

3D Geology and Seismic Hazards in West Tennessee

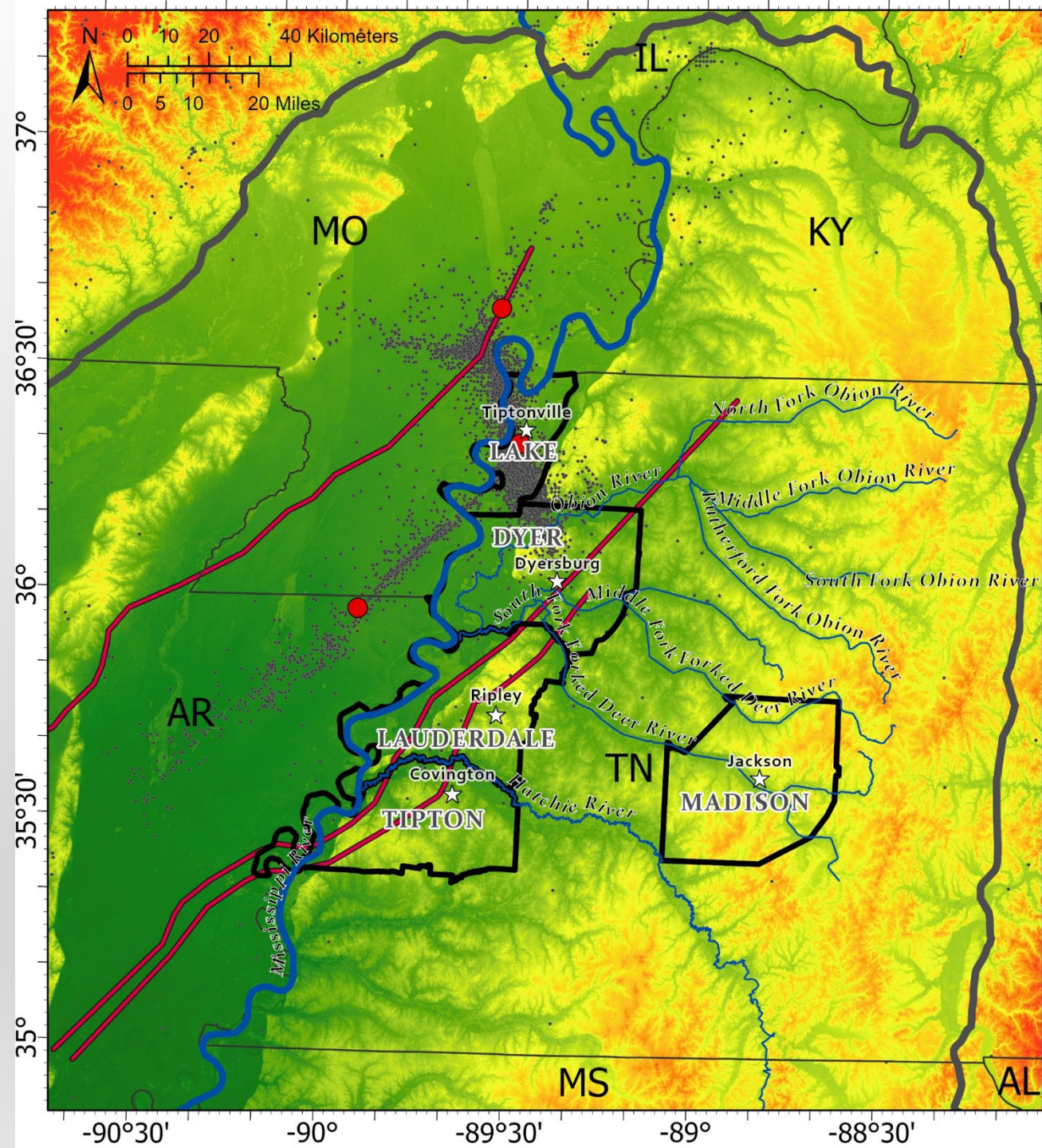
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CRAMER, Chris², TOHIDI, Hamed³, ARELLANO, David³ and PATTERSON, Gary²*

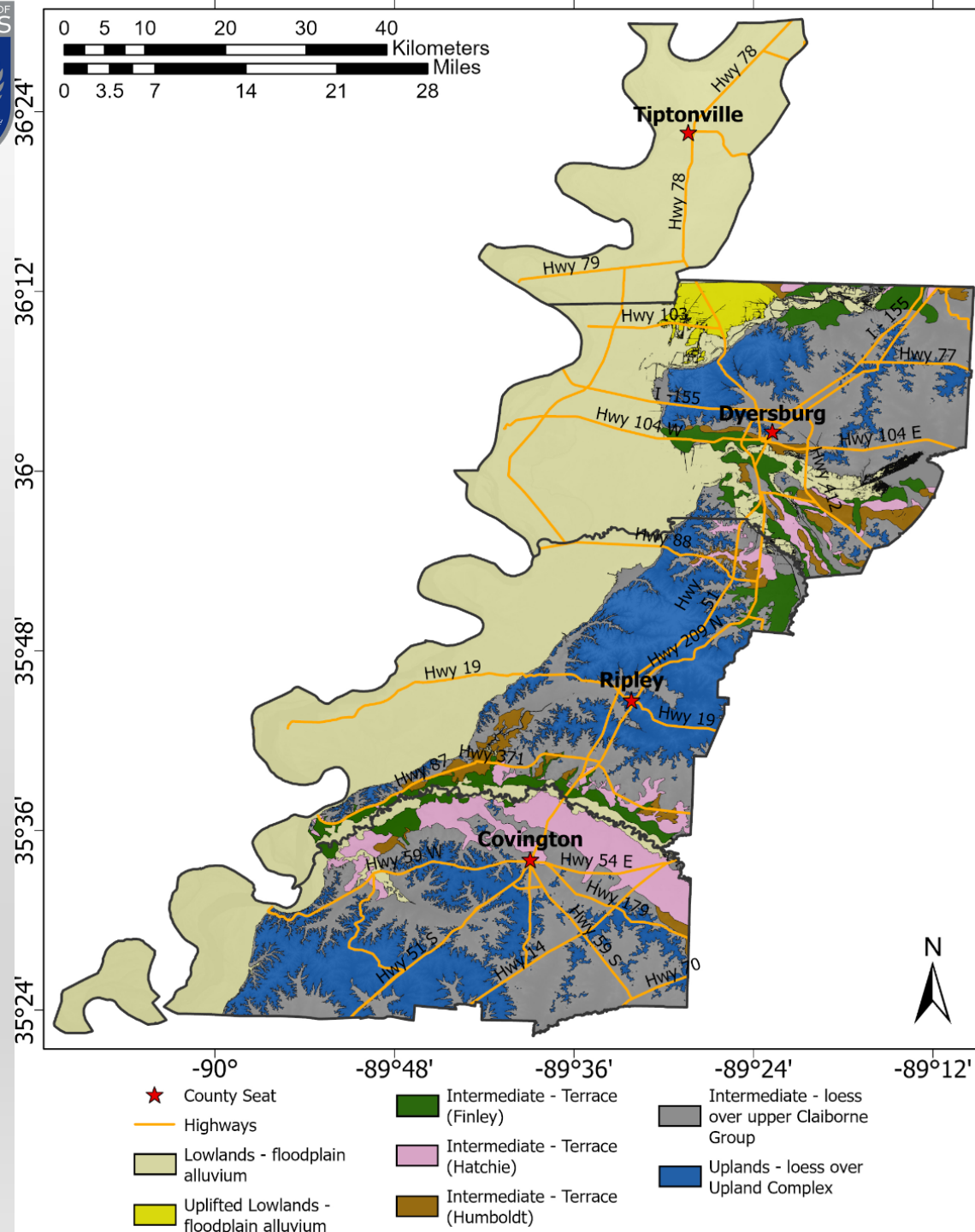
(1)Department of Earth Sciences, University of Memphis, Memphis, TN

(2)University of Memphis, Center for Earthquake Research and Information, Memphis, TN

