

# **Great Lakes Hurricane of 1913: A Meteorological Review 100 Years Later**

**National Weather Service Gaylord MI  
Winter Talk Series 2013**

# Great Lakes Hurricane of 1913: Overview

This November marks the 100 year anniversary of one of the most infamous storms in the recorded history of the Great Lakes.

## 7-10 November 1913

At least 258 lives lost on the Great Lakes.

Twelve ships sank, 30 other vessels crippled.

Eight out of 18 ships battling the storm on Lake Huron sank (*Wexford, Argus, John A. McGean, Hydrus, Isaac M. Scott, Regina, James C. Carruthers, Charles S. Price*). 187 lives lost.



Charles S. Price capsized in Lake Huron



Cleveland Plain Dealer -- 11 November 1913

# Great Lakes Hurricane of 1913: Shipwrecks



## ***Great Lakes Hurricane of 1913: A Little Background Meteorological History***

This talk will not focus on the maritime disaster itself, but more on the local weather impacting citizens that weathered the storm on land.

We'll start by looking at how the storm evolved. But the series of weather maps we are about to see are a little different than what we are used to today.

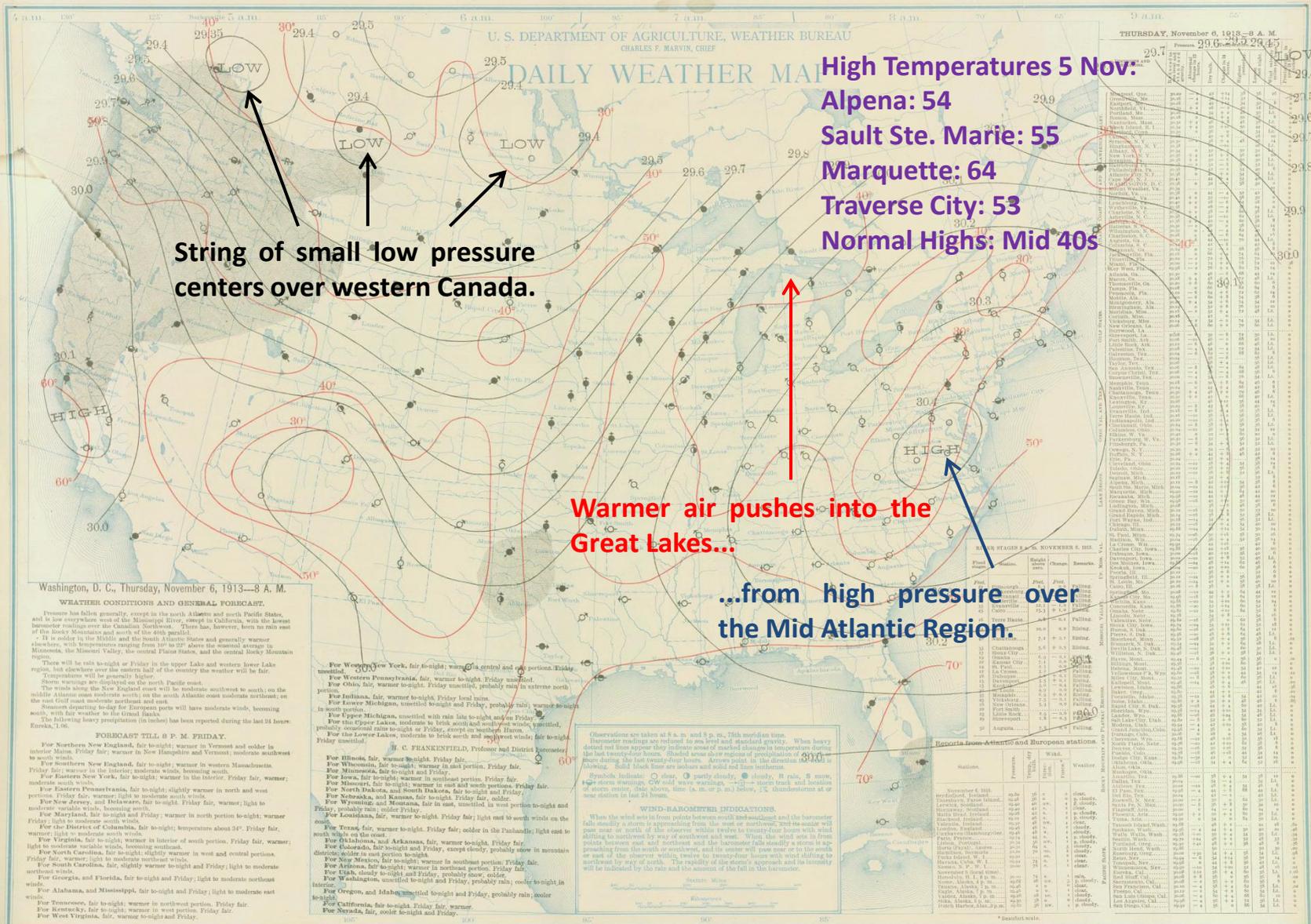
While the concept of high and low pressure were understood, our modern understanding of storm structure wasn't developed until the years following the first World War.

