Holocene Subsidence in the Mississippi Delta

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Since 2001, our sea-level research in the Mississippi Delta has been carried out in close cooperation with UNAVCO, Inc. One of the premier objectives of these studies is to quantify rates of long-term vertical crustal movements with the highest attainable accuracy and precision. The rationale of this work (Törnqvist et al., 2004) is to use indicators of sea-level positions over the past 8000 years, and to measure their vertical displacement relative to one another in order to infer differential tectonic movements. The sea-level indicator used is basal peat–mostly salt-marsh peat that accumulates on the consolidated Pleistocene basement as a result of sea-level rise–that is widely present in the subsurface.

Because our study areas are as much as 100 km apart, it is challenging to determine accurate elevations of sea-level indicators with reference to a common geodetic datum. This challenge is partly due to uncertainties about the quality of National Geodetic Survey benchmarks in this region, which is widely believed to be highly unstable. GPS presents an opportunity to obtain independent elevation data, and thus is critical to these investigations. The main finding so far (Törnqvist et al., 2006) is that the Pleistocene basement underneath the Mississippi Delta is much more stable than what has been commonly postulated.

Our latest field campaign, completed in July 2006, aims at measuring the subsidence rate of the New Orleans metropolitan area. Results of this study are expected in 2007. Figure 1 summarizes the present state of understanding of long-term subsidence rates in various sections of the Mississippi Delta.

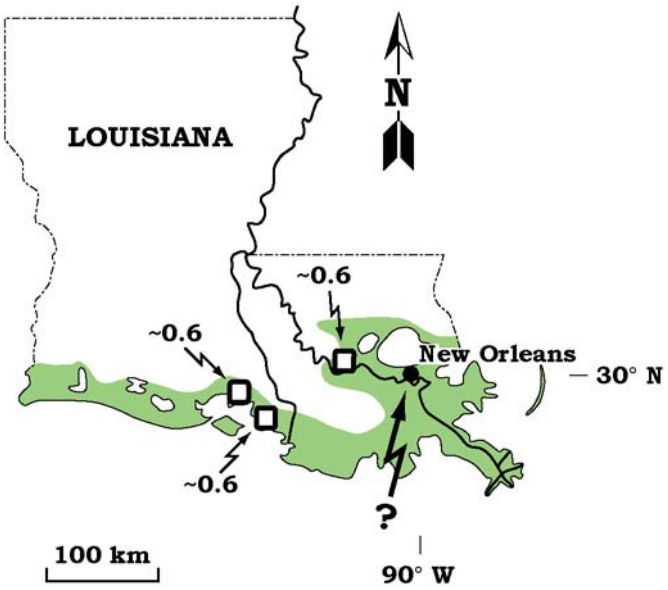

Figure 1. Map with areas experiencing coastal wetland loss in green. The study areas analyzed so far are indicated with approximate rates of subsidence of the Pleistocene basement, expressed in mm yr-1, after Törnqvist et al. (2002, 2004, 2006). Although such data are not yet available from the New Orleans metropolitan area, it appears likely that subsidence rates there are roughly of the same order of magnitude.

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