Investigation of Neotectonic Activity within the Shallow, Unconsolidated Holocene Stratigraphy of the Pearl River Delta Area, Louisiana

Dane Fischer[1], Mark Kulp[1], Kevin Yeager[2], and Charlotte Brunner[2]

[1]Department of Earth and Environmental Sciences, University of New Orleans, 2000 Lakeshore Dr., G. P. Room 1065, New Orleans, Louisiana 70148

[2]Department of Marine Science, University of Southern Mississippi, 1020 Balch Blvd., Stennis Space Center, Mississippi 39529

ABSTRACT

During the last half century numerous researchers have suggested that neotectonic activity has locally, and perhaps regionally, influenced the evolution of the Mississippi River Delta plain and adjacent continental shelf. The possibility of active faults, and concomitant subsidence, has most recently piqued interest as Louisiana proposes initiatives to mitigate coastal erosion and fortify existing flood protection structures. While numerous faults have been identified and are well-documented along the northern Gulf, it has not yet been conclusively shown that modern Louisiana wetlands are subject to active deformation and that wetland loss and coastal erosion are exacerbated by fault motion. Identification of neotectonic activity within upper Quaternary unconsolidated strata requires a multidisciplinary approach that uses a suite of geomorphologic and stratigraphic methods of analysis. A study using these tools is focused on the Pearl River Delta of Louisiana to assess whether the geomorphology and shallow stratigraphy of the area provide evidence in support of fault activity in this location during the Holocene. An analysis of historical changes in geomorphology, which focused on meander patterns, elongated water bodies, and spatial changes in vegetation was used to identify areas where fault motion may have recently taken place. The shallow stratigraphy was then investigated in these locations using vibracores and shallow seismic reflection profiling. Facies relationships coupled with radiocarbon ages of select stratigraphic intervals led to the development of a detailed lithostratigraphic and chronostratigraphic framework. On the basis of these relationships, deformation appears to have taken place in at least one sampled area, but evidence is lacking in other areas. The deformation is difficult to solely ascribe to fault motion and may merely reflect spatially variable compaction within the shallow stratigraphy. Analyses are ongoing to identify the mechanism responsible for the documented differences in stratigraphic elevations. Preliminary results of this study highlight the difficulties in identifying recent fault motion within complex facies relationships in unconsolidated sediments.

Fischer, D., M. Kulp, K. Yeager, and C. Brunner, 2009, Investigation of neotectonic activity within the shallow, unconsolidated Holocene stratigraphy of the Pearl River Delta area, Louisiana: Gulf Coast Association of Geological Societies Transactions, v. 59, p. 279.