The formulation of the so-called "Norwegian Cyclone Model" and the formal definition of warm and cold fronts in 1919 revolutionized weather forecasting.

These ideas, however, took time to take hold in the United States, and it wasn't until around 1940 that the U.S. Weather Bureau adopted the analysis of fronts that we are familiar with on today's weather maps.

So the maps detailing the 1913 storm are a little primitive by comparison.

# Great Lakes Hurricane of 1913: Storm Chronology: 6 November 1913



String of small low pressure centers over western Canada.

High Temperatures 5 Nov:  
 Alpena: 54  
 Sault Ste. Marie: 55  
 Marquette: 64  
 Traverse City: 53  
 Normal Highs: Mid 40s

Warmer air pushes into the Great Lakes...

...from high pressure over the Mid Atlantic Region.

Washington, D. C., Thursday, November 6, 1913—8 A. M.  
 WEATHER CONDITIONS AND GENERAL FORECAST.

Pressure has fallen generally over the north Atlantic and north Pacific States, and is low everywhere west of the Mississippi River, except in California, with the lowest barometer reading over the Canadian Northwest. There has, however, been no rain east of the Rocky Mountains and south of the 40th parallel.  
 It is colder in the Middle and the South Atlantic States and generally warmer in Minnesota, the Missouri Valley, the central Ohio States, and the central Rocky Mountain region.  
 There will be light rain to-night or Friday in the upper Lake and western lower Lake region, but elsewhere over the eastern half of the country the weather will be fair.  
 Storm warnings are displayed on the north Pacific coast.  
 The wind along the New England coast will be moderate southwest to west, on the middle Atlantic coast moderate south to east, and on the south Atlantic coast moderate northeast on the east Gulf coast moderate southeast and east.  
 Seamen departing today for European ports will have moderate winds, blowing south, with fair weather to the Azores Banks.  
 The following heavy precipitation (in inches) has been reported during the last 24 hours:  
 Hurka, 1.66.

FORECAST TILL 8 P. M. FRIDAY.

For Northern New England, fair to-night; warmer in Vermont and colder in Maine. Friday fair; warmer in New Hampshire and Vermont; moderate southwest to west wind.  
 For Southern New England, fair to-night; warmer in western Massachusetts. Friday fair; warmer to the interior; moderate wind, blowing south.  
 For Eastern New York, fair to-night; warmer to the interior. Friday fair; warmer; moderate south wind.  
 For Eastern Pennsylvania, fair to-night; slightly warmer in north and west portions. Friday fair; warmer; light to moderate south wind.  
 For New Jersey and Delaware, fair to-night. Friday fair; warmer; light to moderate variable wind, blowing south.  
 For Maryland, fair to-night and Friday; warmer in north portion to-night; warmer Friday; light to moderate south wind.  
 For the District of Columbia, fair to-night; temperature about 34°. Friday fair; warmer; light to moderate south wind.  
 For Virginia, fair to-night; warmer in interior of south portion. Friday fair; light to moderate variable wind.  
 For North Carolina, fair to-night; slightly warmer in west and central portions. Friday fair; warmer; light to moderate northwest wind.  
 For South Carolina, fair, slightly warmer to-night and Friday; light to moderate northwest wind.  
 For Georgia and Florida, fair to-night and Friday; light to moderate southeast wind.  
 For Alabama and Mississippi, fair to-night and Friday; light to moderate east wind.  
 For Tennessee, fair to-night; warmer in northwest portion. Friday fair.  
 For Kentucky, fair to-night; warmer in west portion. Friday fair.  
 For West Virginia, fair; warmer tonight and Friday.