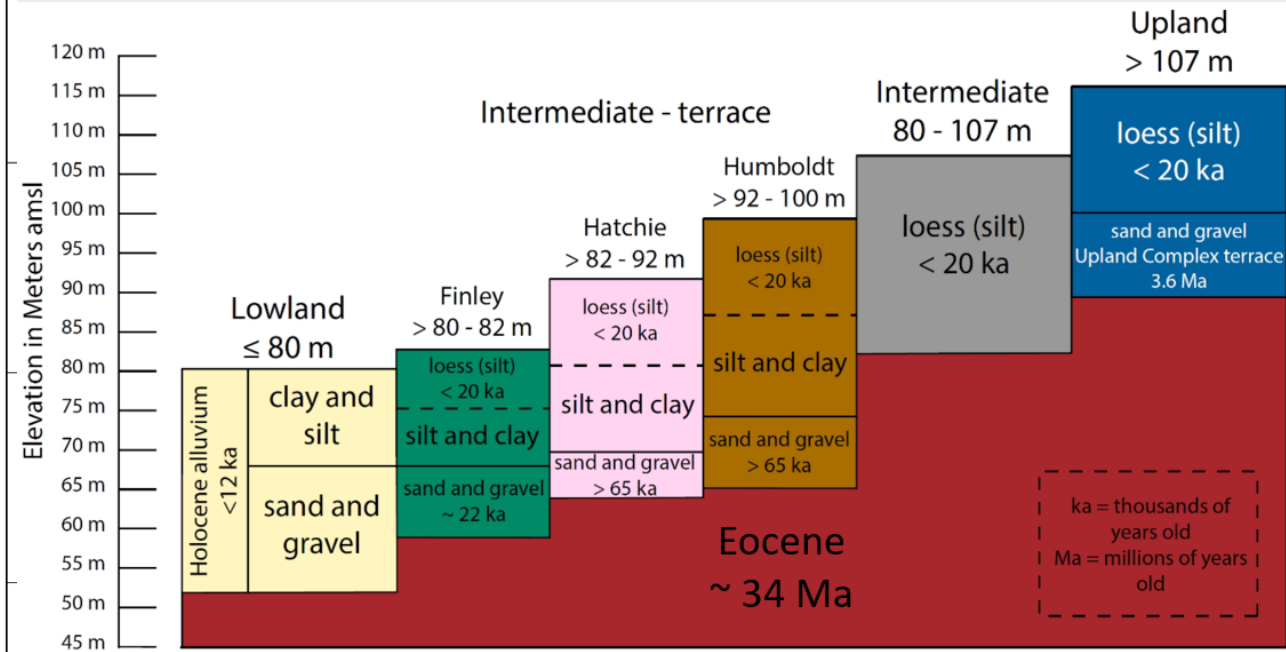
(3)Civil Engineering, University of Memphis, Memphis, TN





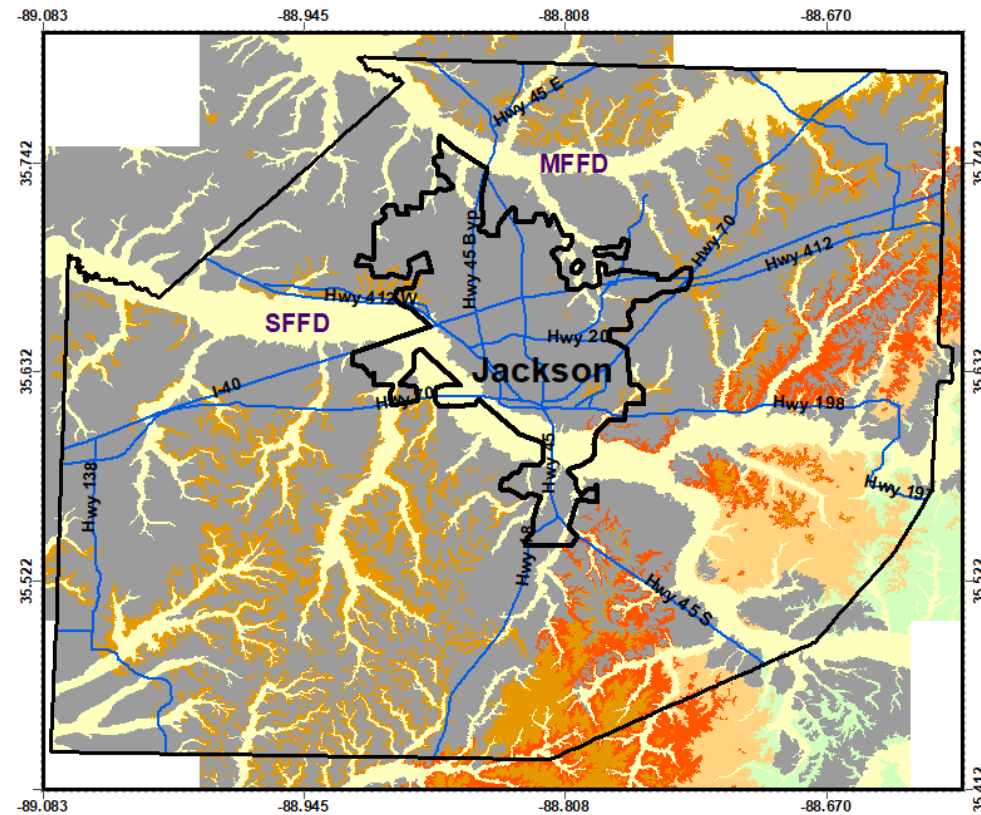








Near-surface Geology













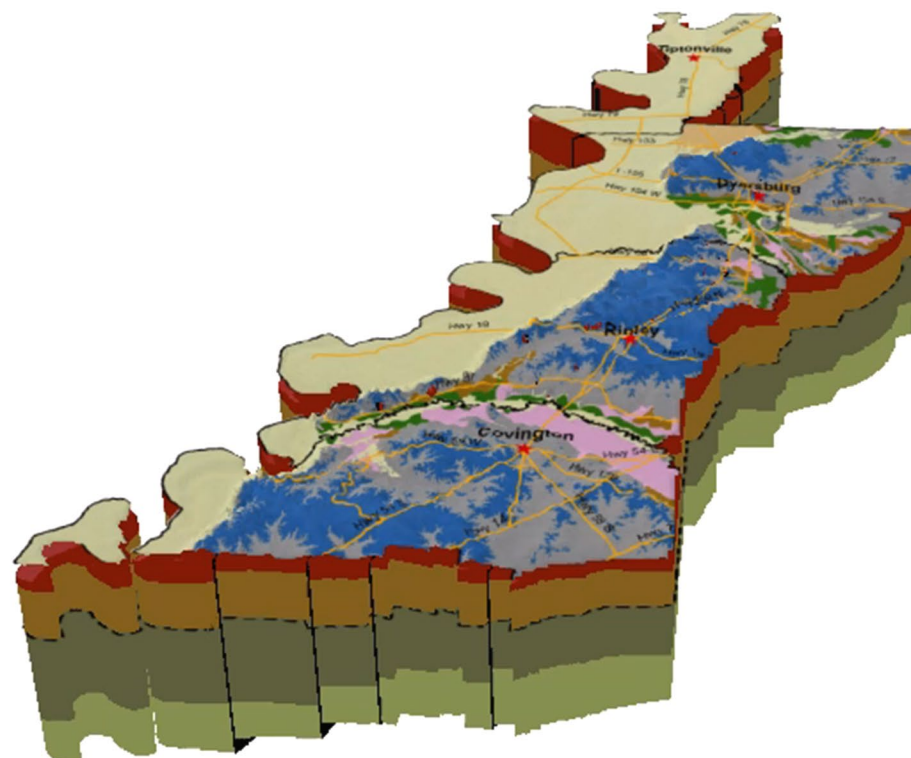
From Cramer et al., 2022







Near-surface Geology

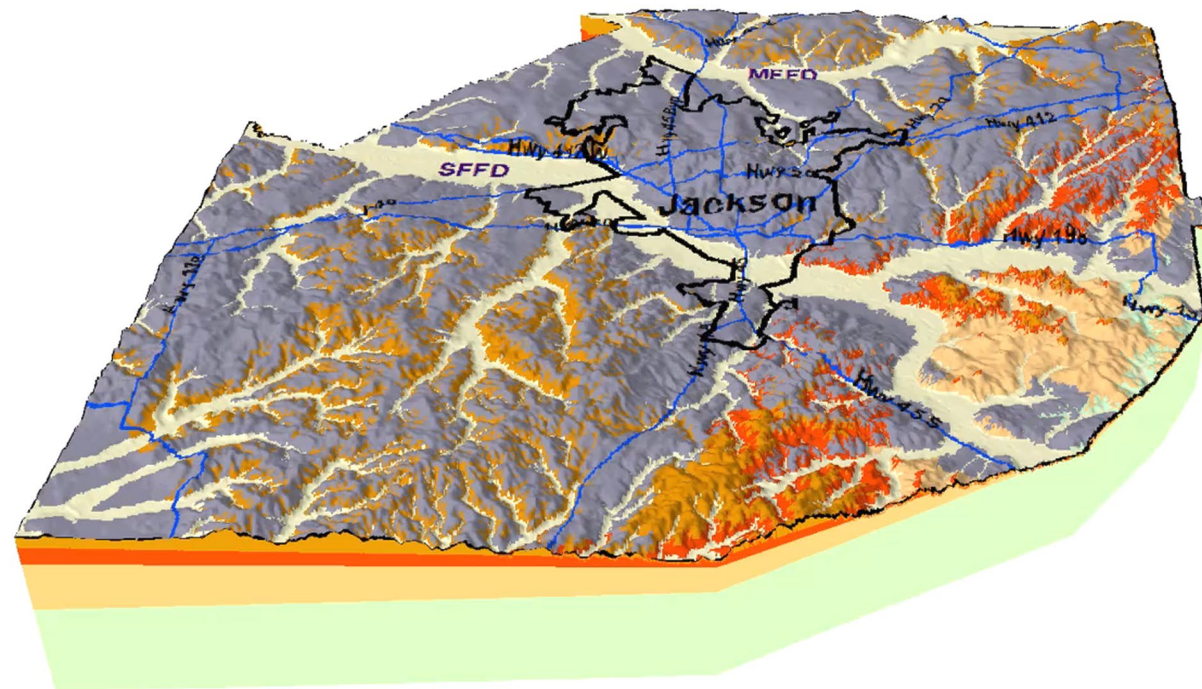


	Alluvium	Holocene
	Loess	Pleistocene
	Claiborne Fm.	Upper Eocene
	Wilcox Fm.	Paleocene – Lower Eocene
	Porters Creek Clay	
	Clayton and McNairy Fm.	Cretaceous

