Mississippi Delta Spongy on Top, Stable Underneath

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Torbjörn Törnqvist, associate professor of earth and environmental sciences and director of the National Institute for Climatic Change Research Coastal Center at Tulane, is studying subsidence of the Mississippi River Delta. (Photo by Paula Burch-Celentano)

The bad news is that the Mississippi Delta is sinking as much as one-fifth of an inch per year and sometimes even more. But the good news is that the sinking is mostly limited to the uppermost layer of sediment, and the land underneath is much more stable. These are the latest findings of Tulane researcher Torbjörn Törnqvist.

Törnqvist is associate professor of earth and environmental sciences and director of the National Institute for Climatic Change Research Coastal Center at Tulane.

His latest findings, which were published Feb. 17 in the journal *Nature Geoscience*, have implications for the post-Katrina rebuilding of Louisiana. For example, the large flood-control structures under consideration can be more secure than previously believed, provided that foundations penetrate entirely through the soft shallow deposits.

Törnqvist shows that subsidence is occurring primarily in shallow layers only 100 feet or even 50 feet from the surface, while deeper layers of the earth subside much more slowly.

Other recent studies have argued that much of the subsidence in coastal Louisiana is the result of processes much deeper in the Earth's crust, but these new findings show that most of the subsidence as measured at the land surface is likely due to the spongy nature of the shallowest few hundred feet or less.

The high rate of subsidence and resulting high rates of rising sea level that characterize much of the Mississippi Delta are due mainly to compaction of the shallowest deposits that accumulated in the past 10,000 years, according to Törnqvist.

"Compaction is essentially the process that squeezes water out of sediment, which leads to a rapid decrease in volume and accelerates subsidence of the land surface," Törnqvist says. "Previous studies had inferred that compaction must be an important contributor to long-term subsidence in coastal Louisiana, but this is the first time that this has been demonstrated directly."

The new results also could help determine the effect of coastal restoration projects such as plans to divert water and sediment from the Mississippi River into regions that have experienced wetlands loss in the past century. The question is whether the weight of newly deposited sediment from diversion projects will actually accelerate compaction and subsidence.

"Even if it is partially offset by additional sinking land, the diversion projects are still very much worth pursuing," Törnqvist says. "But it is important that we understand as much as possible about the shallow subsurface so we can predict the effects of our actions."