For Western New York, fair to-night; warmer in central and east portions. Friday unsettled.  
 For Western Pennsylvania, fair; warmer to-night. Friday unsettled.  
 For Ohio, fair; warmer tonight. Friday unsettled; probably rain in extreme north portion.  
 For Indiana, fair; warmer to-night. Friday local rain.  
 For Upper Michigan, unsettled to-night and Friday; probably rain; warmer to-night in south portion.  
 For Upper Lakes, moderate to brisk south and southwest winds; unsettled; probably occasional rain to-night or Friday, except on western Huron.  
 For the Lower Lakes, moderate to brisk south and southwest winds; fair to-night. Friday unsettled.

J. C. FRANKENFIELD, Professor and District Forecaster.

For Illinois, fair; warmer tonight. Friday fair.  
 For Wisconsin, fair to-night; warmer in east portion. Friday fair.  
 For Minnesota, fair to-night and Friday.  
 For Iowa, fair to-night; warmer in southeast portion. Friday fair.  
 For Missouri, fair to-night; warmer in east and south portions. Friday fair.  
 For North Dakota, and South Dakota, fair to-night and Friday.  
 For Nebraska, and Kansas, fair to-night. Friday fair; colder.  
 For Wyoming and Montana, fair in east, unsettled in west portion to-night and Friday; probably rain; colder Friday.  
 For Louisiana, fair; warmer to-night. Friday fair; light east to south winds on the coast.  
 For Texas, fair; warmer to-night. Friday fair; colder in the Panhandle; light east to south wind on the coast.  
 For Oklahoma, and Arkansas, fair; warmer to-night. Friday fair.  
 For Colorado, fair tonight and Friday; snow likely; probably snow in mountain districts; colder in east portion tonight.  
 For New Mexico, fair tonight; warmer in southeast portion. Friday fair.  
 For Arizona, fair tonight; warmer in northern portion. Friday fair.  
 For Utah, cloudy to-night and Friday; probably snow; colder.  
 For Washington, unsettled to-night and Friday; probably rain; cooler to-night in interior.  
 For Oregon, and Idaho, unsettled tonight and Friday; probably rain; cooler to-night.  
 For California, fair to-night. Friday fair; warmer.  
 For Nevada, fair; cooler tonight and Friday.

Observations are taken at 8 a. m. and 8 p. m., 15th meridian time. When heavy dotted red lines appear they indicate areas of marked changes in temperature during the last twenty-four hours. Shaded areas show regions of precipitation of .01" or more during the last twenty-four hours. Arrows point in the direction of the wind blowing. Solid black lines are isobars and solid red lines are isotherms.

