Meteotsunamis

An overlooked public safety hazard

Panelists

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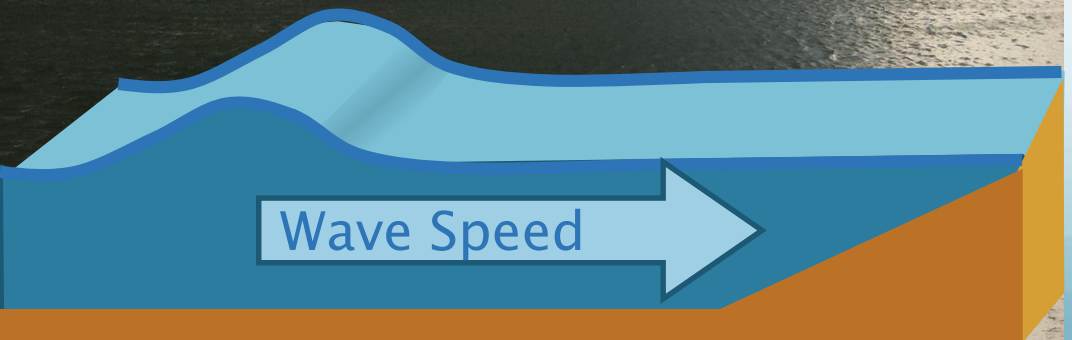
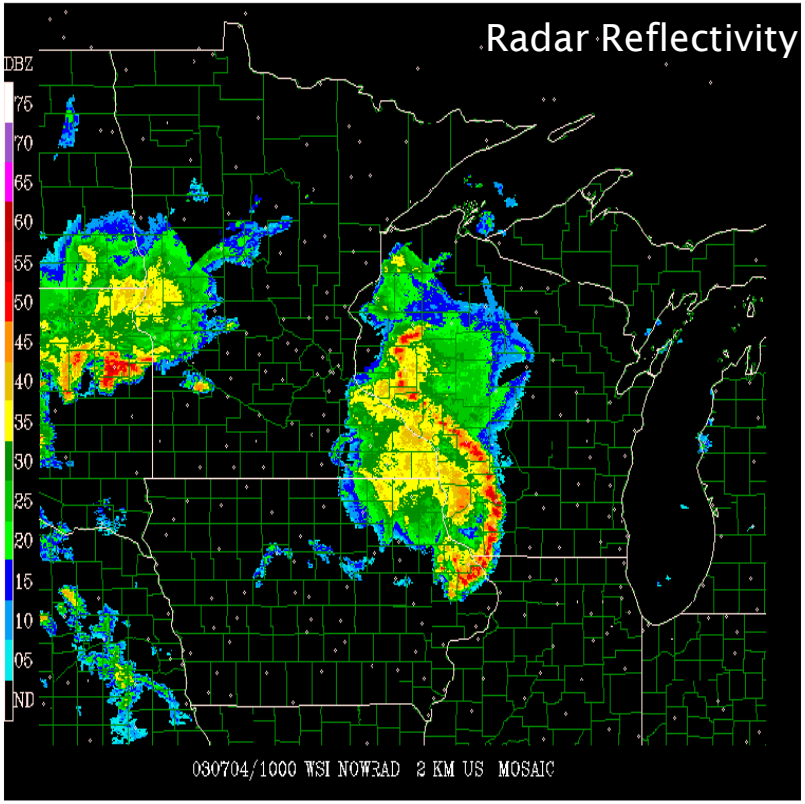
Storm Speed

Wind Speed

Air Pressure





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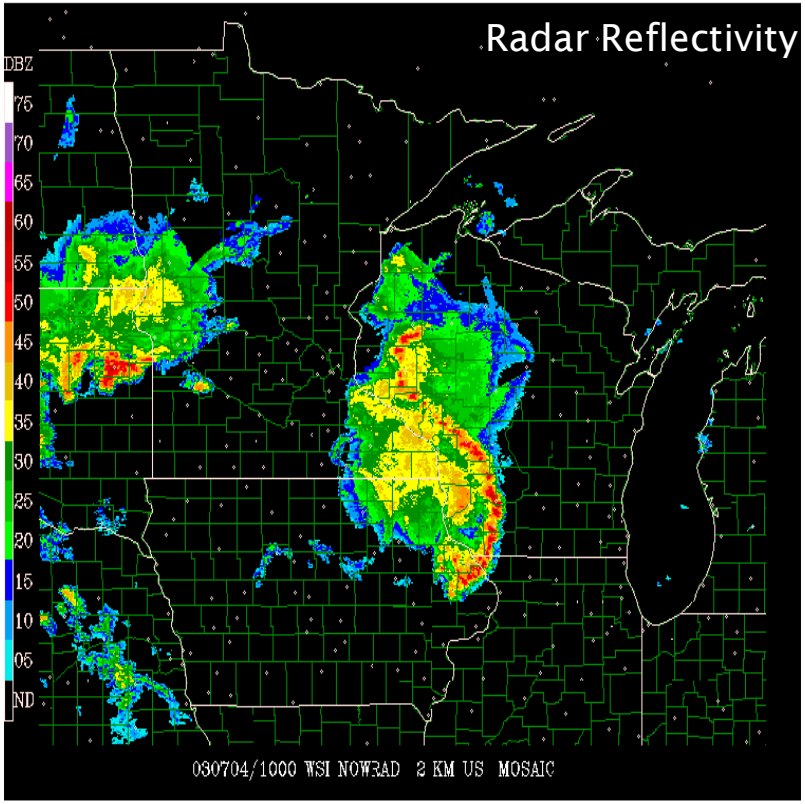
Storm Speed

