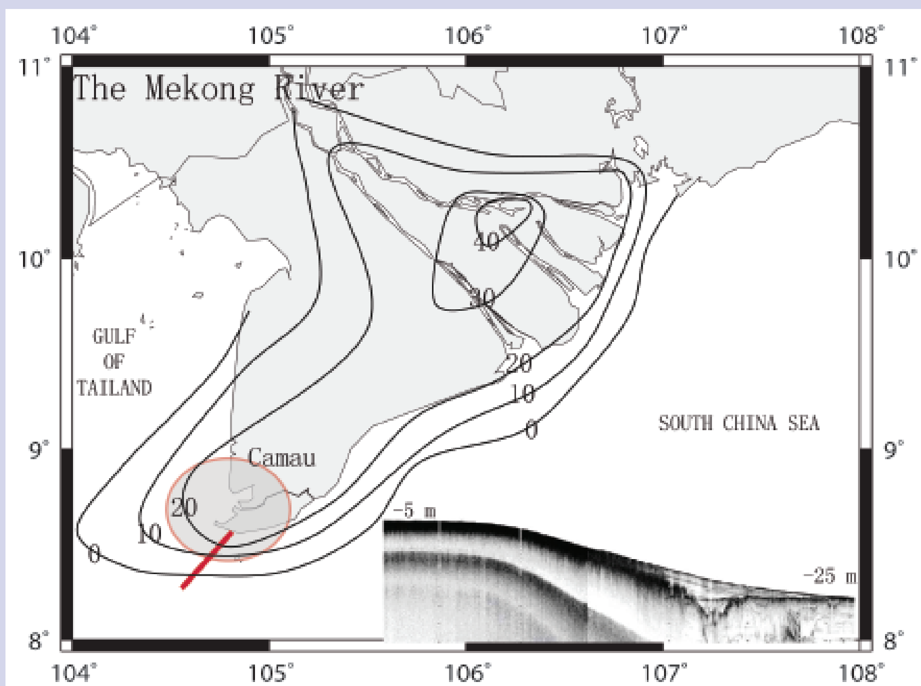

Figure 5. Isopach map of Mekong River-derived sediment discharged to the sea (isopachs in meters). A select seismic profile (red line) across the remote nearshore depocenter is also shown. (onshore data from Nguyen et al., 2000; Ta et al., 2002)