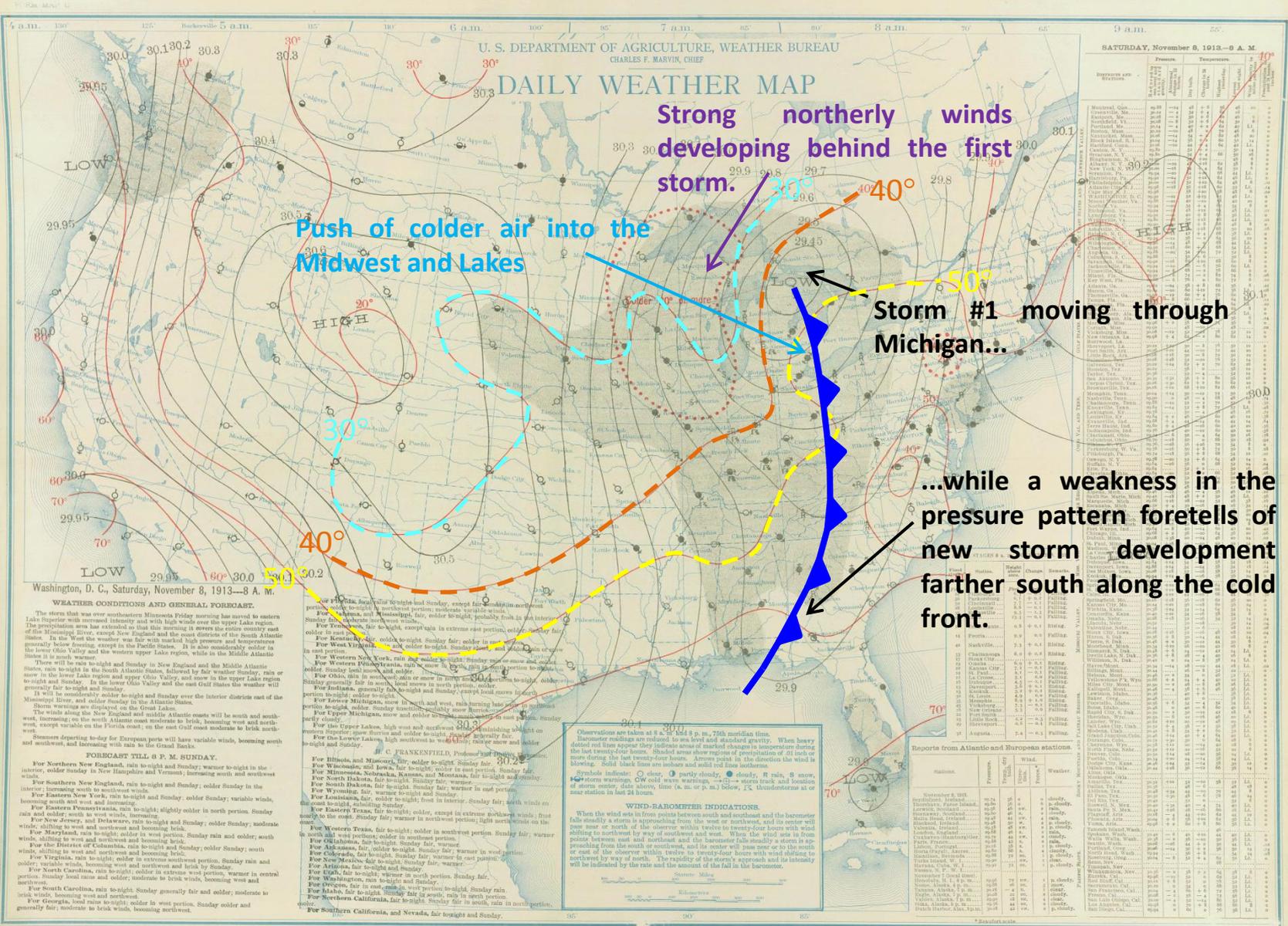
WIND-BAROMETER INDICATIONS.  
 When the wind was in from points between south and southeast and the barometer falls steadily a storm is approaching from the east or north-west; the center will pass near or north of the observer within twelve to twenty-four hours with wind shifting to north-west by way of southeast and east. When the wind was in from points between east and northeast and the barometer falls steadily a storm is approaching from the south or southwest, and its center will pass near or to the south or east of the observer within twelve to twenty-four hours with wind shifting to northwest by way of south. The velocity of the storm's approach and its intensity will be indicated by the rate and the amount of the fall in the barometer.

Report from Atlantic and European stations.

