Electronic Supplementary Material (ESM)

Shallow-subsidence vulnerability in the City of New Orleans, southern USA

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ESM Text S1: Types of deposits occurring in the study area

The descriptions of the main types of deposits, described in the next paragraphs, are derived from Saucier (1994), USACE (1958) and our own field observations (this study).

Fluvial deposits

The Mississippi River brought fluvial sediment to the area of present New Orleans. In general, these fluvial deposits consist mostly of clay-silt mixtures with a limited amount of fluvial sand. Very fine sand-silt mixtures (loamy sand, sandy loam) are found only in the abandoned channel of the Metairie-Gentilly (MG) system and in natural levee or crevasse splay deposits. At depth (> 10 m below MSL) sandy channel and/or point bar deposits occur in some areas, deposited by precursors of the modern Mississippi River. In general, crevasse splay and natural levee deposits are found close to the river levee and contain abundant silt. Further away from (paleo)river courses, where floodplain deposits dominate, clay content increases and the silt-sand content decreases.

Swamp deposits

Intercalated with clayey floodplain deposits, peat and humic clays occur that were formed (peat) or deposited (clay) in a swampy environment at some distance from a river. Swamp peat is commonly found in the area between the Mississippi River and Lake Pontchartrain and contains wood and sedge remains. Gyttja, a fine-grained organic lake deposit, also occurs in the subsurface of this area, indicating the presence of paleo-lakes and ponds.

Pine Barrier Island deposits

North of the MG ridge, sands from the Pine Barrier Island trend are found at various depths (Fig. S4). Pine Barrier Island deposits mostly consist of fine to medium grained sands that may contain shell fragments and silty/reworked sections.

Anthropogenic deposits

The levee constructed along the southern shore of Lake Pontchartrain was built using lake bed sediments excavated just north of the shoreline. The excavation site is observable in the bathymetry of the lake bottom, where a deep hole is present just offshore (up to -10 m MSL; Fig. 6 of the main article). The levee consists mainly of loamy sand with clayey-silty intervals. No data have been collected from other anthropogenic fills.

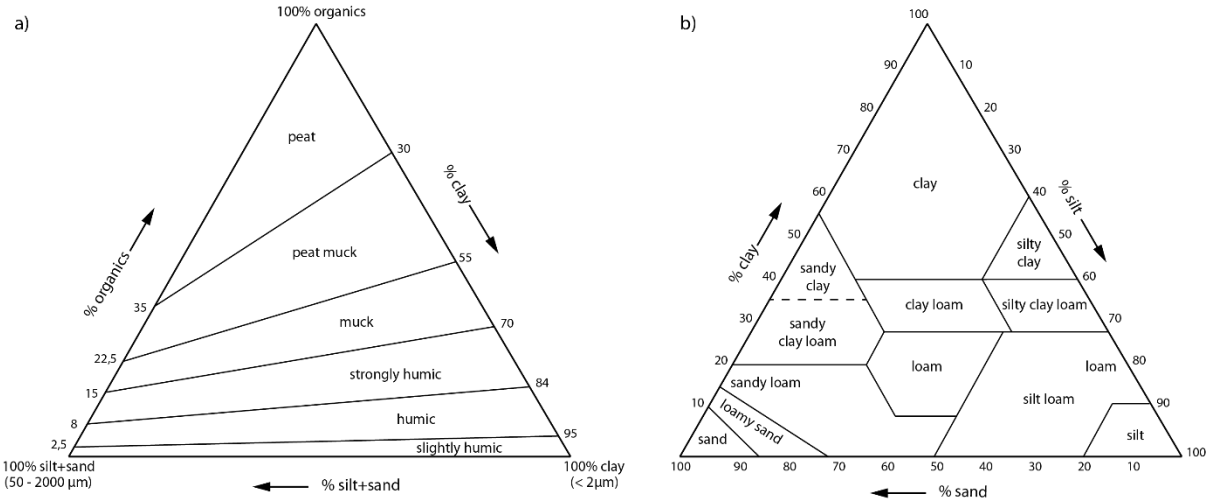

Figure S1. Distinguished organic classes (a) and the USDA texture classification (b), both used in the field to classify organics and sediment in retrieved cores.

