

OCL IA 2009-2012 Proposed Research

The QCL IA has several major themes around which our individual research projects are organized. These include:

- Channels – improving the manner in which we map and characterize channels in seismic data. This process involves both outcrop analysis as well as seismic analysis, both fluvial and deep marine channels.
- Shelf Sands – what types of shelf sands exist (ribbons, bars, sheets, etc.), where do they form and what is their architecture? What are the relationships between shelf sands and shoreline sediment sources?
- Mass Transport Deposits – what are the processes involved, material nature, and clues for prediction of mass transport deposits in the geologic record? This work also involves examining and predicting the anthropogenic impact of mass failure events.
- Shelf and Shelf Edge Deltas – understanding the mechanisms by which deltas evolve and how they move sediment to deep water locations. What controls sediment transfer between tectonomorphic provinces (ie., river to shelf, shelf to slope, slope to basin floor, salt sheet minibasins to abyssal plain, etc.)?

Our group is currently working on several projects that will contribute to understanding in these theme areas. In addition, each project has a quantitative component that provides data to the growing analogs data base maintained in the SAND system.

Projects that will be finishing up in 2009 include:

Quantitative data on the Atoka Channel Systems: A significant volume of quantitative data has been generated by Vishal Maharaj as part of his master's thesis on the nature of channeling in the Atoka Formation of the Fort Worth Basin. This includes several hundreds of channel thickness measurements and associated calculations of meander length, channel widths, radius of curvatures, lithology, etc. These data are being added to the SANDatabase.

Quantitative data on the morphometric of deep water channels and levees in offshore Gabon, West Africa margin: Part of a data compilation from the recently completed masters thesis of Rosalba Mendoza.

Worldwide compilation of data on deltas: This project has been trickling along and we do have some data compiled in the SANDatabase. However, Thomas Brothers will be working on mapping the morphology and assessing the conditions of and processes active in deltas on Mars. Thomas will be looking in depth as terrestrial analog data for his study.

Mapping detailed channel architectures in the Tertiary of Indonesia: Brian Kiel (MS 2009) is using a combination of workstation mapping and visualization tools and ArcGIS/ERMAPPER to map channels in seismic data in offshore West Natuna Basin. He plans to calculate flow parameters across several paleogeographic surfaces and examine the inputs into and affects of this new discharge condition data for models on monsoonal climates in south Asia.

Deep water Outcrops Digital Compilation of analog data: Glenn Fiedler has completed entering all the data from AAPG Deep Water Outcrops Atlas Volume #56 into an Access database and we are currently crunching numbers and improving the utility of this data rich product. A preliminary version is on line for members.

Geographic Focus of 2009-2012 Research Program

We have four students starting PhD programs this semester who will be involved in 3-4 year time frame research programs. Their time frame will drive the focus of our program for the coming 3-4 years. In addition, we have added Dr. Lorena Moscardelli full time to the research staff, and we plan to add Dr. Peter Flaig as a two year post-doctoral student to the program in Fall 2009.

Gulf of Mexico Deep Water focused research program involving several study areas and several focused projects. These include:

1. Mad Dog Area mini-basin fill architecture and geomorphology. Collaboration with AGL surrounding models of rafted mini-basins which suggest that these basins experience phases of pre-rift, syn-rift and post-rift sediment accumulation and bypass. (Jie Huang)
2. Mad Dog Outboard area examining the quantitative seismic geomorphology and sedimentology of Pliocene-age slope leveed channels and fans. (Jessica Morgan)
3. Walker Ridge outboard area examining the quantitative seismic geomorphology of sedimentary deposits and processes occurring along the front of the Sigsbee Escarpment. This effort is part of comparing and contrasting the character of deposits and the manner in which sediments are deposited in front of the advancing salt front. (Wei Ruan)
4. Structure and stratigraphy of the pre-Tertiary fill in the Gulf of Mexico. Impact of older structural framework on Tertiary processes. (Kurtus Woolf, PhD)
5. Sequence stratigraphy and seismic geomorphology of basin fills over mobile substrates. Utilizing various data volumes (Mad Dog, Walker Ridge, EDog, Safi Haute Mer) to develop a template for interpreting sediments in mini-basins in several setting. (Vishal Maharaj, PhD)

Coastal and Shelf Systems research program

1. Darrin Burton (PhD) will begin a field based study in the detailed architecture and flow characteristics of shelf sands. Will include detailed studies of the tidally influenced Sego Sandstone in eastern Utah, the tidally influenced Tocito Sandstones of northwestern New Mexico's San Juan Basin, and the storm and wave dominated Tocito Sandstones of the southeastern portions of the San Juan Basin. Study will include detailed measurements of stratigraphic sections, gamma scans, porosity and permeability, photomicros and lidar imagery to build a three-dimensional digital geologic model and predict flow properties in these complex systems. Will also involve utilizing data from the outcrops to calculate flow characteristics of the western interior cretaceous seaway at these various localities and examine temporal and spatial changes in seaway conditions.
2. Study of detailed character and seismic geomorphology of open shelf sand bars along the north coast of Trinidad. Significant 3D seismic, log and core data have been contributed by bgTrinidad to conduct this near-modern systems study. (Steffan Punnetta, PhD)
3. Study of the detailed character and seismic geomorphology of open shelf sand bars along the west coast of New Zealand. Significant 3D seismic and log data exist for this study of Pleistocene-age mega-sand bars.

4. Detailed architectural study of the coastal plain systems of the Cretaceous-Tertiary, North Slope of Alaska. This program will be driven by Dr. Peter Flaig. In addition, Peter will be involved in assessing and digitally archiving all the data from previous studies on the Frewens Sandstone, Wyoming, the Sego Sandstone, Utah, the Ferron Sandstone, Utah and the Fall River Sandstone, Wyoming.

Shelf Margin and Mass Transport processes and architecture

Studies in shelf margins processes and architecture are an outgrowth of Lorena Moscardelli's previous work which has focused on mass transport processes and deposits. She will be the primary lead in this research.

1. Seismic and log based study of shelf margin delta architecture in both transpressional and extensional settings. Contiguous 3D seismic data along ~50 km of shelf margin in eastern Trinidad are the primary data for this study. These observations will be integrated with information on older shelf margin deltaic deposits to develop a template for interpreting these systems in ancient basin margins. This project primarily funded by an additional grant from Shell and will lead to a significant coring program in these types of deposits in the near future.
2. Ongoing research in the evolution and character of the shelf and shelf margin of eastern Mexico in collaboration with Pemex.
3. Literature compilation of mass transport deposits and their character, as well as detailed architecture and morphology study of mass transport types in the area of Mad Dog. (Kadira Singh).