Station	Pressure	Wind	Weather
London	30.1	light	clear
Paris	30.1	light	clear
Berlin	30.1	light	clear
Stockholm	30.1	light	clear
Helsinki	30.1	light	clear
Oslo	30.1	light	clear
Stockholm	30.1	light	clear
Helsinki	30.1	light	clear
Oslo	30.1	light	clear
Stockholm	30.1	light	clear
Helsinki	30.1	light	clear
Oslo	30.1	light	clear



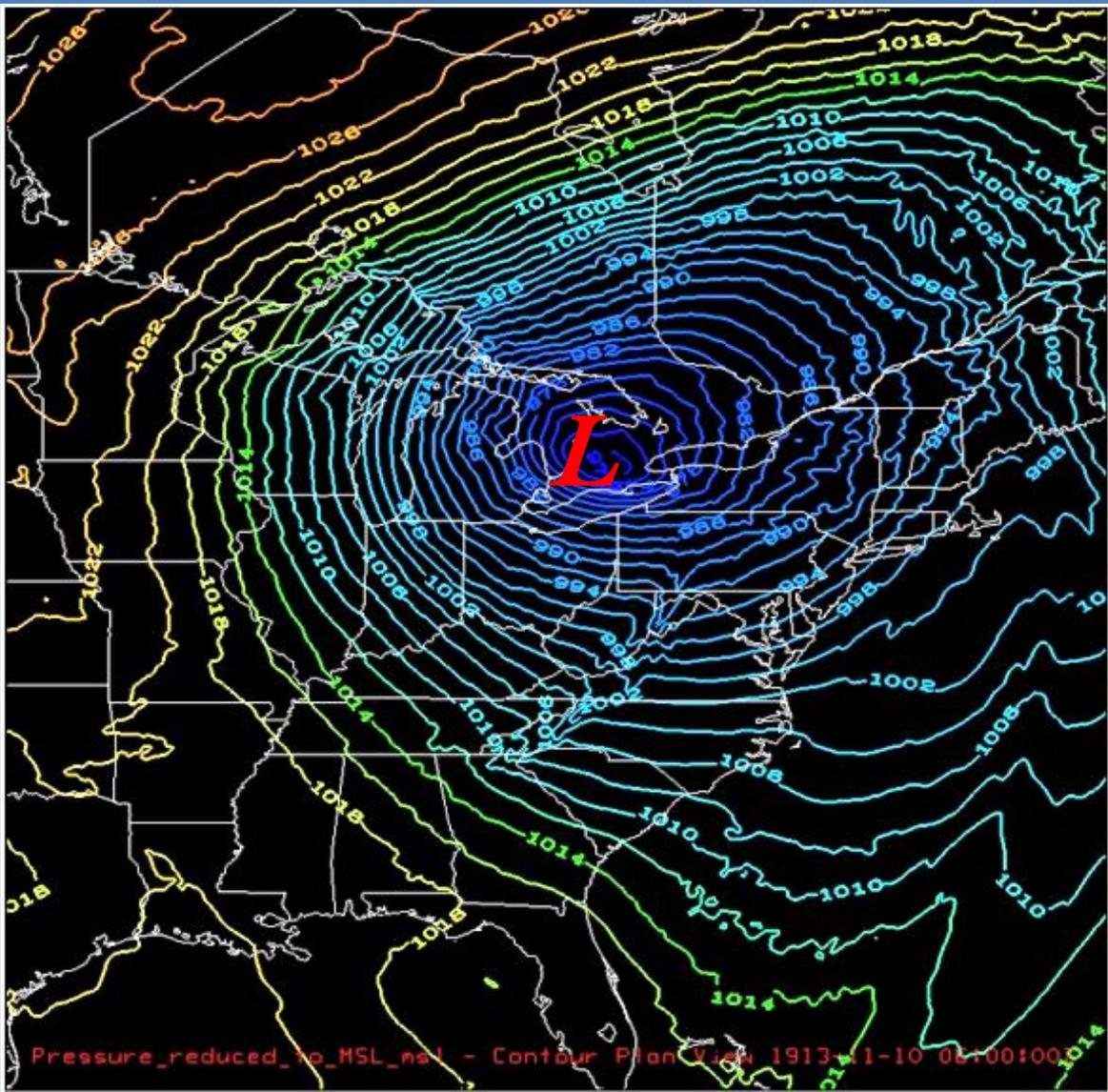
# Great Lakes Hurricane of 1913: Storm Chronology: 8 November 1913







**Great Lakes Hurricane of 1913: Storm Simulation: 10 November 1913**



This is a computer model simulation of the storm taken from a NOAA presentation.