	Alluvium	Holocene
	Loess	
	Finley Sand/Gravel	Pleistocene
	Hatchie Sand/Gravel	
	Humboldt Sand/Gravel	
	Upland Complex	Pliocene - Pleistocene
	Upper Claiborne	Eocene
	Memphis Sand	
	Lower Paleogene	Paleocene – Lower Eocene
	Cretaceous	



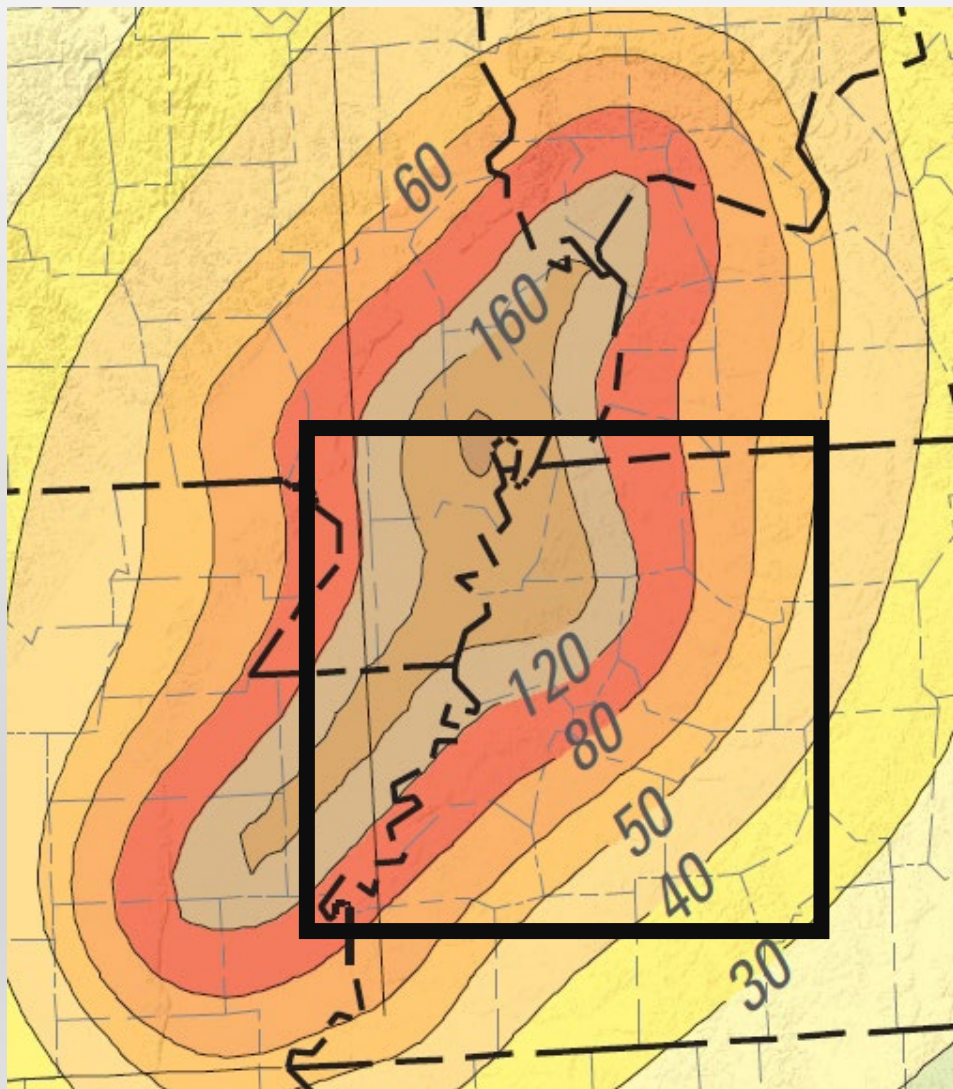
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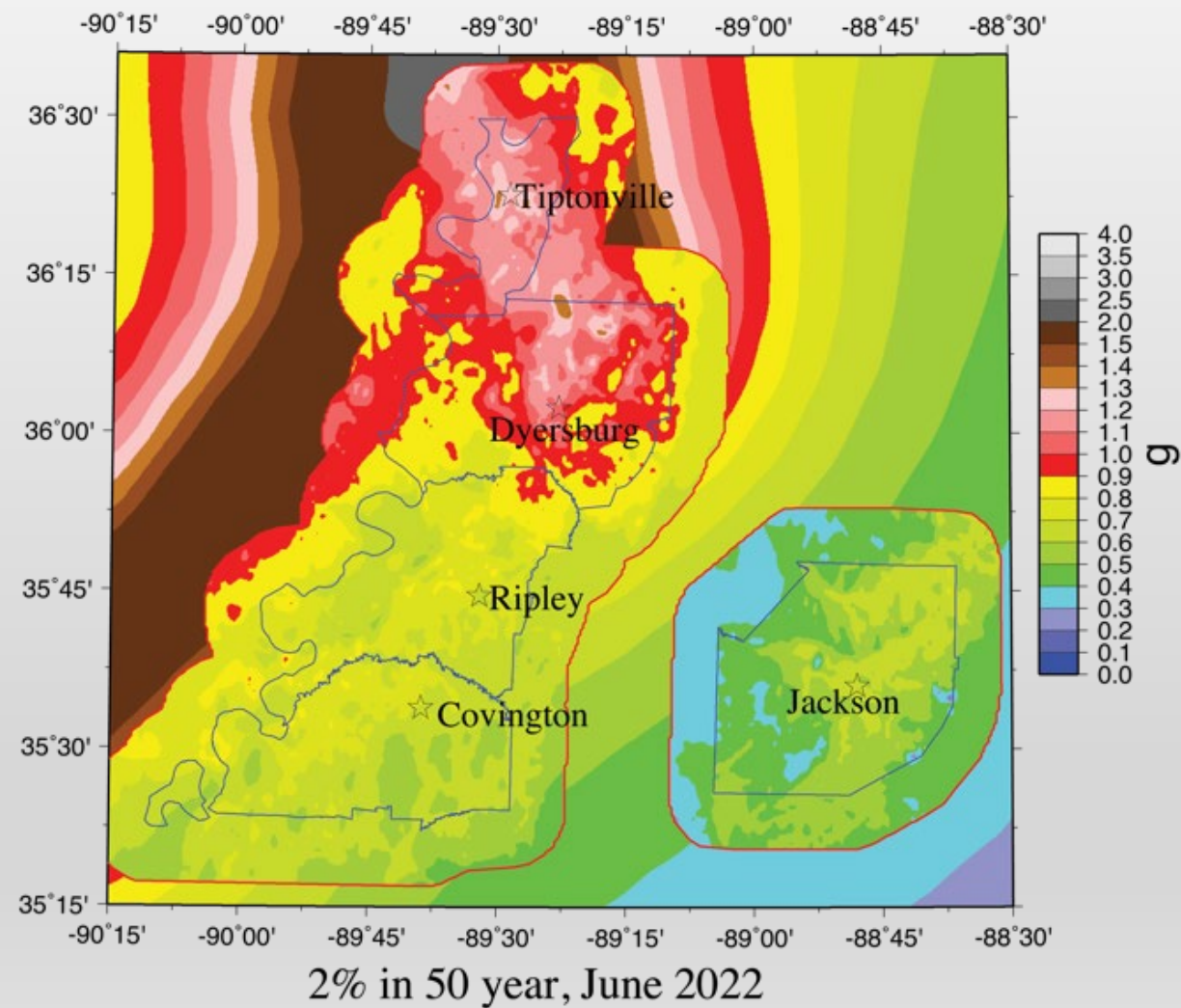
Seismic Hazard

PGA Hazard (1-2 story buildings)

USGS Hazard Map (2014)

