

# What is a METEOTSUNAMI?

(METEOROLOGICAL TSUNAMI): A TSUNAMI-LIKE WAVE CAUSED BY WEATHER SYSTEMS

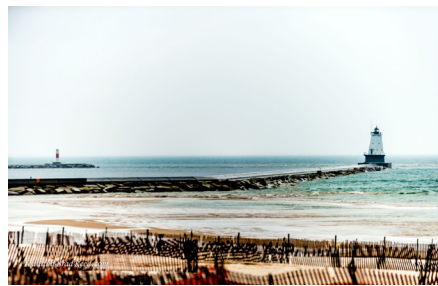
## HIGH RISK SEASON

### Late Spring to Early Summer

Metetsunamis are a tsunami-like wave generated from severe weather impacts on speed and direction of wave movement over a waterbody. These events can result in a localized rise in water levels by as much as 1-2 feet, leading to dangerous rip currents, and lasting minutes to hours. While a true tsunami is much larger, meteotsunamis are more widespread and occur more often. Meteotsunami frequency is related to both storm frequency and the characteristics of a waterbody and its coast. In the Great Lakes, they are observed most frequently at sites with the largest harbors posing a sudden threat to beachgoers safety. Many people are unaware of the phenomena and the dangers they produce. While somewhat rare, these events are most common from late spring to early summer and are likely to become more of a concern due to climate change, with increasing frequency and severity of storms in our area.



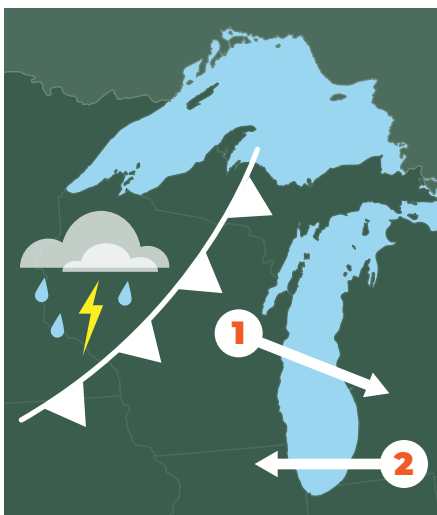
A flooded pier in Ludington, MI on April 13, 2018 during a hail and rainstorm event that created a meteotsunami.



Nine minutes after this event, the lake water levels dropped and returned to normal. Photographs courtesy of Todd Reed.

## WHAT CAUSES A METEOTSUNAMI?

Lake Michigan experiences meteotsunamis more frequently than other Great Lakes due to its shape and frequent fast-moving storms passing through the area. While not fully understood, it is thought that Calumet Harbor receives the most frequent meteotsunamis because of the presence of a harbor and the high frequency of strong thunderstorm activity in the warm season.



### Diagram of how a meteotsunami occurs in Lake Michigan:

1. A storm passes from the west, pushing water across Lake Michigan. Water rushes toward the Michigan coastline.
2. Water bounces back toward Illinois. The strength of the meteotsunami can become more powerful as it heads towards Illinois and reaches our shoreline. Dangerous conditions occur along the lakefront, including rip currents and a sudden rise in lake level.

## A SAFETY THREAT TO ILLINOIS LAKESHORE

Every year:

- ▶ 100+ occur in the Great Lakes
- ▶ 50+ of those are in Lake Michigan
- ▶ 29 on average hitting in Calumet Harbor!

## WHO IS IN DANGER?

Pay attention to weather forecasts for Lake Michigan before going out on the water, and know the risks of swimming and beachfront activities during storm season.

### ▶ SWIMMERS

Avoid dangerous current areas. Swim when lifeguards are present. Swimmers can be carried far away from the shore due to rip currents.

### ▶ PEOPLE ONSHORE

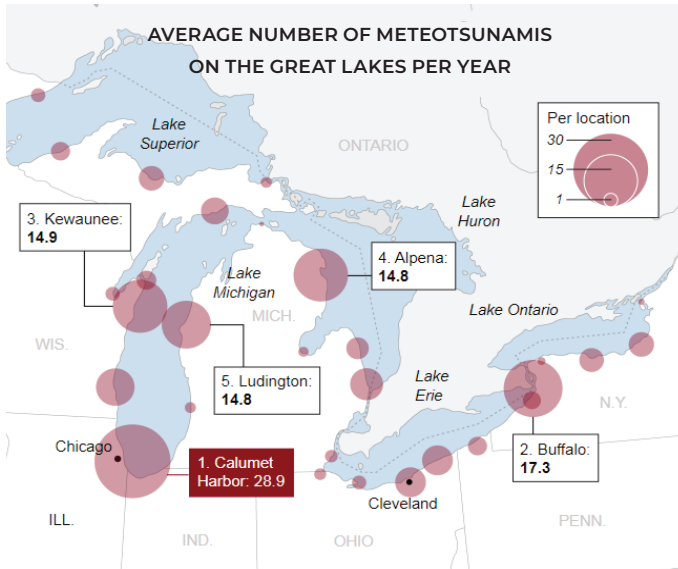
Move inland, seek higher ground. Fishing and stormwatching can be dangerous when water levels suddenly rise and wash over piers or shoreline, potentially sweeping people into the lake.