Wind Speed

Air Pressure

Wave Speed



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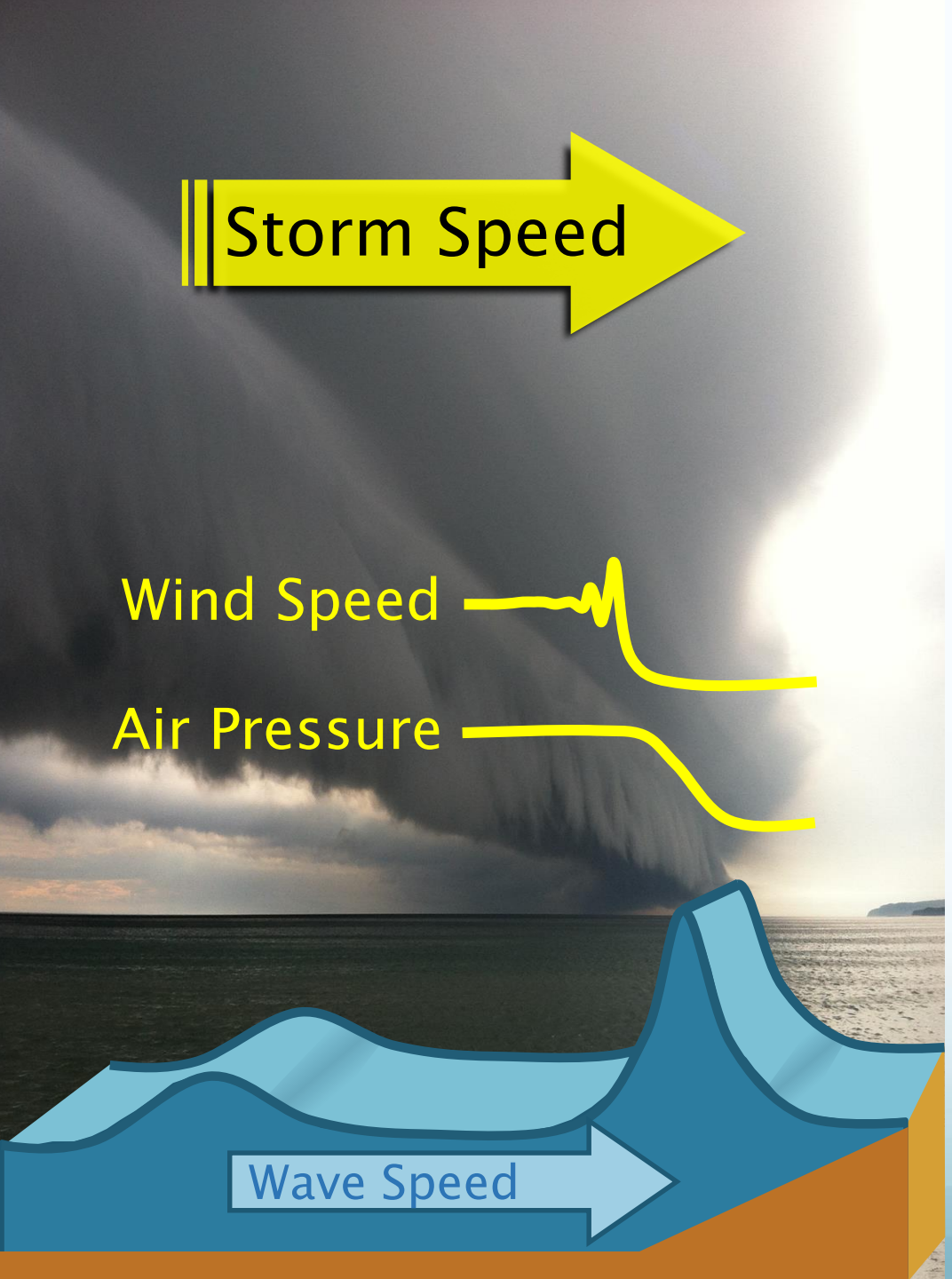
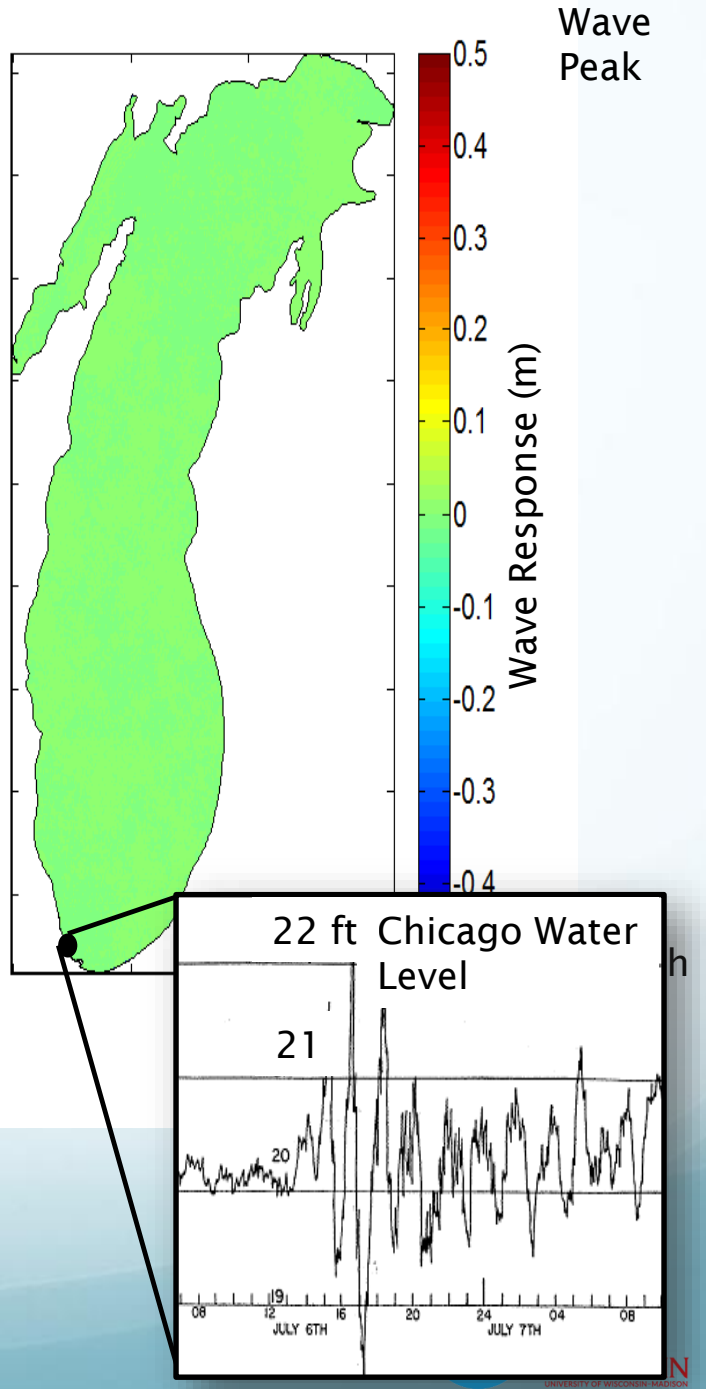
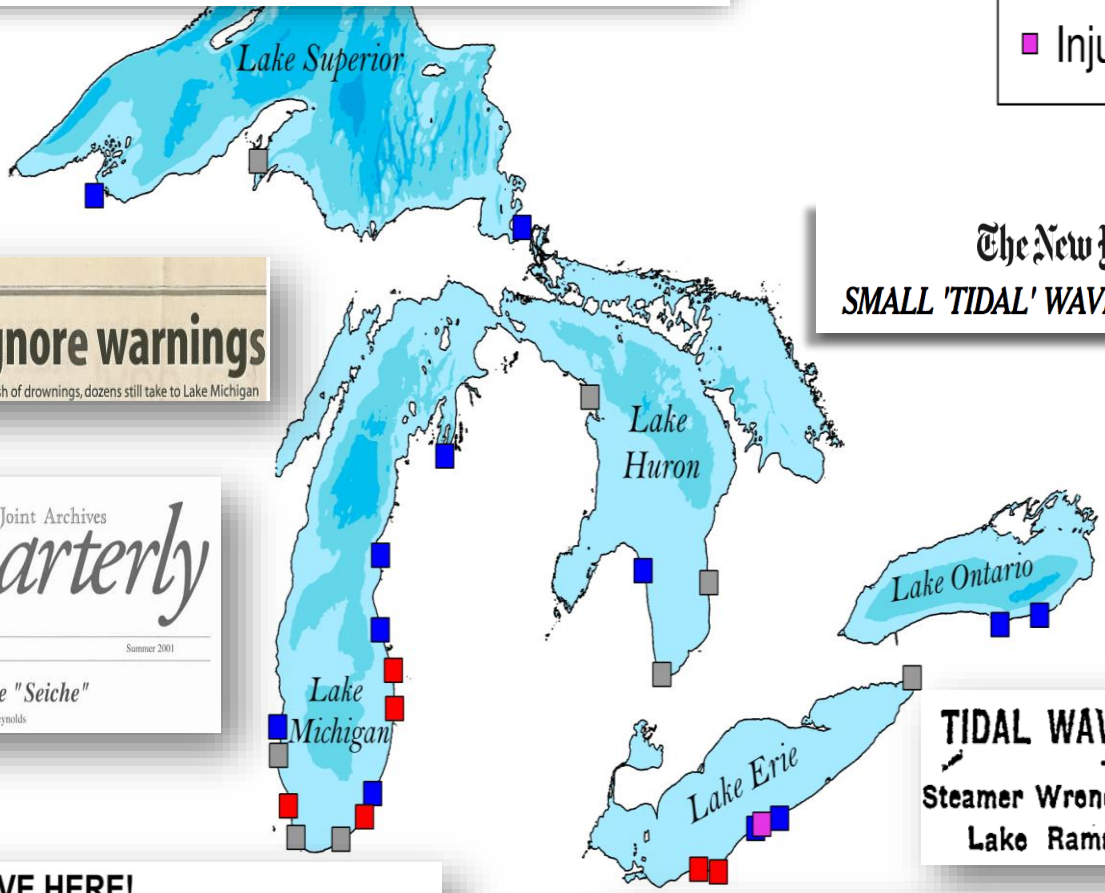