Table S1. Reclassification table for classes used within the USDA and USCS classification systems.

USDA	**USCS**
Peat; peat muck, muck	Peat
Slightly humic; humic; very humic	Organic
Clay	Clay
Silty clay; clay loam; silty clay loam	Clayey silt, silty clay
Sandy clay; sandy clay loam	Sandy clay, clayey sand
Loam; Silt loam; Sandy loam; Loamy sand	Silty sand, sandy silt
Silt	Silt
Sand (very fine, fine, medium, coarse, very coarse)	Sand

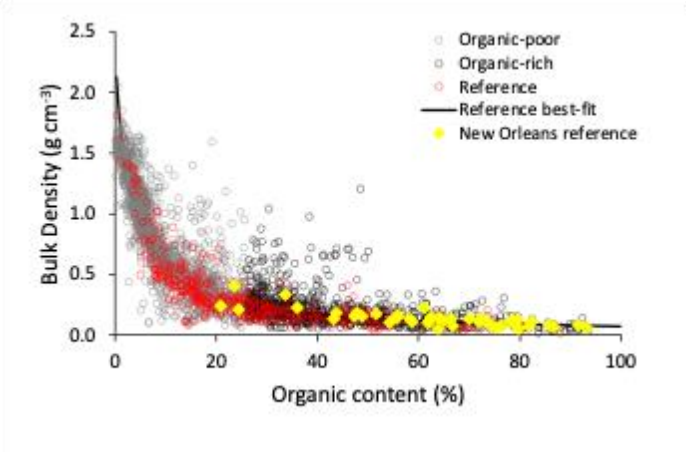

Figure S2. Relationship between organic content and bulk density of fresh peat samples from the Mississippi Delta, including the fresh peat dataset used in this study (from Keogh et al., 2021).

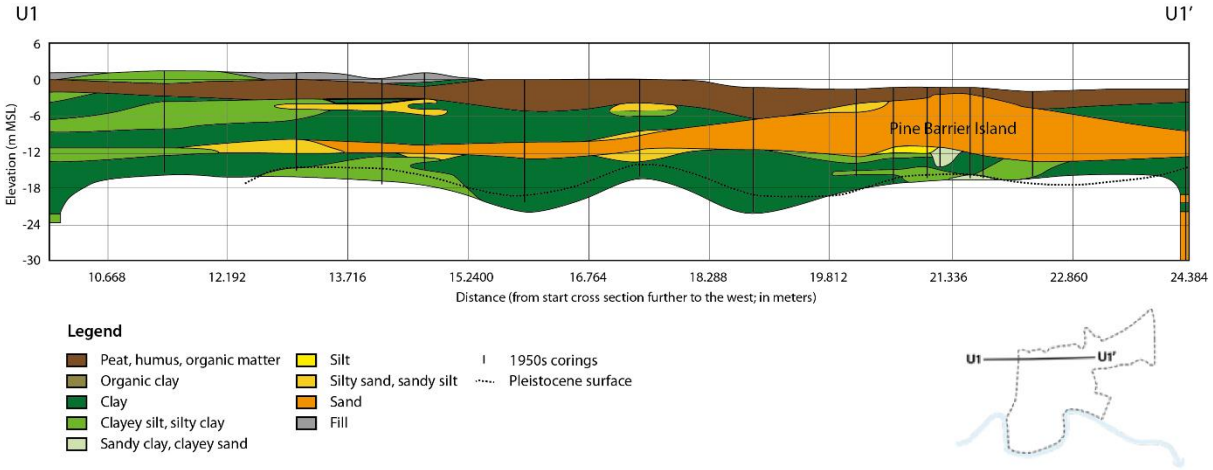

Figure S3. East-west cross section of the Holocene sequence in the northern part of New Orleans (redrawn from USACE, 1958).