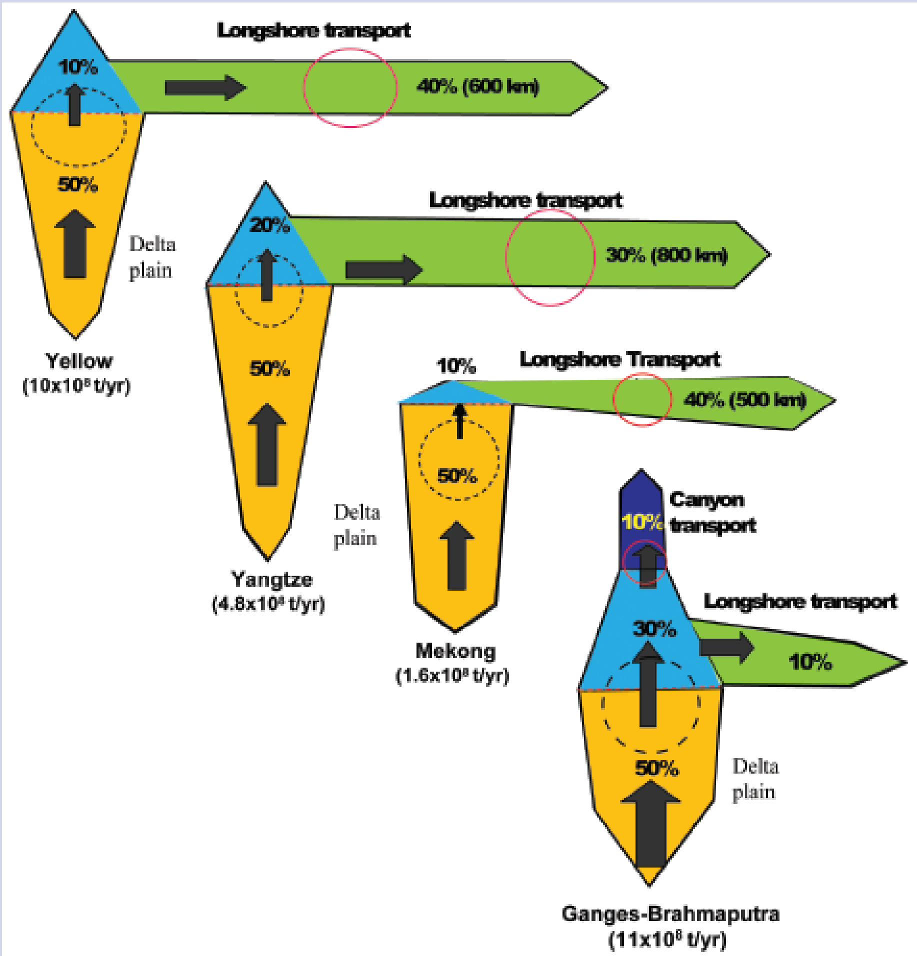

Figure 6. Conceptual model of the fate of Asian large river-derived sediment delivered to the coasts and seas. The dash circles represent the proximal depocenter near the river mouth, the red circles represent the remote nearshore depocenter 300-400 km away from the river mouth.

river, variations in river discharge due to runoff, land use, and sediment yields from the catchment (Syvitski and Milliman, 2007) may be recorded in the stratigraphy and morphology of these deposits. Recently, attempts have been made (Xiao et al., 2006) to analyze the influence of climate changes on the Yangtze-derived mud deposits on the East China Sea inner-shelf, using data sets of grain size and geochemical parameters obtained from sediment cores. Although the shelf deposits are complex in terms of sequence continuity and hydrodynamic reworking, this research topic is worth exploring in the future.

Large river systems are generally buffered from high-frequency variations in discharge because of their size, and so typically have steady long-term water and sediment fluxes. From previous studies, it is observed that ~30-50% of large-river sediments are trapped within the river mouth estuary and lower delta plain, while the larger remaining fraction is discharged to the sea (Fig. 6). Of the total discharge ~20-30% typically accumulates on the shelf adjacent to the river mouth, often as a mid-shelf subaqueous delta system. However, a substantial portion of fluvial sediment discharge to the ocean (~30-40%) is found to be transported along the shore far from the river mouth (600-1500 km), where it may form an alongshore clinoform deposit that is generally < 100 km in width and up to 20-40 m thick (Fig. 6). Thus, except for a few cases with shelf-indenting canyons (G-B, Indus, and Danube, etc.), most of modern river-derived fluvial sediment is not able to reach the deep ocean directly. In this way large river systems may take a more positive, widespread, and constructive role in the development of coastal and nearshore areas than previously considered.

ACKNOWLEDGEMENTS

Financial supports of a series of projects are from China and US National Science Foundation, Office of Naval Research, Chinese Academy of Science and North Carolina State University. We are grateful for the careful and thorough review and editing from Steve Goodbred.

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Accepted November 2009

PRESIDENT'S COMMENTS

"PUBLISH OR PERISH": SO PUBLISH YOUR RESEARCH IN TOP-TIER SEPM JOURNALS AND SPECIAL PUBLICATIONS!

Those of us who once were, or currently are, tenure-track or probationary faculty members in academic institutions instinctively shudder when we hear these words "publish or perish". It is true that there is ever-increasing pressure to publish one's research in high-profile top-tier journals with a specified (or unspecified) "output" expected at the time of tenure review. Indeed, even our own Ph.D. students in the Geology Department at Baylor University must publish two papers (i.e., accepted, in press, or published) and have a third submitted before they are allowed to defend their dissertations. As a result of increased pressures to publish placed upon both graduate students and tenure-track or probationary faculty candidates, more manuscripts than ever before are being generated and submitted to journals for peer review and, hopefully, acceptance and eventual publication.

So why publish in SEPM Journals and Special Publications when there are so many competing choices in Sedimentary Geology and Paleontology?

1. QUALITY

SEPM journals, both the ***Journal of Sedimentary Research*** and ***PALAIOS***, are among the highest-ranked journals in sedimentary geology and paleobiology/ paleontology, with impact factors (2008) of 1.775 for ***JSR*** and 1.604 for ***PALAIOS***. Our journals are among the best in their respective fields, publishing top-quality research that is well-cited by both academicians as well as by practicing professionals in industry.