Storm Speed
Wind Speed
Air Pressure
Wave Speed


Wave Peak
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
Wave Response (m)
22 ft Chicago Water Level
21
20
19
08
12
16
20
24
04
08
JULY 6TH
JULY 7TH

'Great Lakes tidal wave' causes 5-foot immediate rise in water on Lake Superior shoreline



Historic Events
- Death
- Damage
- Injury
- Other Event

THE ANN ARBOR NEWS TUESDAY, JULY 8, 2003

Swimmers ignore warnings

Despite red flags posted on beaches and rash of drownings, dozens still take to Lake Michigan

The New York Times MAY 6, 1952

SMALL 'TIDAL' WAVE SWEEPS LAKE HURON

The Joint Archives of Holland HISTORY RESEARCH CENTER

The Joint Archives Quarterly

Volume 10 Number 2 Summer 2001

Fatal Wave: The "Seiche"

by Geoffrey D. Reynolds

TIDAL WAVE SWEEPS ERIE.

Steamer Wrenched from Moorings on Lake Rams Large Freighter.

BIG TIDAL WAVE HERE!

Many Swept Into Lake; Fear 10 Killed

Three Bodies Already Found

Mother of 11 Among Victims
3 Divers, Boats Hunt Others

Three persons were drowned and several more were feared lost Saturday when a 25-mile-wide tidal wave smashed the Lake Michigan shore here.

The freak wave, estimated from 3 to 10 feet high, struck at about 9 a.m. from Jackson Park north to Wilmette. An undetermined number of persons were swept into the lake.

FREAK TIDAL WAVE.

50ft Wall of Water.

NEW YORK, June 1.—A freak tidal wave churned up by high winds swept a 50ft wall of water along the shore of the Lake Erie resort area of North-East Cleveland on Saturday night, drowning at least 6, injuring others and smashing scores of small boats.

EXTRAORDINARY.

A HUGE TIDAL WAVE IN LAKE ERIE.

Damage to Shipping and Other Property—Loss of Life—Details of the Wonderful Phenomena —A Great Cloud Precedes It With Some Drops of Rain.

