

NAME: _____ PERIOD: _____ DATE: _____

LAB PARTNERS: _____ LAB #17

THE GREAT EARTHQUAKE OF 1811 (THE MERCALLI INTENSITY SCALE)

INTRODUCTION

The Richter Scale is used to measure earthquake magnitude based on an analysis of P and S wave data from a seismogram. Another method of measuring earthquakes is the Mercalli Scale, which is not a measure of the amount of energy released by an earthquake, but the damage caused by it.

OBJECTIVES

After completing this investigation you will be able to:

1. Use the Modified Mercalli Intensity scale to assign earthquake intensities.
2. Evaluate earthquake hazards from historic seismic descriptions.
3. Use a map to find locations in the eastern part of the United States.
4. Determining the epicenter of an earthquake using the Modified Mercalli Scale

MATERIALS

Pen
Pencils with eraser
Modified Mercalli scale

APPROXIMATE TIME 2 periods

PROCEDURE

1. Using the Modified Intensity scale, determine an intensity for each locality given in this exercise. Write the Roman numeral in the column for 'Assigned Mercalli Intensity'.
2. On the U.S. map provided, write the Mercalli intensity Roman numeral on the map **IN PEN** next to the appropriate town.
3. Develop a field map of equal intensities (isolines). Use the same technique you would use for isotherms on a weather map or contour lines on a topographic map. You will use an interval of 1, drawing isolines: IV, V, VI, VII, VIII, IX, X, XI
4. Answer lab questions.

MERCALLI INTENSITY	LOCATION	EARTHQUAKE EFFECTS
	Big Prairie Arkansas	Rails bent greatly All bridges destroyed
	Boston Massachusetts	Shock felt on upper floors of buildings Nothing moved in houses
	Cape Girardeau Missouri	Damaged 5 chimneys, split 2 brick houses Ground cracked, underground pipes broken
	Concordia Kansas	Sleeping persons awakened, swaying of trees, and telephone poles
	Columbia Tennessee	Wakened people, some run outdoors Damage slight
	Detroit Michigan	First shocks distinctly felt. Walls creaked, standing cars rocked
	Fort St. Stephens Louisiana	Earth shook here so as to shake the fowls off their roosts. Houses shook very much, trees and poles moved.
	Fort Worth Texas	Felt by everyone. Heavy furniture moved in rooms within homes.
	Galveston Texas	Parked cars rock noticeably. House walls make creaking noise, dishes clanking together in cabinets.
	Georgetown South Carolina	The parade ground of the fort settled from 1-2 inches below former level. Walls creaked in wood frame houses.
	Henderson City Kentucky	Overturned some chimneys, ordinary buildings partially collapsed.
	Knoxville Tennessee	Windows and furniture shaken. People ran out into streets, lasted 3 minutes.
	Lebanon Ohio	Woke people. People left houses. Felt by all.
	Louisville Kentucky	Noticed by persons driving cars. Poorly built structures had great damage. Houses were swaying. Lasted about 4 minutes.
	Memphis Tennessee	Part of the river burst and shook hundreds of great trees from the bottom. The trees were in the river with their roots turned upward. Buildings shifted off foundations

Nashville Tennessee	Same as Henderson City, Kentucky
Natchez Mississippi	Clocks stopped. Hanging art vibrated. Articles hanging from ceilings vibrated rapidly. Threw some articles off shelves. Damage slight, cracked some plaster.
New Madrid Missouri	Awful noise resembling loud thunder, also from the cracking and falling of trees. Fowls and beasts cried. Mississippi flowed backwards, graveyard fell into river. All chimneys and all houses fell down. Earth rolled in waves a few feet high.
New Orleans Louisiana	Slight shaking, dishes rattled
Newark New Jersey	Several shocks felt, felt like a truck hitting the building
Norfolk Virginia	Several clocks stopped. First awoke people from their sleep. Houses shook with great violence. Shaking of beds.
Oklahoma City Oklahoma	Older buildings suffered most damage due to poor design to withstand earthquakes.
Piney River Tennessee	Banks of river caved in. Some chimneys thrown down. Damage slight in well designed buildings.
Pittsburgh Pennsylvania	Houses shaken. Clocks stopped.
Quebec Canada	Shook furniture in houses and doors upon their hinges. Walls creaked.
Raleigh North Carolina	Several slight shocks were felt. Standing cars rocked noticeably.
Richmond Virginia	Bells on both floors of house in the most elevated part of the city rang. Some windows broken, trees disturbed.
Riviere aux Tranches Canada	Felt many of the earthquake shocks. Walls creaked.
St. Louis Missouri	Clamor of windows, doors, furniture. A few chimneys were damaged, a few stone houses were split. Noticed by persons driving cars.

	Savannah Georgia	Flash of light followed by rattling noises. Earth movement made people teeter as though on shipboard in heavy swell of sea. Many people nauseated. Doors disturbed.
	Vicksburg Mississippi	Same as Louisville, Kentucky
	Vicennes Indiana	Same as Vicksburg, Mississippi
	Waco Texas	Objects outside and inside homes overturned. Swaying of telephone poles and flag poles
	Washington D.C.	Rang church bells and cracked the pavement. Shook doors, windows and furniture. Clocks stopped.
	Wichita Kansas	Some brick chimneys cracked. Noticed by all persons.

LABORATORY QUESTIONS

1. What location on the map is closest to the earthquake epicenter? How can you tell?

2. What happens to the intensity of the earthquake and its corresponding damage to land and buildings as the distance from the epicenter increases?