2. FREE ON-LINE COLOR GRAPHICS

SEPM is proud to announce that both journals, ***JSR*** and ***PALAIOS***, are offering free color graphics in the on-line versions of journal articles. Note that the online version is the official "copy of record" for our journals so the online color version is the official copy of your article. With ever-increasing reliance on color graphics we are able to offer our readership the visual experience that color reproduction affords.

3. NO JOURNAL BACKLOGS

We currently have no backlogs for either journal, due to a combination of efficient streamlining of assignment to Associate Editors and their diligent oversight of the external review process. Feel free to contact the journal co-Editors at ***JSR***: Paul McCarthy, (mccarthy@gi.alaska.edu) and Gene Rankey (grankey@ku.edu) ; ***PALAIOS***: Steve Hasiotis (hasiotis@ku.edu) and Edith Taylor (etaylor@ku.edu) for details.

4. SOCIETY SPONSORSHIP

Publishing in SEPM supports a non-profit Society - publishing in society journals like SEPM means that it is member owned, analogous to a coop. Society journals cost significantly less for libraries (ask your librarian to compare subscription prices of ***JSR*** or ***PALAIOS*** to similar topical commercial journals)because they are not trying to make a profit, unlike the for-profit companies.

5. SPECIAL PUBLICATIONS ARE NOW INCLUDED IN THE WEB OF SCIENCE INDEX

No longer do tenure-track or probationary junior faculty need to be concerned that publishing in SEPM Special Publications is "not counted" by their respective institutions for tenure and promotion considerations, because Thomson Reuters has now agreed to include our SEPM Special Publications in the Web of Science Index! This change recognizes the high level of rigorous peer review and technical editing that goes into the assembly of a Special Publications Volume. This fact, coupled with improved flow of the publishing process associated with new on-line submission of Special Publications manuscripts, makes submitting to our SEPM volumes more attractive than ever! Feel free to contact the Special Publications co-Editors Gary Nichols (g.nichols@gl.rhul.ac.uk) and Brian Ricketts (brian.ricketts@xtra.co.nz) for more information on publishing in these outlets, or if you have an idea for a Special Publication volume.

So – why would you not want to choose SEPM as the publication venue for your science, when all of these positive aspects are in your favor? You can better serve your Society by sending your best papers to SEPM journals and Special Publications. Sure, there are many competing journal outlets, but how many can beat SEPM in terms of publication quality, visibility, impact factors, and cost?

Steve Driese, President
SEPM Society for Sedimentary Geology

Summary of Council of Scientific Society Presidents (CSSP) Meeting May 2-5, 2009 Washington D.C.

SEPM is a member of the Council of Scientific Society Presidents (CSSP) that meets twice a year in Washington D. C. CSSP has a number of goals that include presentations on cutting edge science across the entire breadth of American scientific research, discussing issues common to all science, developing messages on these issues to communicate to our elected legislators and executives, sharing best practices of the different scientific societies, and visiting legislators to communicate concerns and views amongst the American science community. Member societies range from Animals and Agricultural to Chemistry to Forensics to Math to Optics to Physiology to Science Teaching. Geoscience societies represented included AGI, the GSA, Geochemical, and Crystallography societies. Past-Presidents Bill Morgan and Rick Sarg represented SEPM. SEPM benefits from its membership in CSSP by interacting with other science societies and expressing the concerns of earth scientists on public policy matters. Broad themes at this meeting were 1) science leadership during the current time of crisis, 2) the frontiers of 21st century science, 3) global issues like climate change and the future of fossil fuels, 4) science education, and 5) overcoming turbulent economic times as a scientific society. In addition, representatives from selected government agencies presented their science-based efforts. Attendees at this meeting heard from the Departments of Interior and Agriculture.