Additional resources: bit.ly/2sl2xMB

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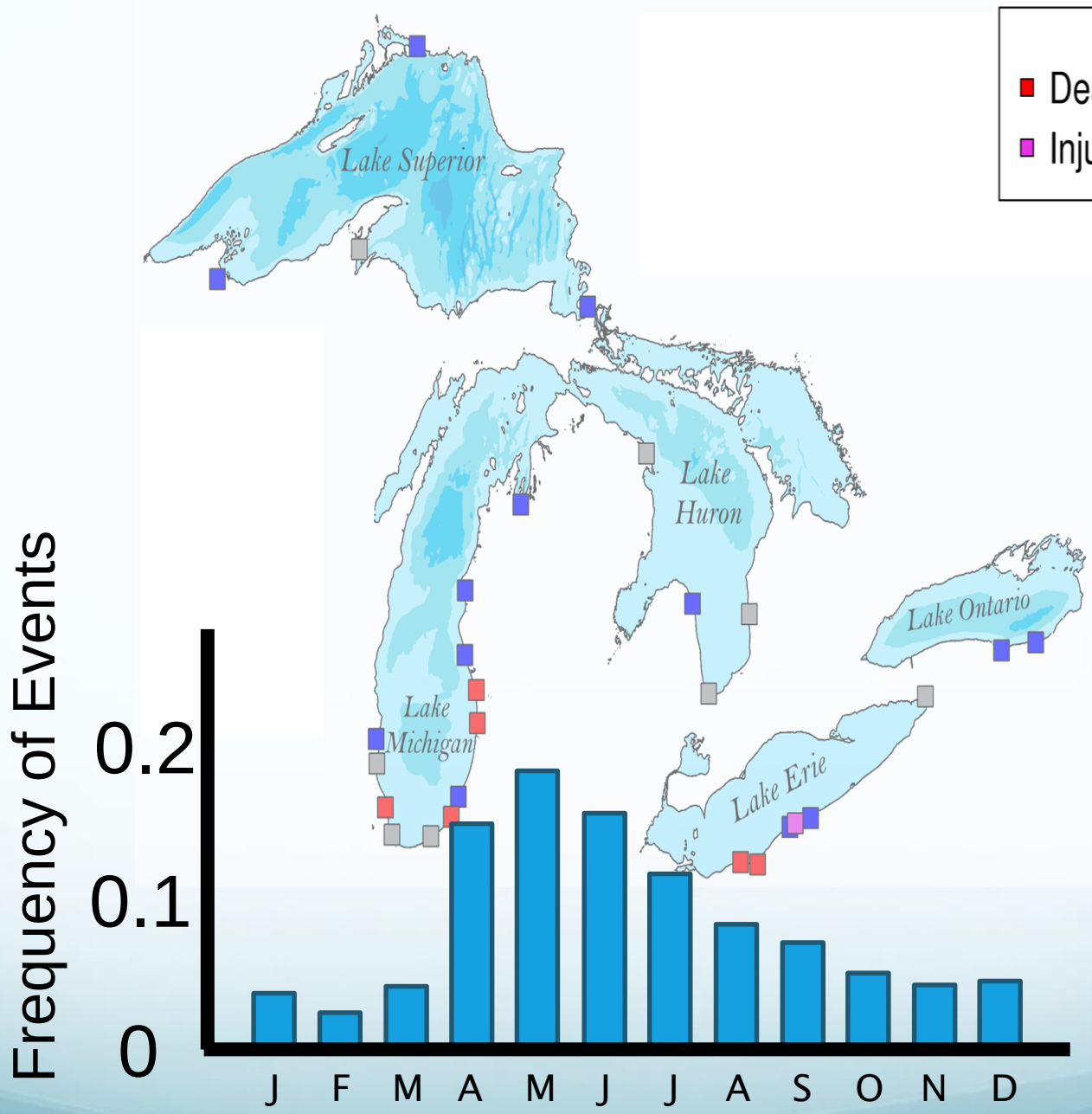
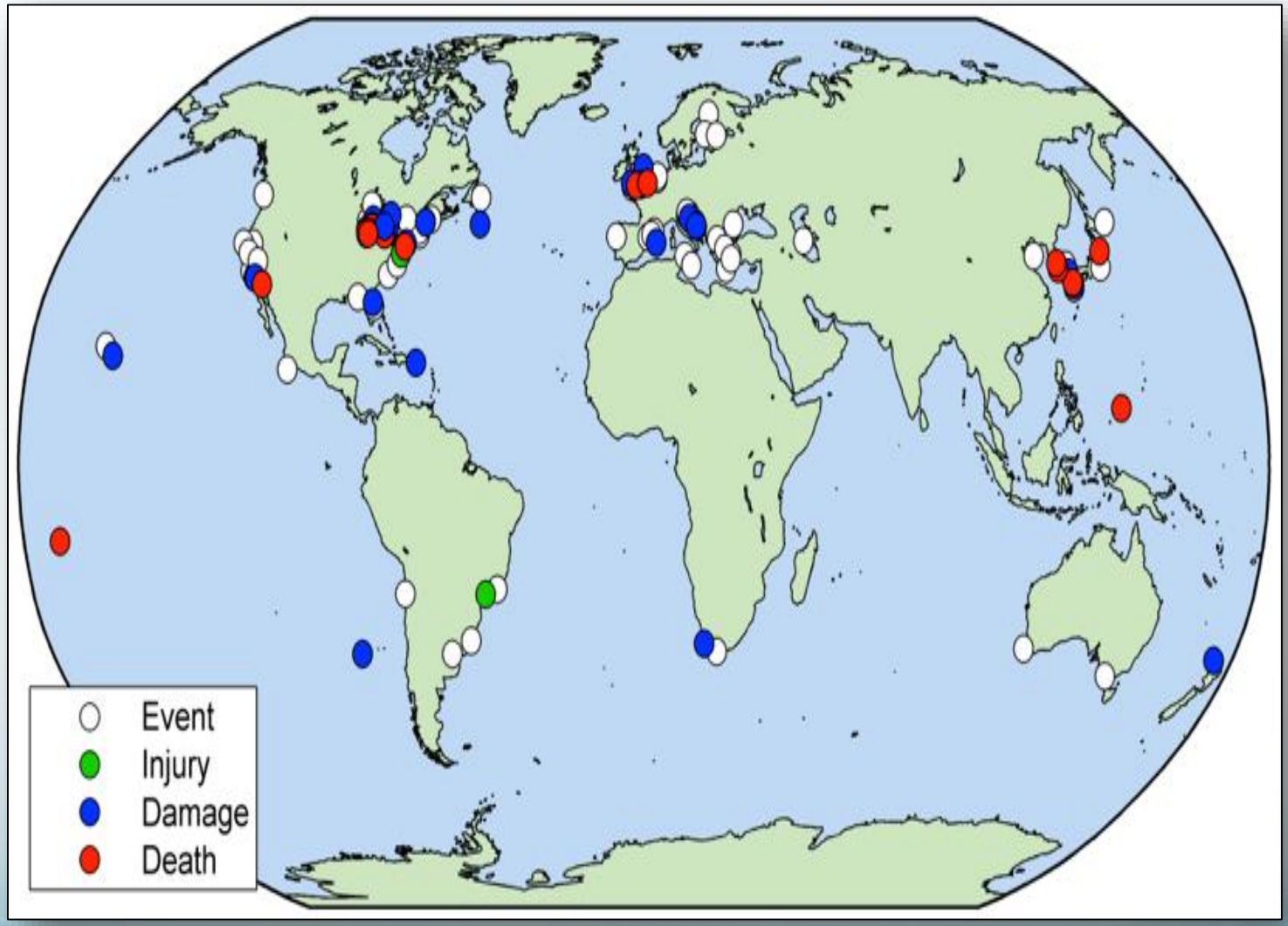