3. Predict what the Mercalli Intensity number would have been for Maine.

4. What does the Mercalli Scale measure?

5. What does the Richter Scale measure?

6. What would be the Mercalli Intensity Scale number if a locality was described as:
Ground separated
Buildings moved off their foundations
Landslides occurred

7. How does a magnitude #4 on the Richter Scale compare to a magnitude #5?

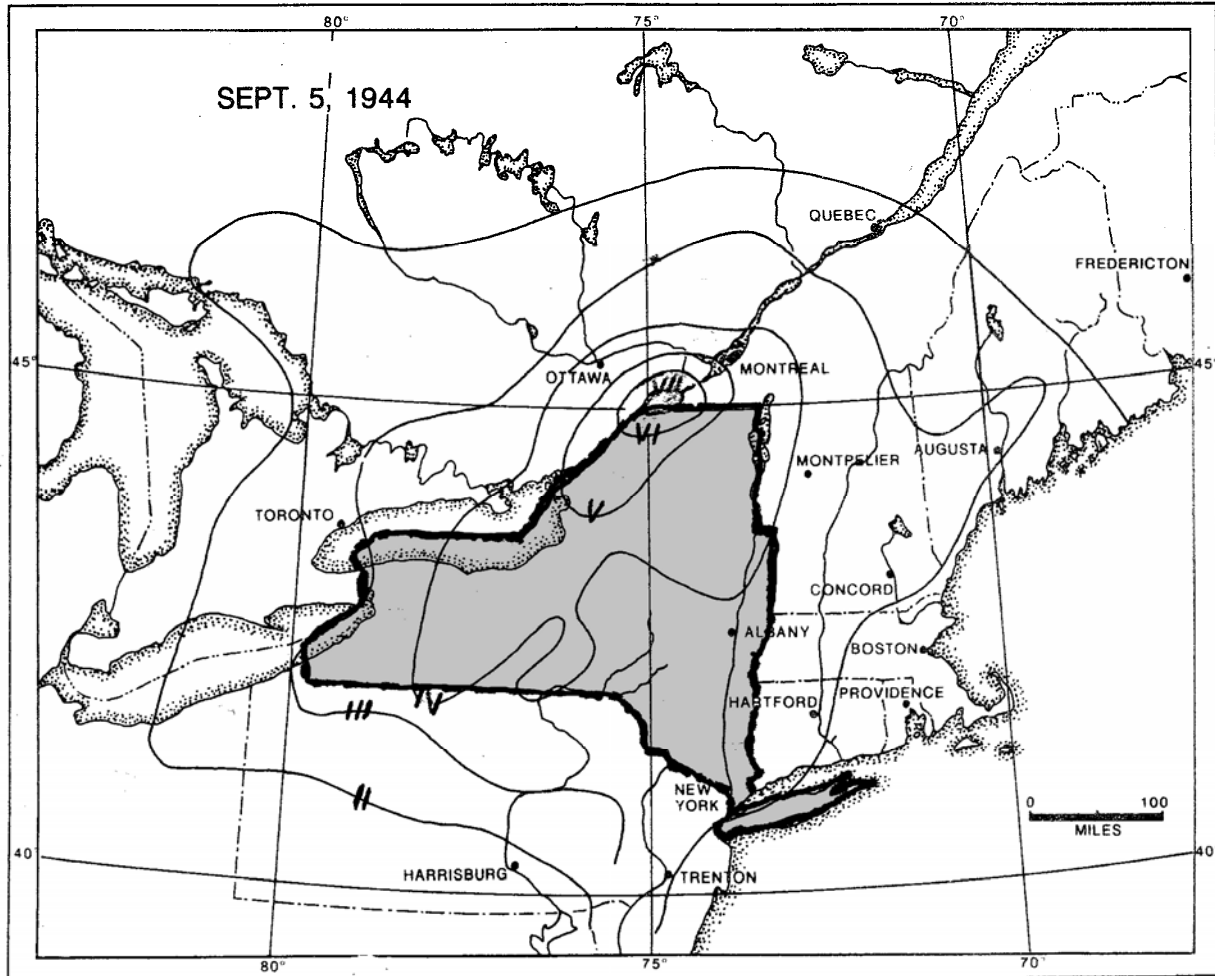


MODIFIED MERCALLI SCALE

- I. Not felt except by a very few under especially favorable circumstances.
- II. Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
- III. Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing truck. Duration estimated.
- IV. During the day it is felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing cars rocked noticeably.
- V. Felt by nearly everyone; many awakened. Some dishes, windows, etc. broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
- VI. Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
- VII. Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; some chimneys broken. Noticed by persons driving motor cars.
- VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings, with partial collapse; great in poorly built structures; some chimneys broken. Noticed by persons driving cars.
- IX. Damage considerable in specially designed structures; well designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
- X. Some well built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed over banks.
- XI. Few, if any masonry structures remain standing. Bridges destroyed. Broad fissures in the ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
- XII. Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

PART 2

The map shown below shows the intensity levels for the largest earthquake ever recorded in New York State. It occurred on September 5, 1944. The intensity levels on this map are based on what people experienced at the time of the earthquake. The map also shows the size of the area in which the earthquake was felt.



PROCEDURE: Answer the questions below using complete sentences. Use the Earth Science reference tables where necessary.

1. What is the approximate latitude and longitude of the earthquake's epicenter?
2. What city in New York State is located closest to the epicenter?

3. What was the maximum intensity felt during this earthquake?

4. According to the Modified Mercalli Intensity Scale describe the conditions that were noticed in New York City during this earthquake.

5. What was the approximate Mercalli intensity at the following New York State locations?
 - A. Ithaca _____
 - B. Kingston _____
 - C. Buffalo _____
 - D. Rochester _____
 - E. Long Island _____

6. Going northeast from the epicenter along the St. Lawrence River determine the distance in miles to the number III isoseismal.