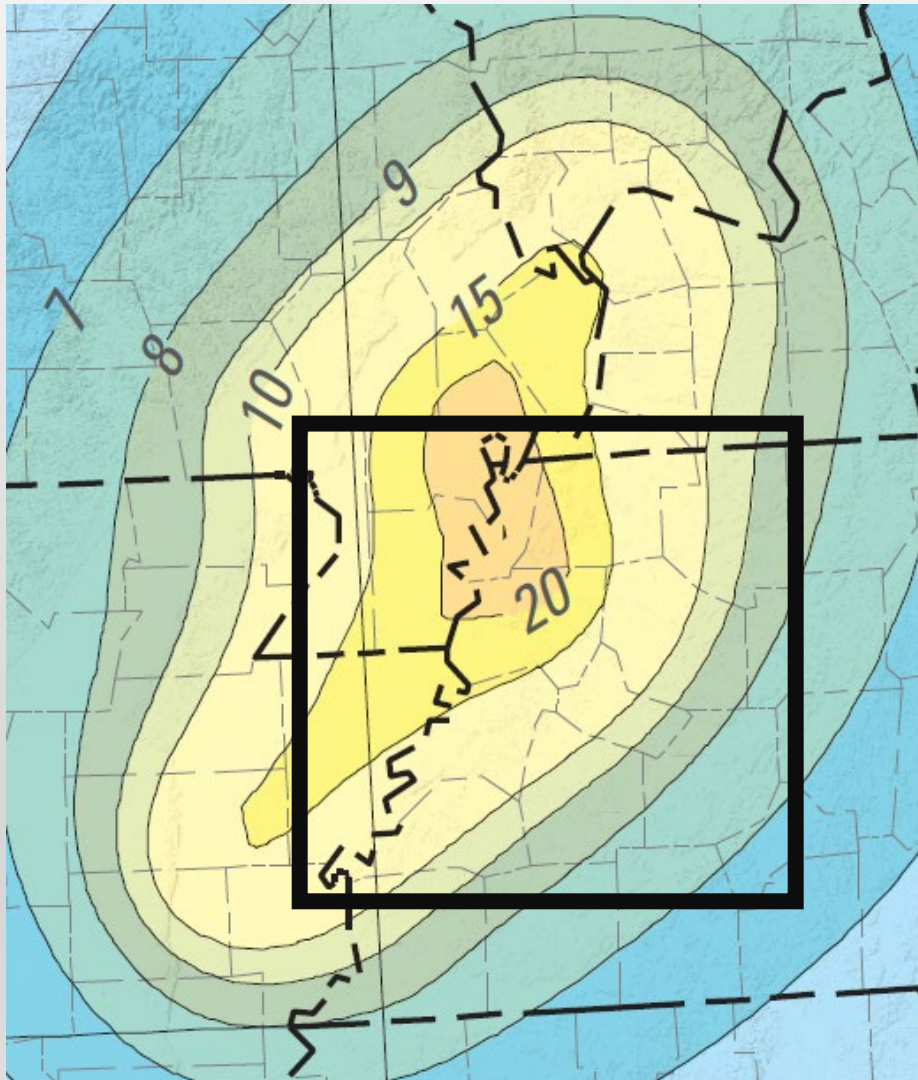


Overlay of Project Hazard Results

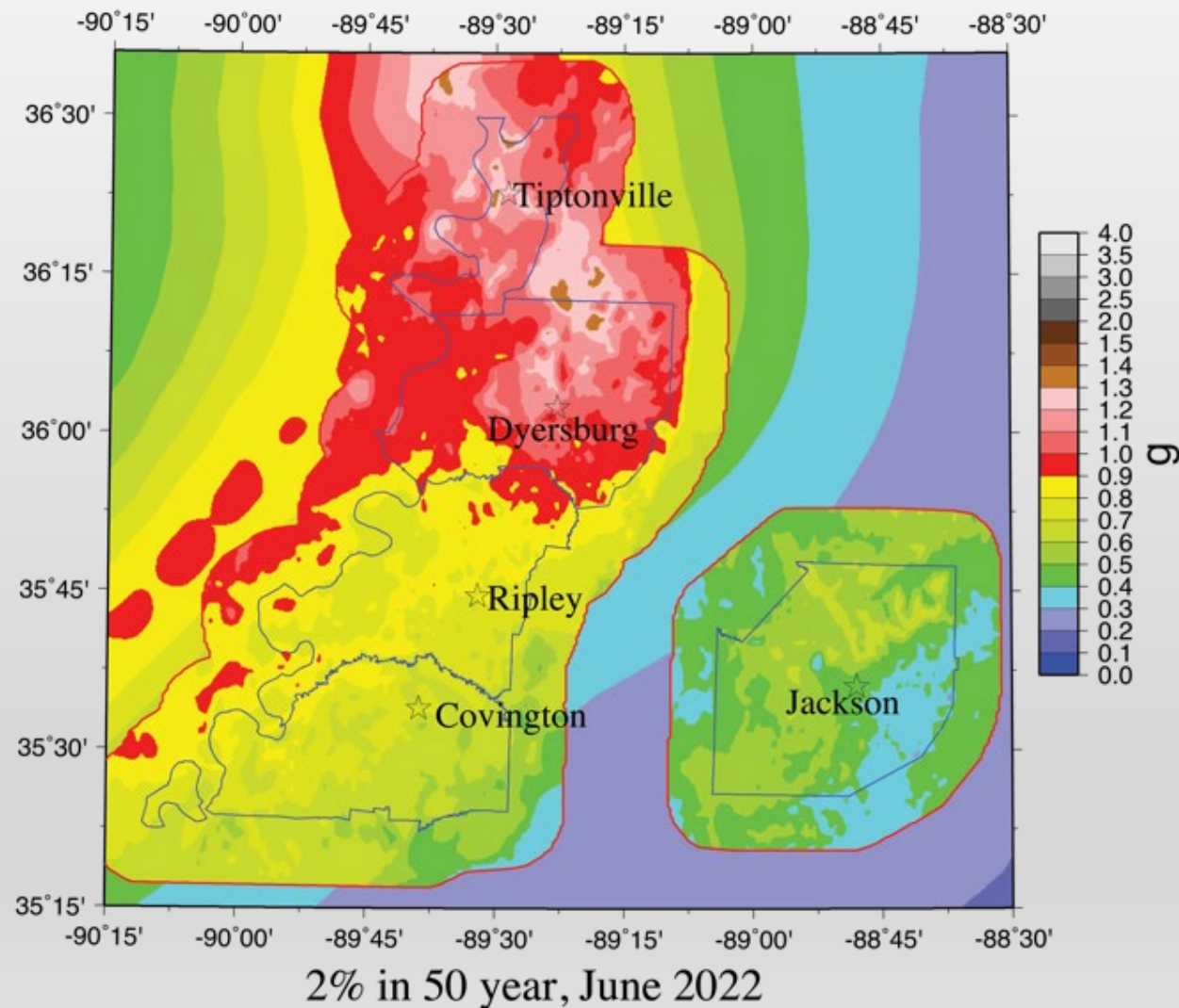


Seismic Hazard: 1.0s Hazard (10-story buildings)

USGS Hazard Map (2014)