Additional resources: bit.ly/2sl2xMB

Meteotsunami events across the globe

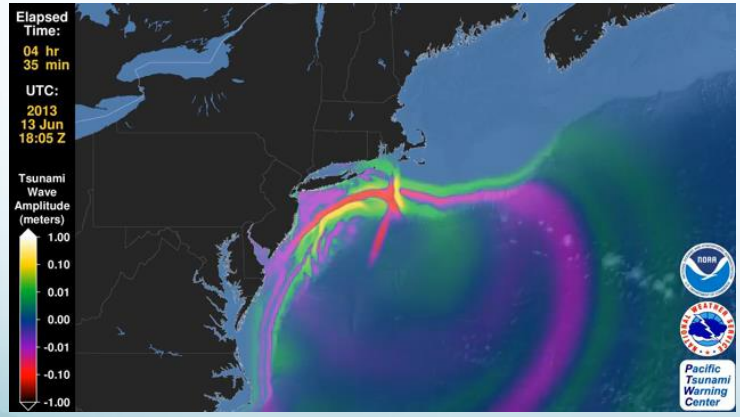


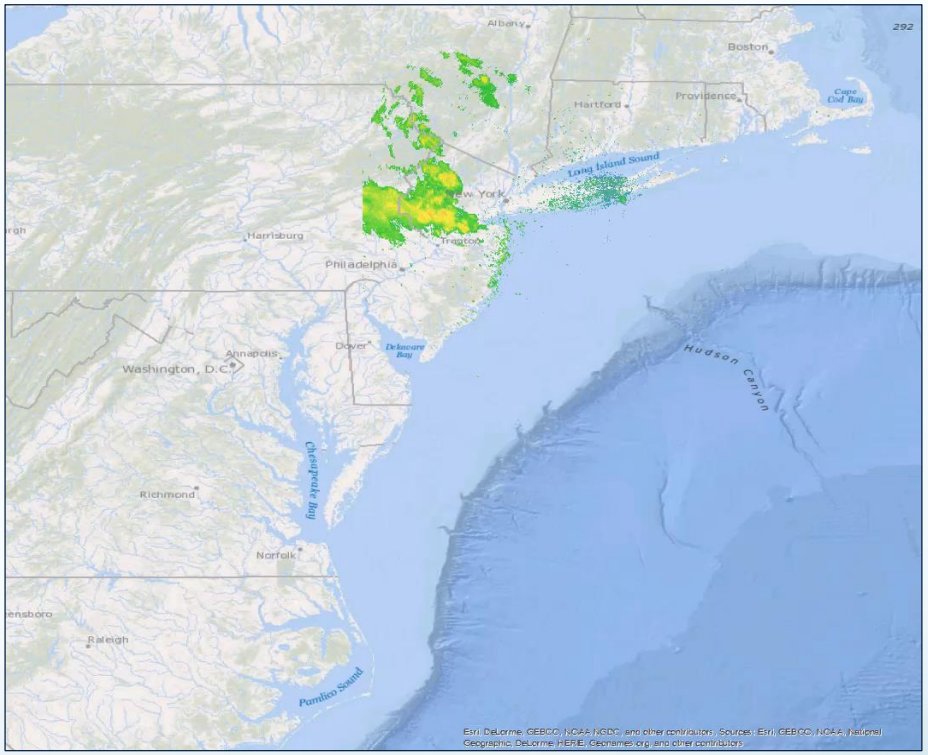
Additional resources: bit.ly/2sl2xMB

Meteotsunami events on the Atlantic Coast

Additional resources: bit.ly/2sl2xMB

June 13, 2013 Meteotsunami Event





NOAA Technical Report (Bailey et al., 2014)
Journal Article (Wertman et al., 2014)

