Subsidence Rate in New Orleans, Louisiana, Dependence on Location and Time

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ABSTRACT

Rates of subsidence have been determined in New Orleans by many different studies using a variety of techniques: carbon dating of materials within cores, geodetic analysis, gravitational analysis, space geodesy studies, and tidal gage analysis. The rate of subsidence has been determined throughout the Holocene to within a few years of the present. The authors of these studies proposed a number of different categories of mechanisms causing subsidence: anthropogenic fluid withdrawal, faulting, glacial isostatic adjustment, Holocene sediment compaction, sediment loading, and surface water drainage and management are causing subsidence. Some of these causes are natural and others are anthropogenic while still others in terms of rates are natural and are increased by anthropogenic activities. It has been noted by a number of studies that certain mechanisms will dominate the subsidence rate and depending on study they indicate a different mechanism dominates. The reason for these different conclusions is that which mechanism is dominant varies depending on time interval and location.

Prior to twentieth century subsidence rates are dominated by natural causes such as: compaction, down-warping (isostatic adjustment), faulting, and sediment loading. The resulting rates of subsidence are generally 1 mm/yr or less. From 1900 to the present, anthropogenic activities have dominated the subsidence rate, which are often 5 to 25 mm/yr. These rates of subsidence are far larger than the typical rates of global sea-level rise of 2 to 3 mm/yr that have been observed since the middle of the 19th century. There have been a variety of anthropogenic activities that have caused or contributed to these accelerated rates of subsidence: compaction, extraction of water, faulting, and surface water drainage and management. However, the dominate mechanism appears to vary depending on location and time. Fluid withdrawal appears to dominate in a portion of east central to southwest portion of New Orleans. Current topographic basins that lie between Lake Pontchartrain and Gentily Ridge and between Mississippi River levees and Gentily Ridge are areas where it appears that compaction of Holocene organic sediment is dominant between 1895 and 1935 with rates decreasing after 1935. Fault movement probably is dominant near the Manchac Fault off the north side of New Orleans.

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