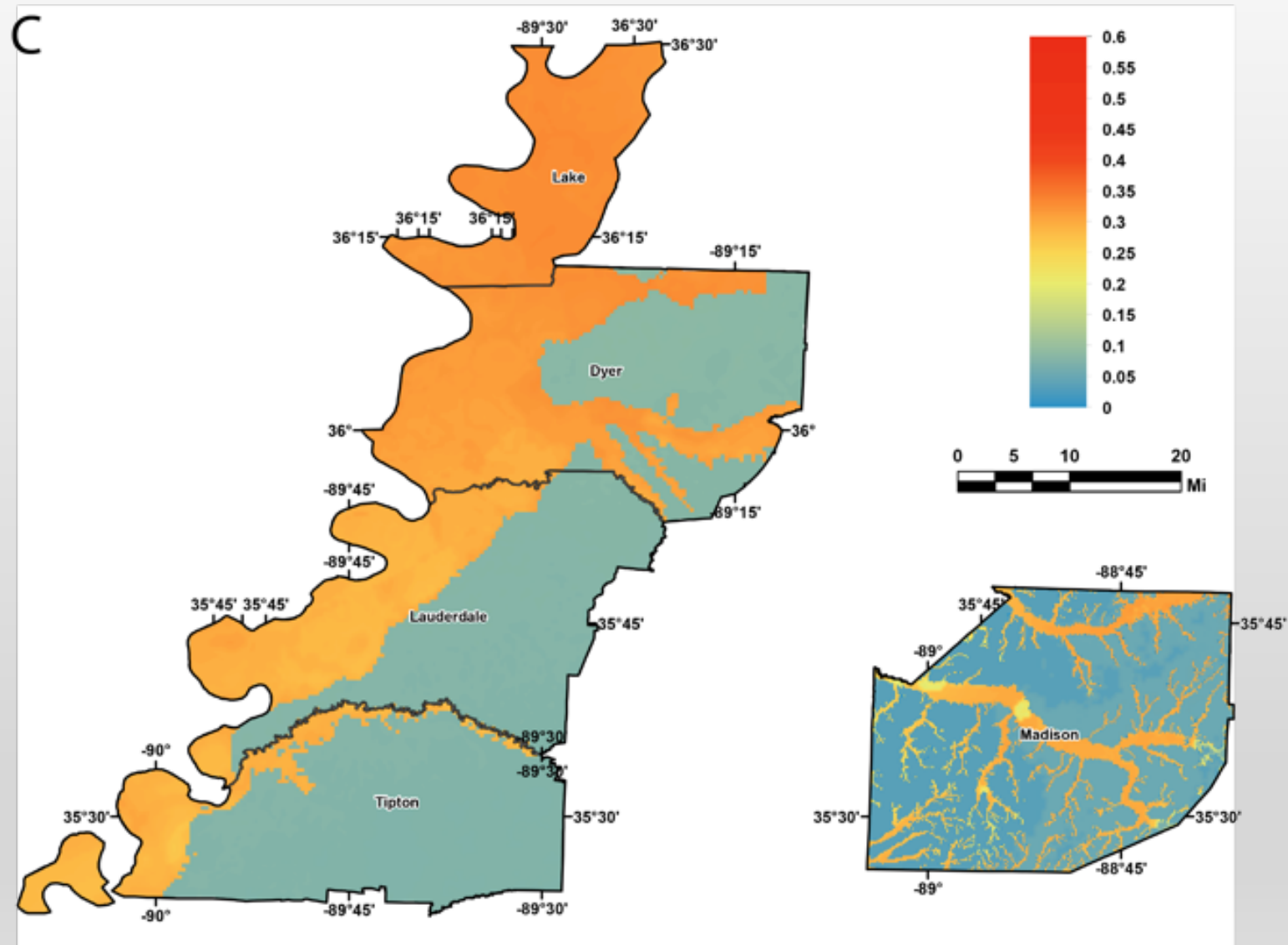


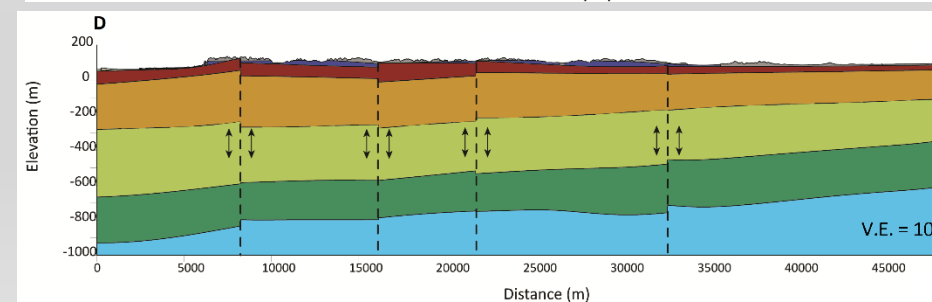
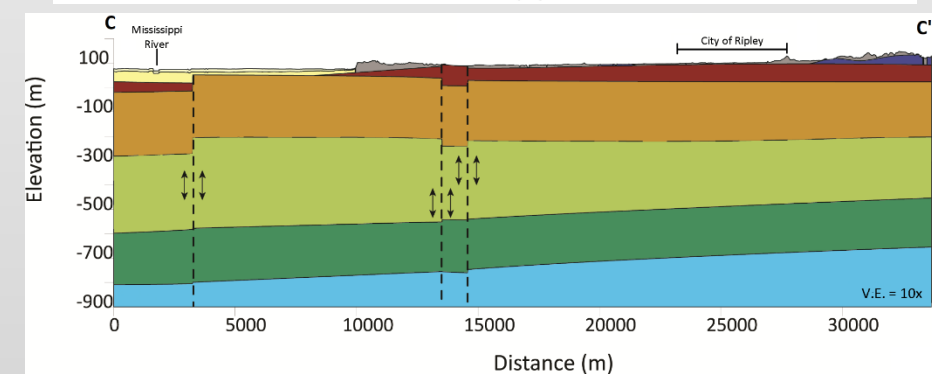
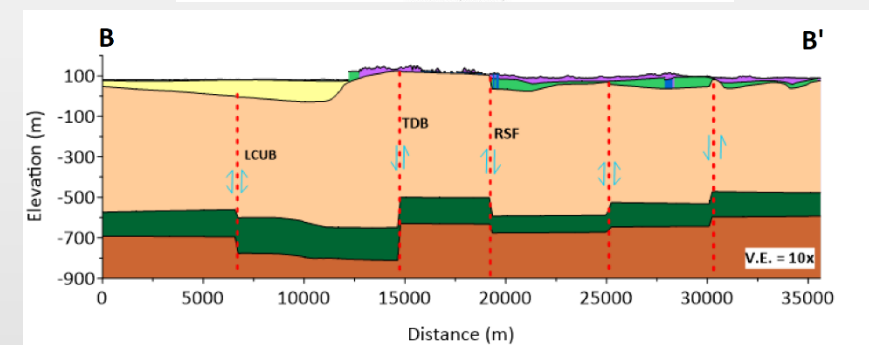
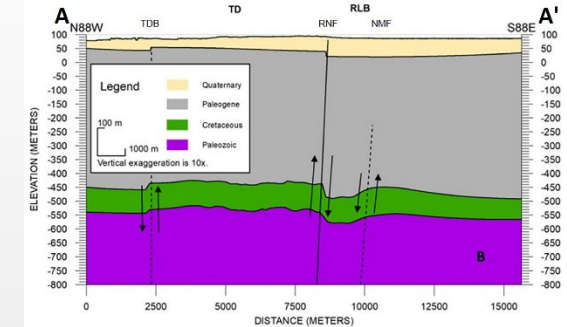
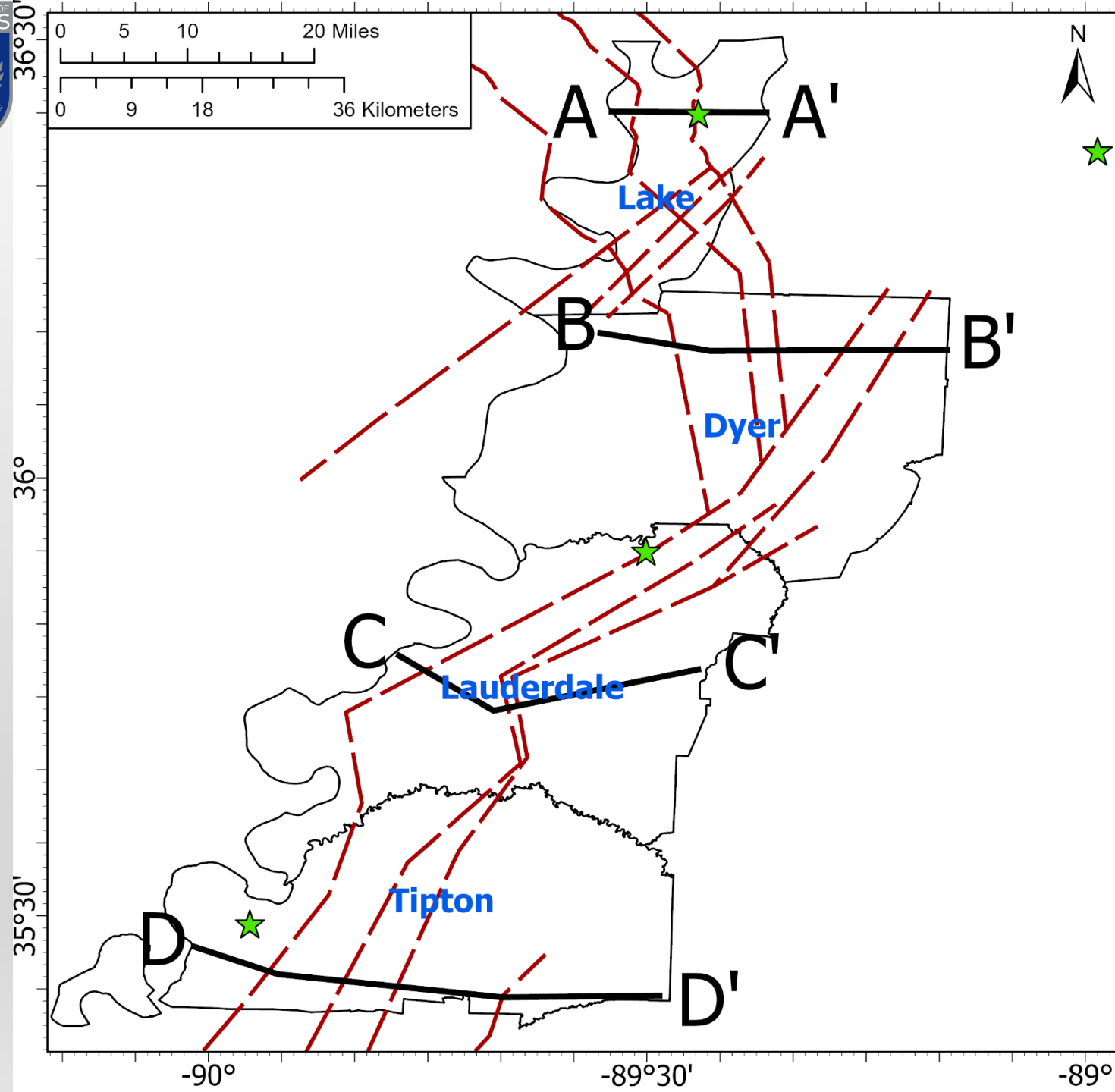
Overlay of Project Hazard Results