Additional resources: bit.ly/2sl2xMB

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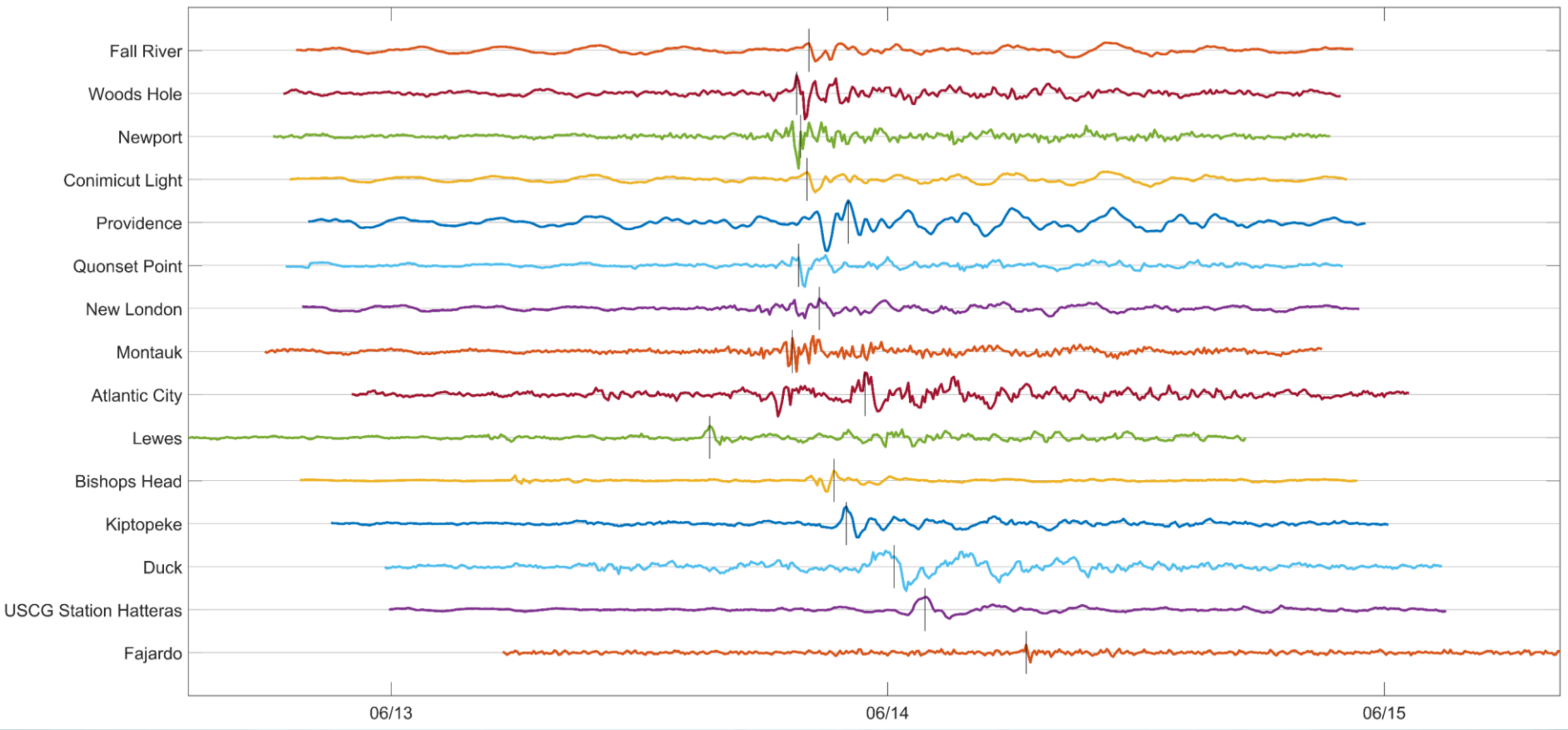
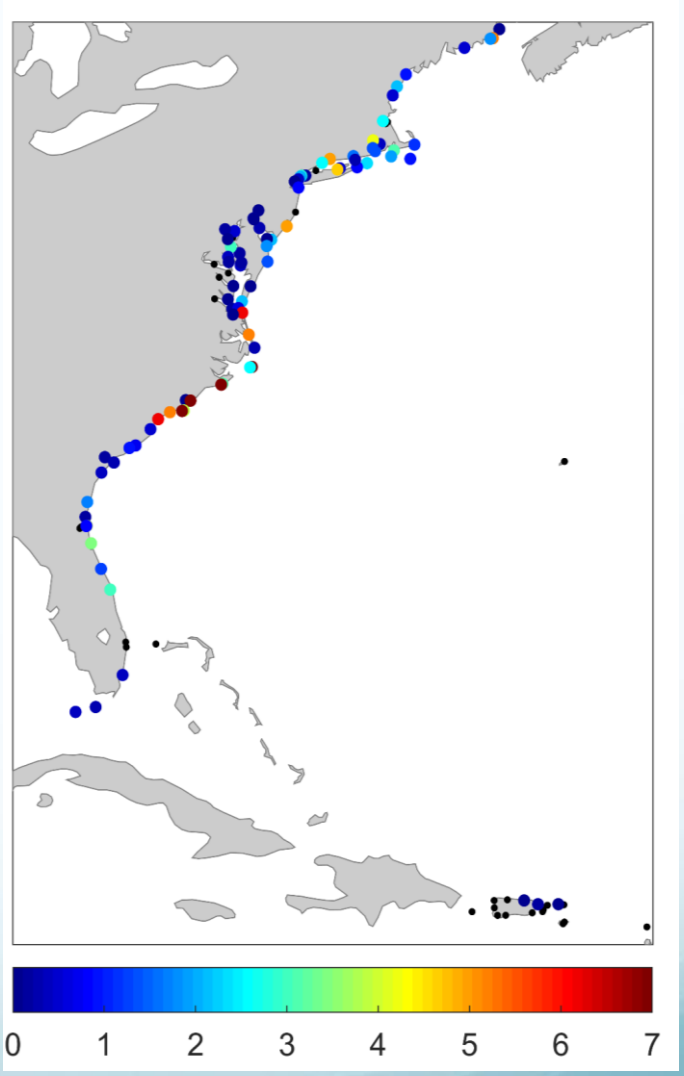
June 13, 2013 Meteotsunami Event



Additional resources: bit.ly/2sl2xMB

1996-2016 East Coast Climatology

- About 20 events per year – most are under 1 ft.
- Most frequent in winter and summer and during afternoon and early evening
- Occur often in the Carolinas, northern Florida, and Long Island Sound



Additional resources: bit.ly/2sl2xMB

Can we detect and predict meteotsunamis?