Among the topics discussed at the meeting the following might be of interest to SEPM members:

- Dr. John Sterman, MIT presented a new program to enable rapid and flexible simulations of various responses to changing climate factors like CO2. This program is designed for use by policy makers to help them understand potential outcomes to a range of factors affecting climate change. This application is designed to bridge the significant time gap that exists between scientific discovery and the need for policy change.
- The Department of Interior is now actively developing strategies to make science-based assessments of the changes brought about by climate change, and to develop mitigation strategies to manage change in federal lands, and especially in coastal regions.
- Shirley Sagawa from the Center for American Progress outlined a number of ways to focus on growing non-profits including 1) making the cause first, the organization second, and the leaders third, 2) getting the right people in the right job, 3) building a community, 4) personalizing the mission, 5) increasing the capacity for innovation (e.g., find out what the young people are doing), 6) developing a can-do culture, 7) ensuring that the organization is people oriented, and 8) having compelling communications (i.e., why does it matter).
- Amory Lovins, of the Rocky Mountain Institute, noted in a talk on "Profitable Solutions to Climate, Oil, and Proliferation of Nuclear Weapons" that saving energy is cheaper than buying it, and that the smart firms were buying energy efficiency whether or not they were concerned with climate-change issues. He stated that US GDP increased 27% from 1977-1985 during the Arab oil embargo, even as oil consumption dropped by 17%. This scenario of increasing GDP while decreasing oil consumption is readily possible today given existing efficiencies that could be realized in transportation methodologies and electricity generation, while at the same time decreasing nuclear arms proliferation by lessening the use of nuclear energy.

In addition, and of particular interest to both academic and industry members of SEPM, perhaps, are the issues of scholar mobility and visas. Remarkably, as a whole, US scientists are not going abroad. This stems from a variety of reasons, lack of resources, a lack of international partnerships, the dearth of post-doctorial fellows, and a lack of acknowledgement that this is an important experience for scientists' growth and development. A number of federal agencies are partnering with the U. S. State Department to enhance scholar exchange. As a footnote, since geology is a global profession, it does not seem that this is as much of a problem for us as for the general scientific community. Educational visas, are however, a common problem to us all. CSSP has been a strong voice for the science community, and has actively engaged the State Department to improve the visa process for international students studying in the U. S., so that the U. S. does not fall behind in attracting the very best students from around the world.

Rick Sarg and Bill Morgan

THE SOCIETY'S GLOBAL PRESENCE

This fall, SEPM had major exhibitions in China and Brazil plus India in December.

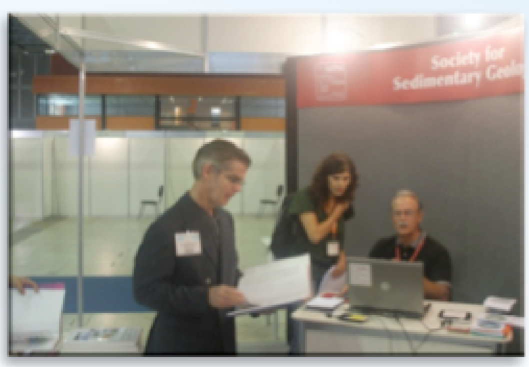
SEPM at the Chinese National Congress on Sedimentology

SEPM Global Ambassadors for China, Prof. Daidu Fan and Prof. Xumian Hu, with the help of three students (Miao Huo, Jiangang Wang, and Yin Wang) created an SEPM exhibit at the 4th Chinese National Congress on Sedimentology, hosted by the Qingdao Institute of Marine Geology, October 16-20, 2009. The congress had over 750 attendees and over 200 signed up for further information about SEPM, including Prof. Shu Gao (Deputy Secretary of the Chinese Society of Sedimentology). Drs. Fan and Hu had discussions with many important Chinese sedimentary geologists about how to improve connections with SEPM and the Chinese and Asian sedimentary community. For their full report go to Global Ambassador's page at www.sepm.org.

Sedimentology Congress attendees visiting the SEPM booth at the meeting.

SEPM at the AAPG International Meeting in Rio De Janeiro, Brazil.

SEPM Executive Director, Howard Harper and his spouse, Diane, represented the Society with a booth at the Rio AAPG ICE meeting, November 15-18, 2009. SEPM publications, new and old (SEPM reprinted books on CD series) were very popular. Although only a limited number of printed books were shipped over, all were sold and we were able to create book CDs at the booth for any of the now digitized books. Over 20 new members (student and professional) joined on site and many more took away membership information. Several long time members were happy to see SEPM's presence in Rio and many more non-members were very enthusiastic about learning more about the society.



Bill Morgan (Past SEPM President and Honorary Member) looks at one of SEPM's latest books, while Howard Harper helps a new member apply online.

A new student member checks out the latest books while Howard helps Henry Waring, long-time member and Brazilian resident, renew online.

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