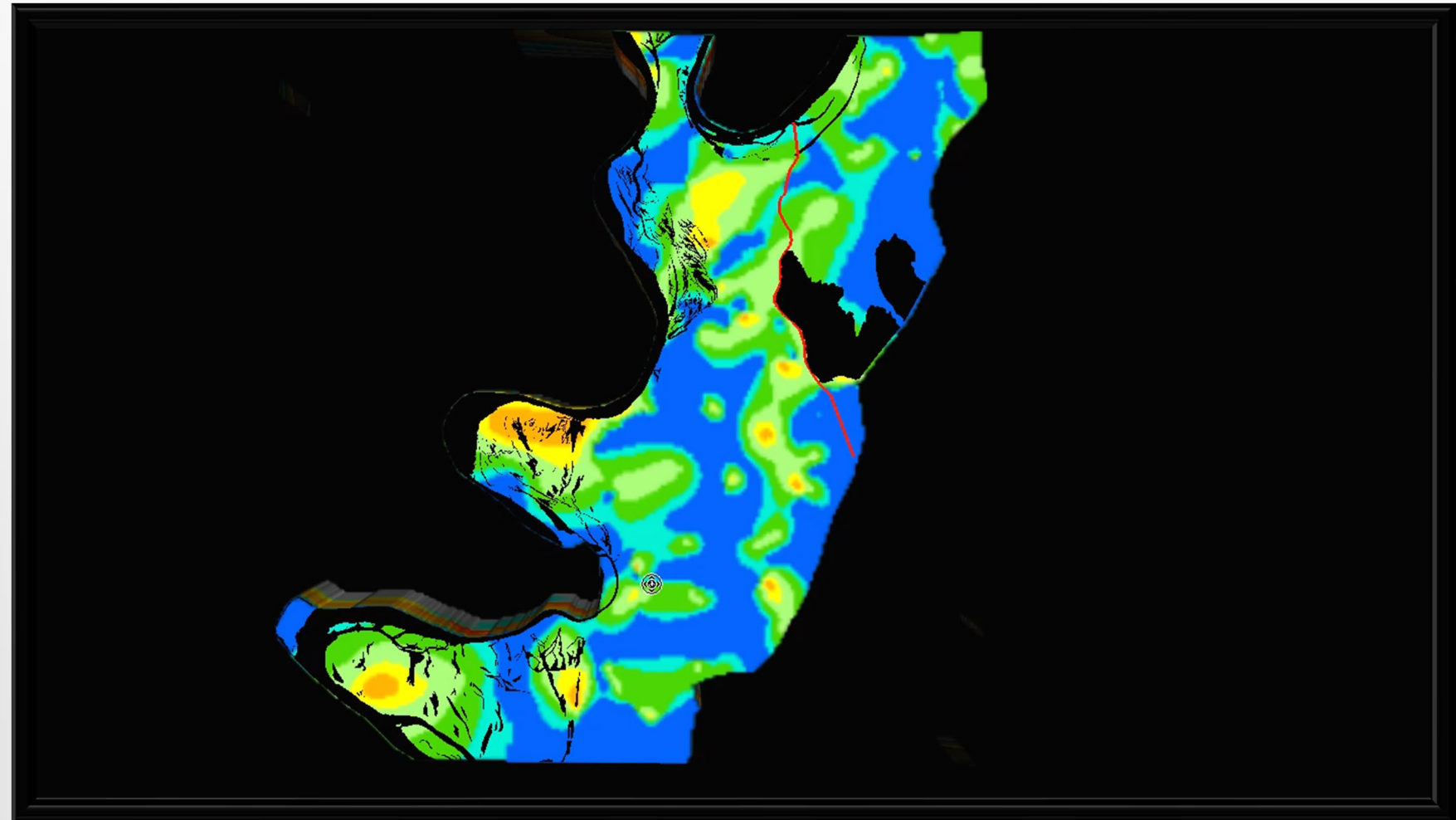
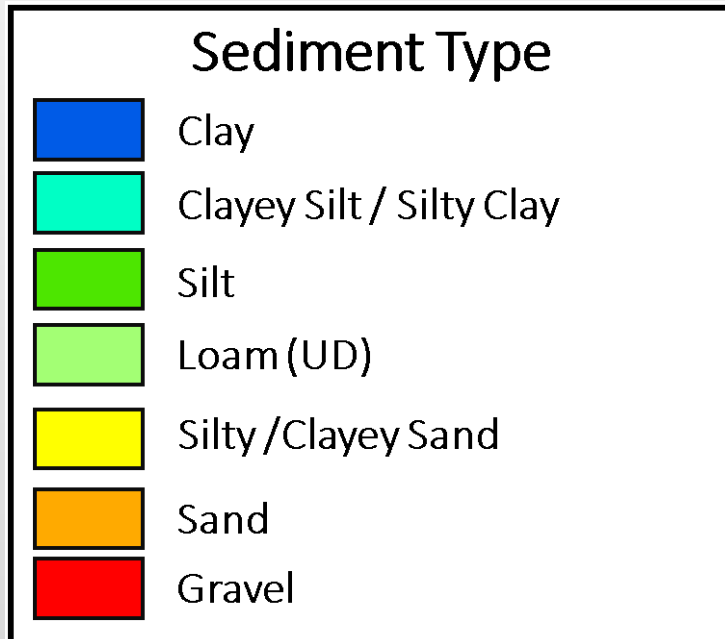
From Cramer et al., 2022