Additional resources: bit.ly/2sl2xMB

So far, we have made progress on:

- Researching meteotsunamis cause and process.
- Establishing the Great Lakes and East Coast meteotsunamis database and climatology.
- Working to improve weather forecast and hydrodynamic model accuracy.
- Working to build a sensor network for better detection.
- Coordinating with NOAA Tsunami Program, Tsunamis Warning Centers and local forecast offices on the creation of warning protocols.
- Leveraging advances made by Croatian scientists on meteotsunamis warning system.
- Organizing an international symposium on meteotsunamis research, development, forecasting and warning system.

Additional resources: bit.ly/2sl2xMB

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What's next?
Build a reliable warning system.

To do this we need:

- International collaboration;
- A real-time meteorological, pressure, and water level sensor network;
- Accurate weather forecasts and hydrodynamic models;
- To establish warning protocols and coordinate with NOAA Tsunami Program, Tsunamis Warning Centers and local forecast offices to issue advisories and warnings; and
- To educate the public on meteotsunami risks and the appropriate response to warnings.

Additional resources: bit.ly/2sl2xMB

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Questions?

Meteotsunamis: An overlooked public safety hazard

This slide deck and additional resources, including animations, can be found at: **bit.ly/2sl2xMB**

Upcoming AGU Sessions on meteotsunamis:

Meteotsunami Causes and Formation, Recent Events, and Forecast-Warning Systems I
Wednesday, February 14, 2018 08:00 AM - 10:00 AM, Oregon Convention Center - A107-A109

Meteotsunami Causes and Formation, Recent Events, and Forecast-Warning Systems II Posters
Wednesday, February 14, 2018 04:00 PM - 06:00, PM Oregon Convention Center - Poster Hall

Panelists

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Bonus slides

Additional resources: bit.ly/2sl2xMB

Historic meteotsunami events in the Great Lakes

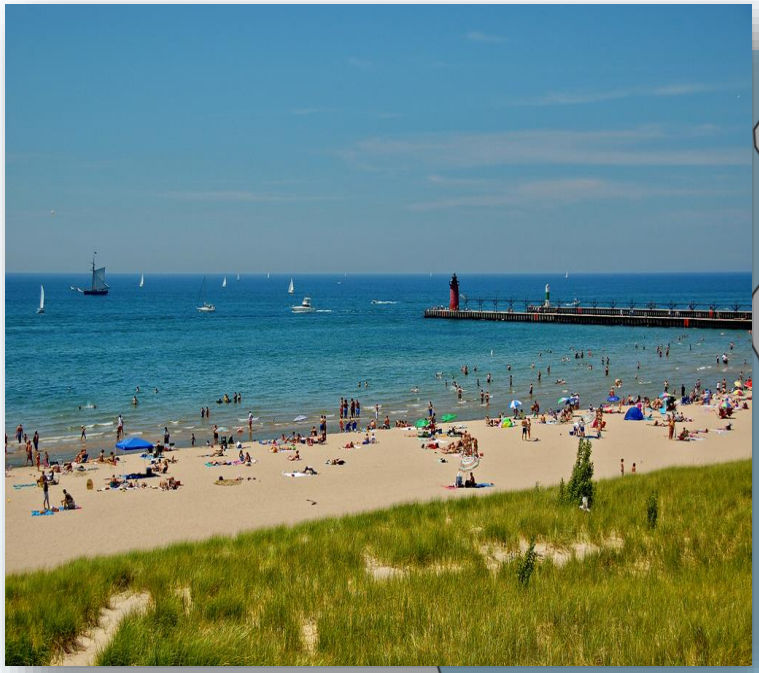
Additional resources: bit.ly/2sl2xMB

Grand Haven, Mich. - July 4th, 1929

- Grand Haven, July 4th, 1929
  - Storm passage early in day
  - 2 waves produced
  - 6-meter height
  - Swimmers swept off pier and beaches
  - ***10 dead***

Additional resources: bit.ly/2sl2xMB

Holland, Mich. – July 13th, 1938

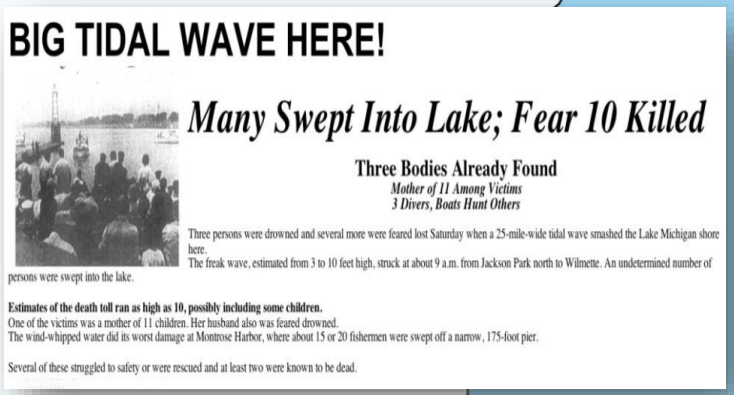


Holland, July 13, 1938

- A strong westerly squall line thunderstorm crossed Lake Michigan
- Meteotsunami “surges” over breakwater, sweeping people off (~100 ft inland)
- **5 dead**

Additional resources: bit.ly/2sl2xMB

Chicago, Ill. – June 26th, & July 6th 1929



BIG TIDAL WAVE HERE!

Many Swept Into Lake; Fear 10 Killed

Three Bodies Already Found

Mother of 11 Among Victims

3 Divers, Boats Hunt Others

Three persons were drowned and several more were feared lost Saturday when a 25-mile-wide tidal wave smashed the Lake Michigan shore here.

The freak wave, estimated from 3 to 10 feet high, struck at about 9 a.m. from Jackson Park north to Wilmette. An undetermined number of persons were swept into the lake.

Estimates of the death toll ran as high as 10, possibly including some children.

One of the victims was a mother of 11 children. Her husband also was feared drowned.

The wind-whipped water did its worst damage at Montrose Harbor, where about 15 or 20 fishermen were swept off a narrow, 175-foot pier.

Several of these struggled to safety or were rescued and at least two were known to be dead.