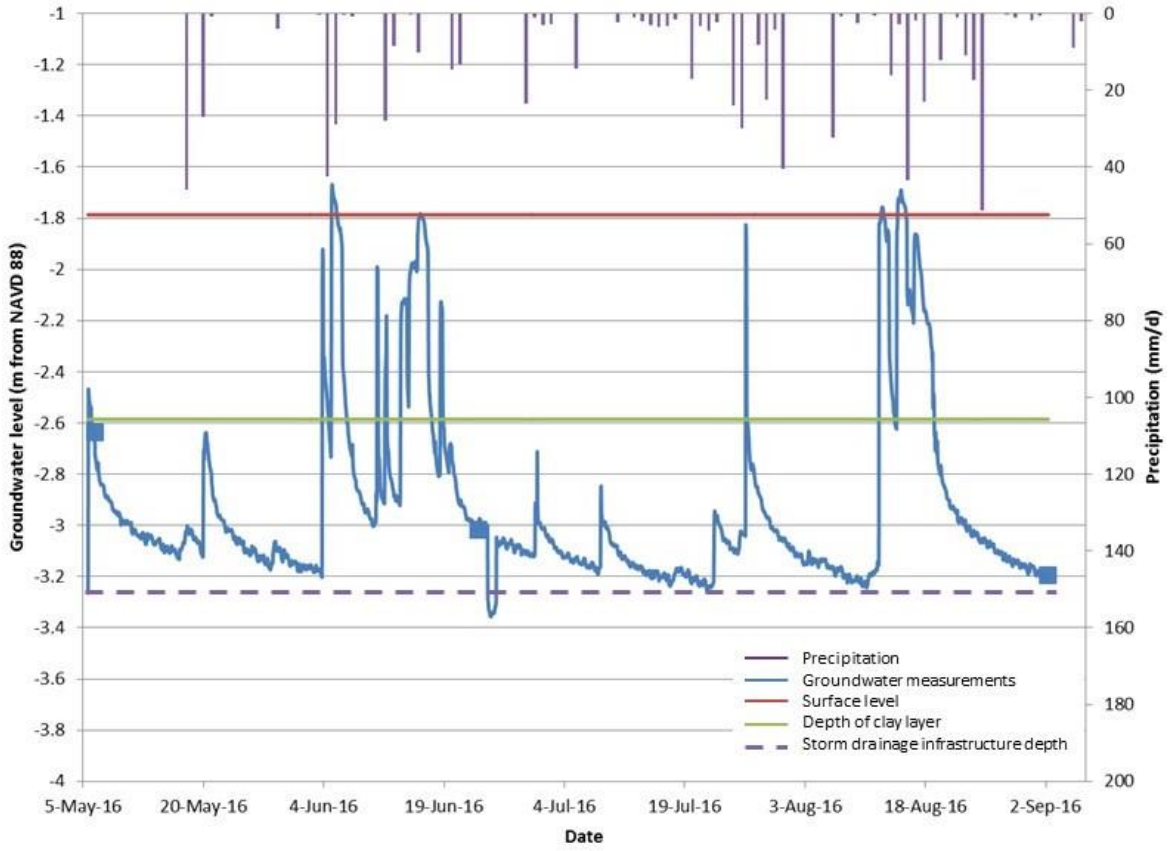

Figure S4. High-frequency (semi) phreatic groundwater monitoring in the center of Mirabeau in Gentilly (MM), approximately 80 cm of clay upon Pine Barrier sand.

ESM References

Keogh M, Törnqvist T, Kolker A, Erkens G, Bridgeman J (2021). Organic Matter Accretion, Shallow Subsidence, and River Delta Sustainability. Journal of Geophysical Research: Earth Surface. 126. e2021JF006231. 10.1029/2021JF006231.

Saucier RT (1994) Geomorphology and Quaternary geologic history of the Lower Mississippi Valley, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

USACE (1958) Geology of the Mississippi River Deltaic Plain Southeastern Louisiana. Technical report no 3-483, Volume 2, July 1958, U.S. Army Engineer Waterways Experiment Station Corps of Engineers, Vicksburg, Mississippi.