Liquefaction Hazard

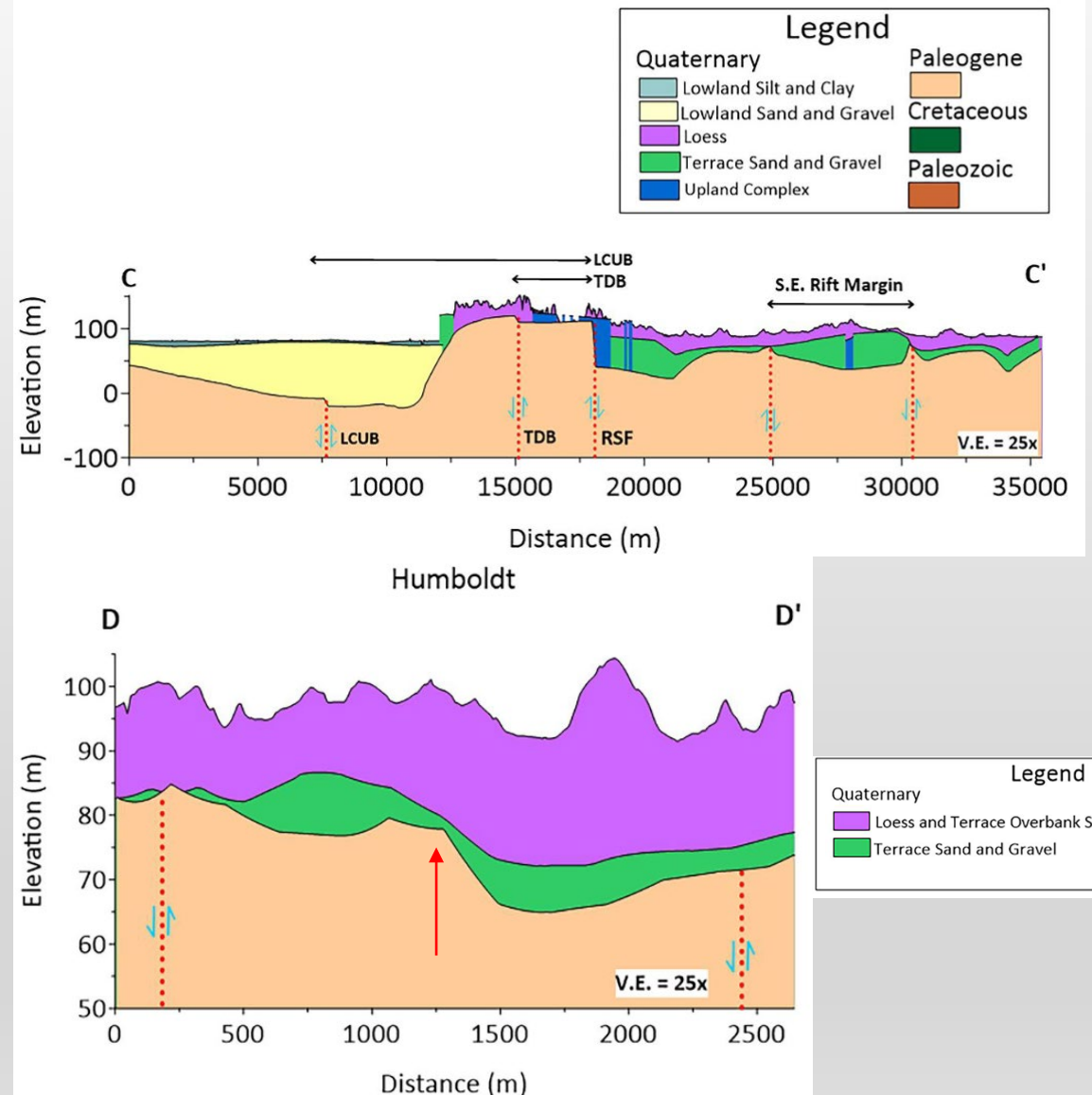
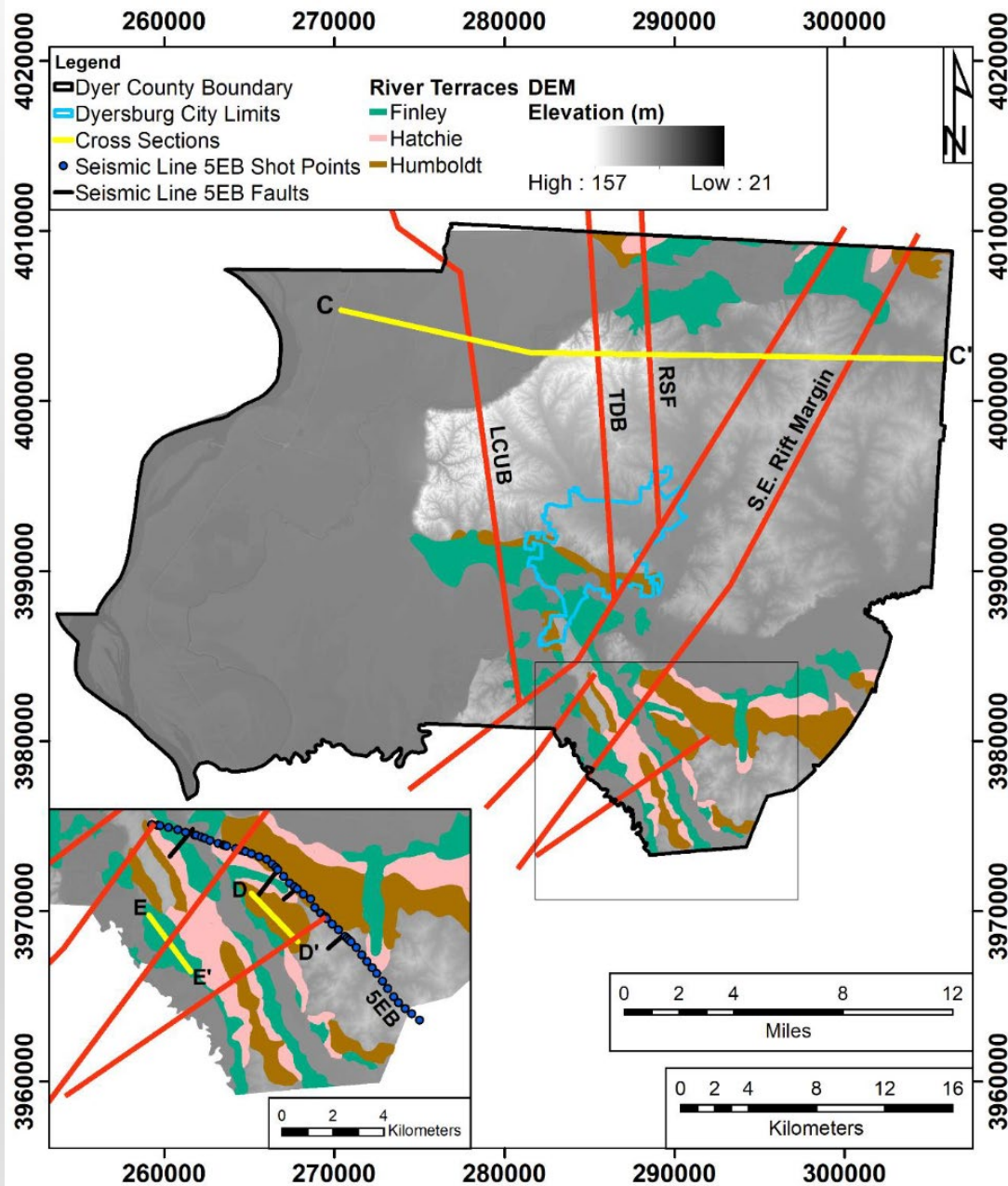




Lake County



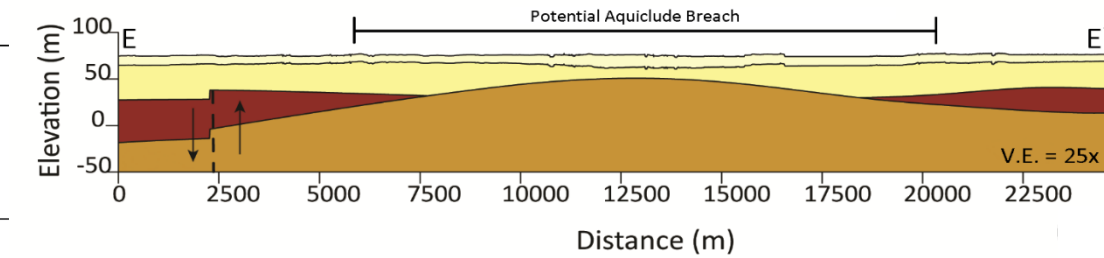
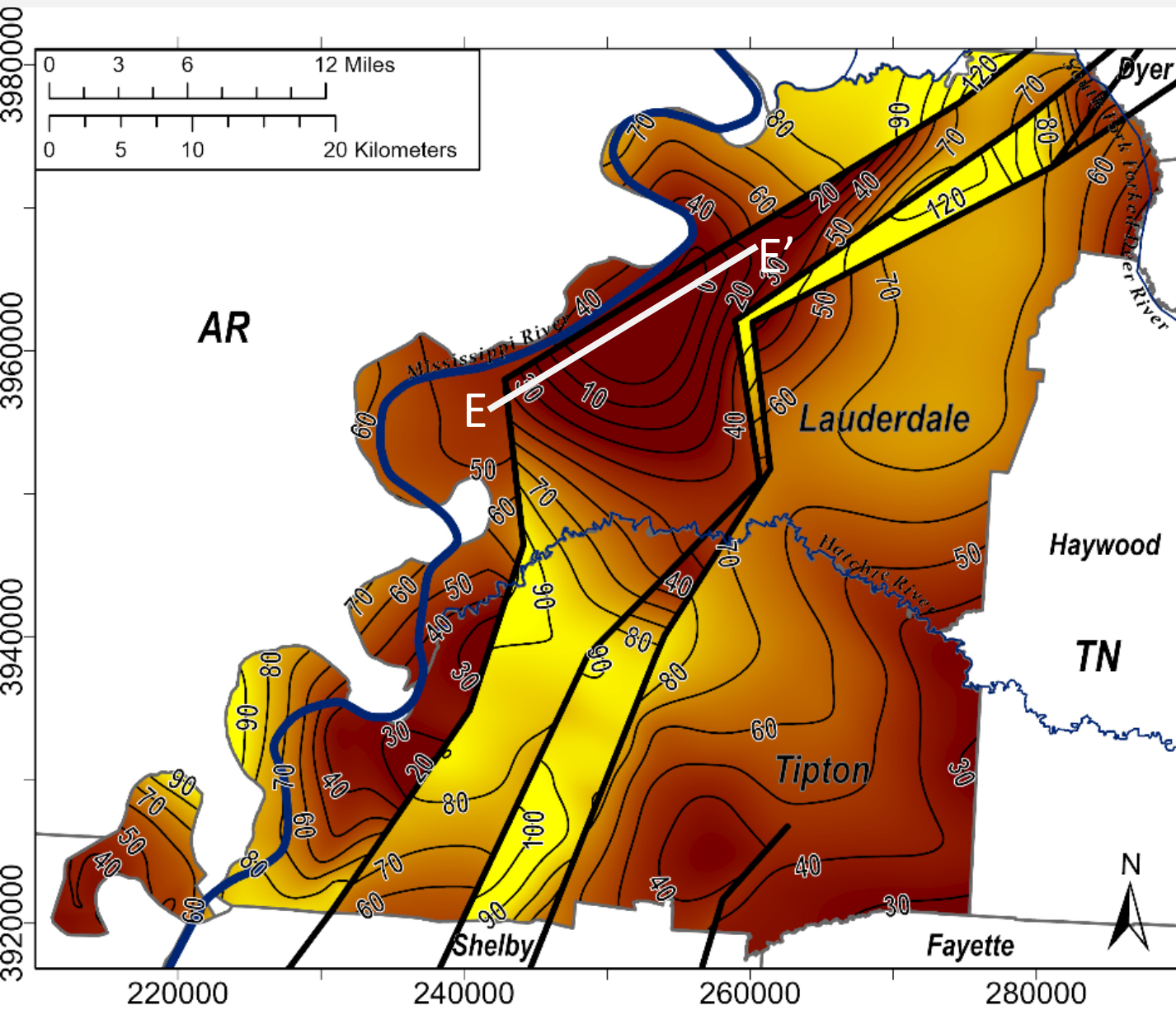
Dyer County