Chicago, June 26, 1954

June 26

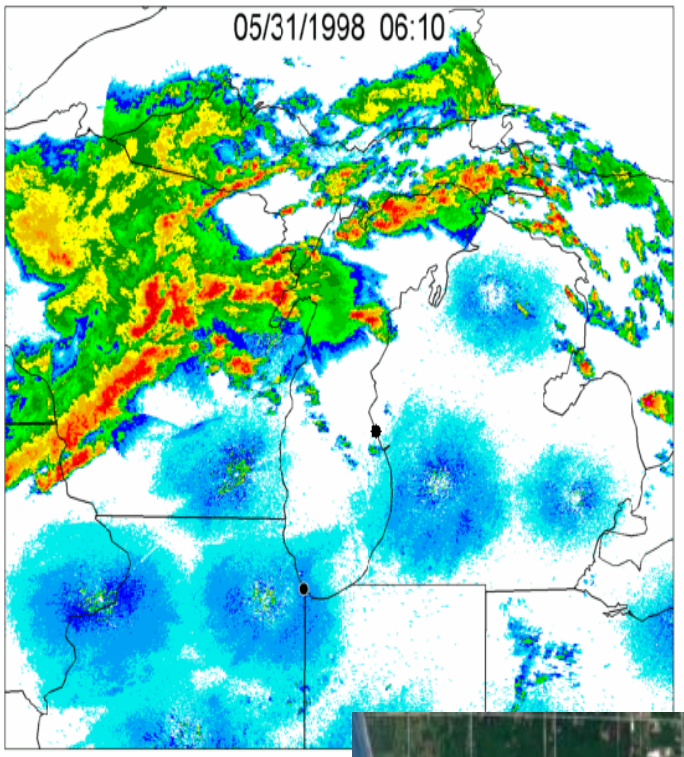
- 3 meter wave struck Chicago
- 7 people drowned

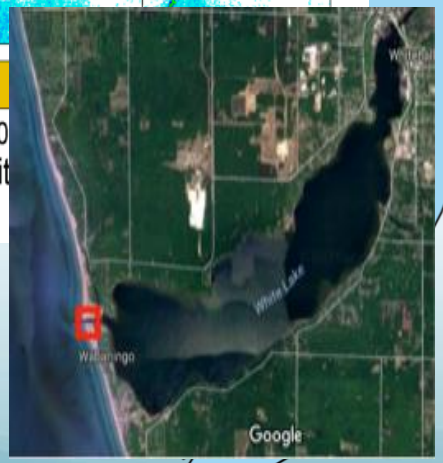
July 6

- 2 meter wave struck Chicago
- “Much more severe” than June 26th
- Swept cars from parking lot

Additional resources: bit.ly/2sl2xMB

White Lake, Mich. – May 31st, 1998

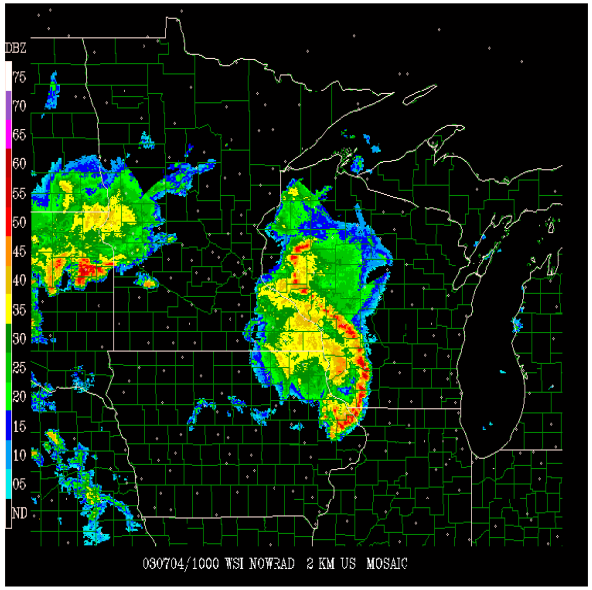




- White Lake, May 31, 1998
  - Derecho moves across Lake Michigan
  - Tug boat in channel reports “storm surge” with storm
  - Sudden retreat in water pushes tug into a barge, then rolls and sinks

Additional resources: bit.ly/2sl2xMB

Warren Dunes, Mich. – July 4th, 2003

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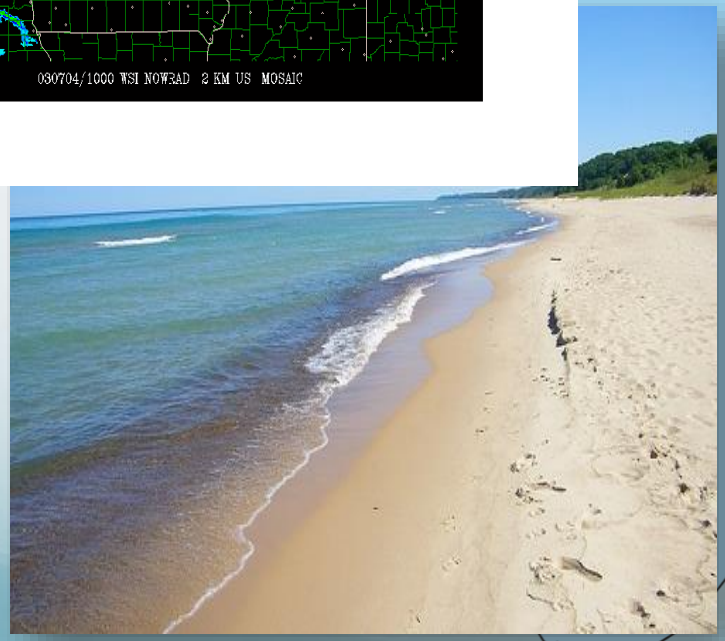
Swimmers ignore warnings

Despite red flags posted on beaches and rash of drownings, dozens still take to Lake Michigan



- Thunderstorm crosses Lake Michigan
- 7 swimmers drown, attributed to rip currents
- Moderate meteotsunami detected at time of drowning, likely contributor

Warren Dunes, July 4, 2003

Additional resources: bit.ly/2sl2xMB

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