### ▶ BOATERS

Navigate to deeper waters. Waves build and amplify once they move to shallow water. Non-motorized watercraft and watersports participants may become disoriented from the sudden change in water levels which is capable of toppling boats.

## HIDDEN DANGER IN THE GREAT LAKES

While meteotsunamis occur around the world, the Great Lakes are contained basins that are highly reactive to weather. In the Great Lakes there is often no warning, because storms causing meteotsunamis may occur over a different part of the lake or the meteotsunami effect may occur hours after a storm has passed. This delay compounds the danger to beachgoers who may have returned to the water after the storm.



Source: University of Wisconsin at Madison

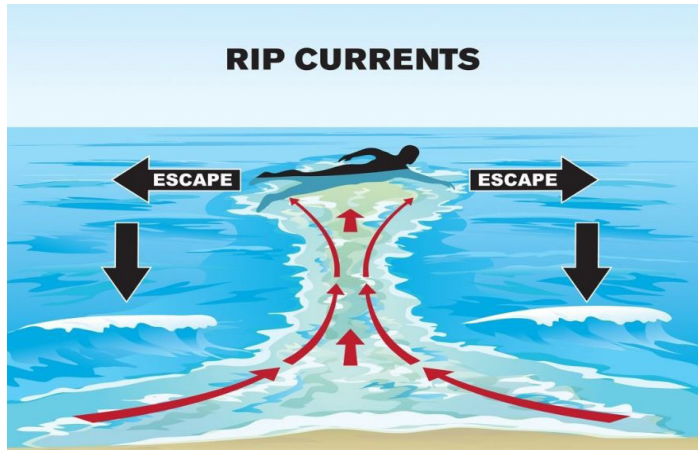
## DANGEROUS CURRENTS

### Avoid Dangerous Areas

- ▶ Stay in designated swim areas..
- ▶ Avoid swimming near piers and breakwalls. Many fatalities have occurred.

### If Trapped in a Dangerous Current:

- ▶ Swim to the side, out of the current, and then to the shore.
- ▶ If in danger, call for someone to throw a life ring or anything that floats.



Source: dangerouscurrents.org

## HOW IS A METEOTSUNAMI DIFFERENT THAN A SEICHE

- ▶ From the shoreline, it may be hard to see the difference, but the distinction between the two phenomenon is their structure.
- ▶ Seiches are waves that rock back and forth across the entire lake, from shore to shore.
- ▶ During a meteotsunami, the weather system moves at the same speed as these waves, keeping them strong. While typically these begin as a single wave, they can bounce off of shorelines making the wave structure more complex with many rises and falls and changes in frequency.
- ▶ While both of these events cause dangerous rip currents, meteotsunamis can come on much faster than seiches and last minutes to hours.

## CHECK YOUR LOCAL NATIONAL WEATHER SERVICE OFFICE FOR OFFICIAL FORECASTS & WATCHES

### For More Information:

- <https://nca2014.globalchange.gov/highlights/regions/midwest#statement-16934>
- <https://hws.weather.gov/nthmp/documents/meteotsunamis.pdf>
- <https://oceanservice.noaa.gov/facts/meteotsunami.html>
- <https://www.seagrants.wisc.edu/news/scientists-discover-that-meteotsunamis-can-cause-rip-currents/>
- <https://www.noaa.gov/news/you-might-not-have-noticed-but-about-25-meteotsunamis-hit-east-coast-each-year>
- <https://www.chicagotribune.com/news/ct-met-lake-michigan-meteotsunami-waves-20190415-story.html>
- <https://www.chicagotribune.com/news/ct-met-cb-lake-michigan-meteotsunami-waves-20190424-story.html>
- <http://igs.illinois.edu/seiches-sudden-large-waves-lake-michigan-danger>



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## ABOUT THE COASTAL MANAGEMENT PROGRAM

The Illinois Coastal Management Program (CMP) provides guidance, technical support, and some financial assistance to municipal, county, and state government agencies that are working within the coastal region of northern Illinois in support of the Lake Michigan Coastal Program (LMCP). The mission of the CMP is to protect and enhance natural, cultural and historical coastal resources, and to foster coordination and partnerships among local, state and federal agencies, and local organizations.