From Reichenbacher et al., 2022



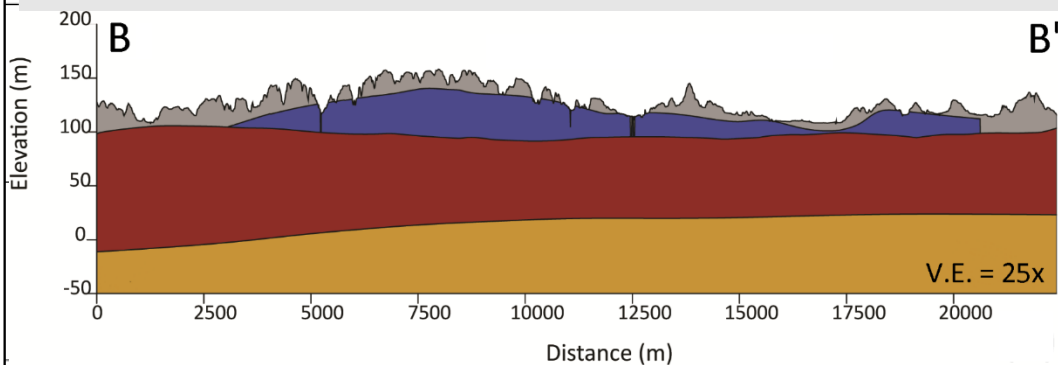
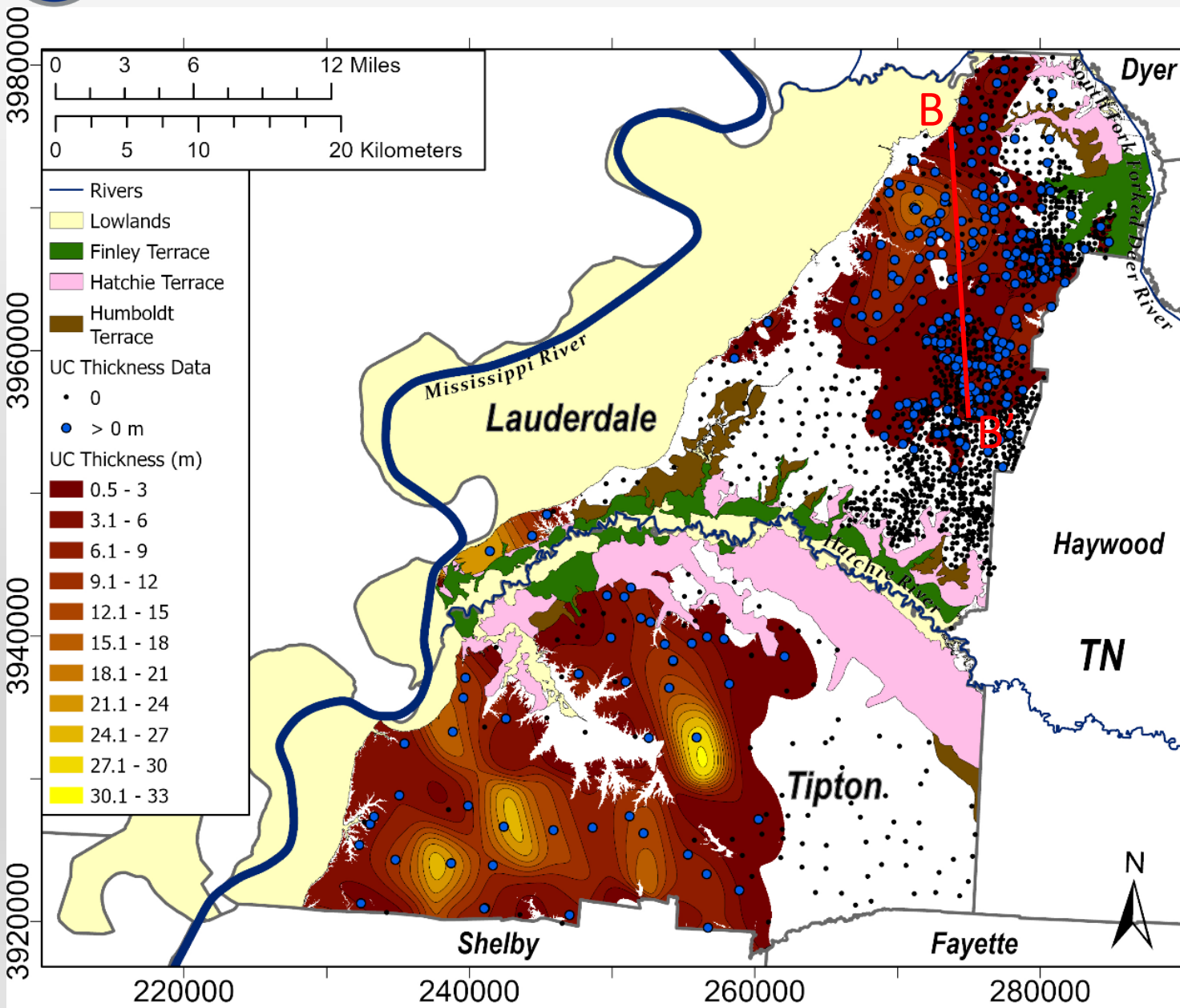
Breaches in the Aquiclude above the Memphis Sand In Lauderdale and Tipton Counties



From Harrison, 2022



Upland Complex Sand and Gravel Isopach in Lauderdale and Tipton Counties



From Harrison, 2022



Outcomes of 3D Geologic Mapping in Western Tennessee/ Northern Mississippi Embayment

- Surface geologic maps and subsurface structure contour maps
- Seismic and liquefaction hazard assessment
- Fault displacement and history
- Identified potential Quaternary faulting
- Detailed surface aquifer for optimal agricultural extraction
- Located aquiclude breaches above the Memphis Sand
- Mapped near-surface gravel resources



Thank You

U.S. Department of Housing and Urban Development

Center for Earthquake Research and Information (CERI)

Department of Earth Sciences, University of Memphis

Civil Engineering, University of Memphis

Center for Applied Earth Science and Engineering Research (CAESAR)



QUESTIONS?

References

Cramer, C.H. et al., 2022, Seismic and Liquefaction Hazard Maps for Five Western Tennessee Counties, submitted.


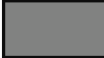








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	Loess	
	Finley Sand/Gravel	
	Hatchie Sand/Gravel	Pleistocene
	Humboldt Sand/Gravel	
	Upland Complex	Pliocene - Pleistocene
	Upper Claiborne	
	Memphis Sand	Eocene
	Lower Paleogene	Paleocene – Lower Eocene
	Cretaceous	

Cenozoic	Quaternary	Alluv	Light gray silty clay and sand; contains lignite.		
		Loess	tan silt and clayey silt.		
		U. C.	Ferruginous, fine- to very coarse-sand and gravel.		
		Jackson Formation	Light gray to buff, medium- to very fine-grained silty sand, interbedded with light gray clayey silt.		
	Tertiary	Oligocene	Cockfield Formation	Light gray to light brown silt and clay interbedded with medium- to fine-grained sand; lignite common.	
			Cook Mtn. Formation	Light gray to light buff clay and silt; contains variable amounts of sand and lignite.	
			Claiborne Group		
			Memphis Sand	Fine- to very coarse-grained, light gray-white quartzose sand; contains pyrite, lignite, and rock fragments.	
		Paleocene	Wilcox Group	Flour Island Fm.	Medium to light gray silty clay and clayey silt containing thin beds of fine- to very fine-grained sand; commonly contains lignite, pyrite, and mica.
				Fort Pillow Sand	Fine- to very coarse-grained quartzose sand; commonly contains lignite, pyrite, and mica.
			Midway Group	O.B. Fm.	Light gray, sandy, micaceous silty clay.
				Porters Creek Clay	Steel-gray to dark gray, hard, micaceous clay; disseminated organic material common; locally mottled yellow-buff; locally fossiliferous; pyrite common; becomes calcareous and very glauconitic near the base.
			Clayton Fm.	Light green-gray, glauconitic, fossiliferous, clay interbedded with green-white fossiliferous marl.	
			Owl Creek Fm.	Samples from the Owl Creek Formation missing, but geophysical logs indicate it is present.	
			Upper Cretaceous	McNairy Sand	Fine- to coarse-grained sand, commonly containing pyrite, mica, and wood fragments, and traces of glauconite interbedded with steel-gray, soft, micaceous silty clay.
				Demopolis Formation	Massively-bedded, fossiliferous, argillaceous, gray marls.
Coffee Formation	Well-sorted, loose white sands interbedded with laminated to thin-bedded, brownish-gray carbonaceous clays with clean quartz silt partings.				
Paleozoic	Upper Cambrian (?)	Unknown		White to dark-gray, fine- to coarse-crystalline dolomite; locally recrystallized; trace vuggy porosity; pyrite common; trace quartz crystals.	

Legend

 Major intervals with no samples
  Sand and Gravel
  Sand
  Silt

 Clay
  Calcareous clay
  Dolomite
  Unconformity

Alluv. = Alluvium
 U. C. = Upland Complex
 O.B. Fm. = Old Breastworks Formation