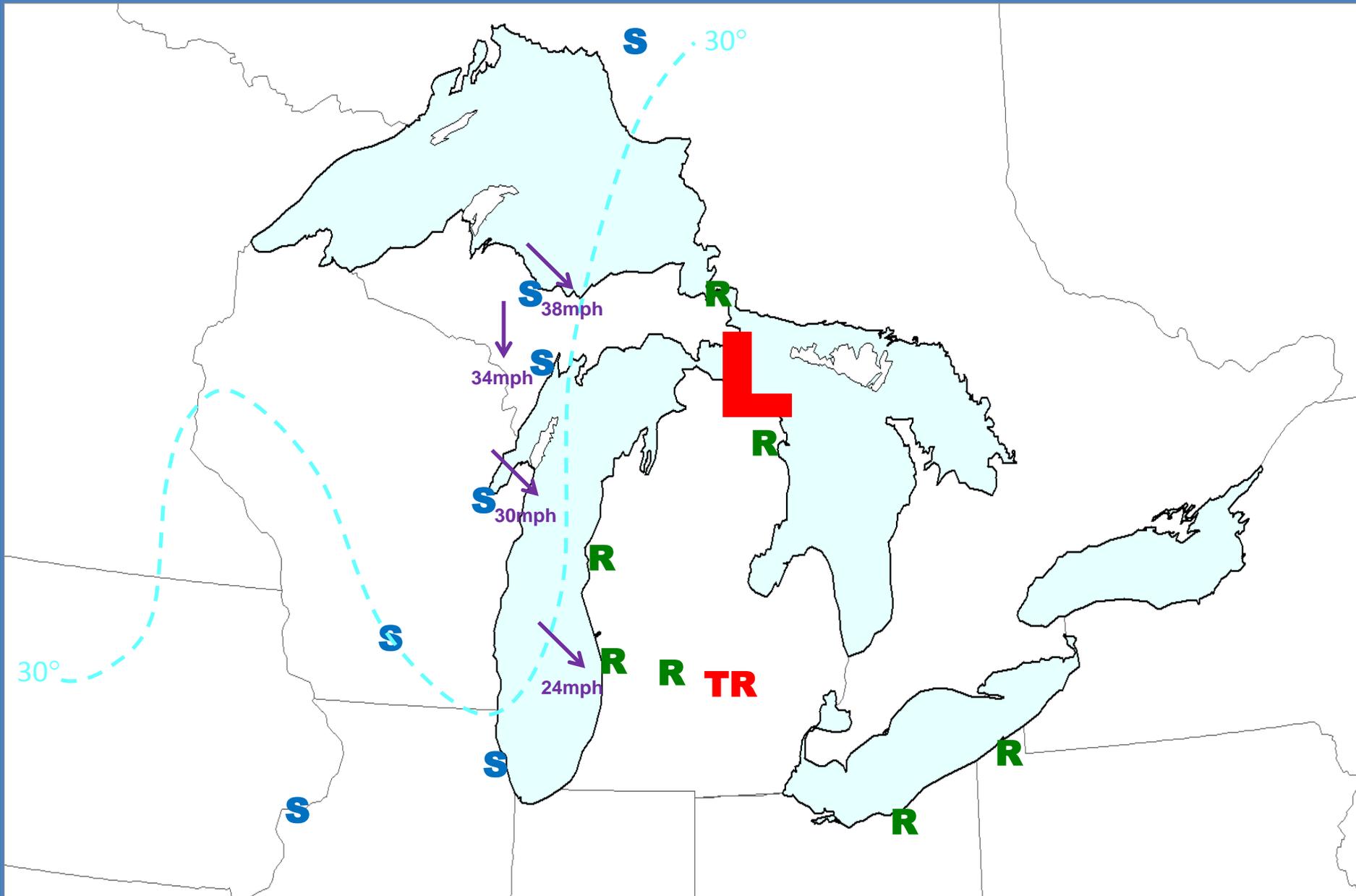
Time of this simulated pressure pattern is 1am 10 November...at the point that the storm was deepest.

Lowest central pressure in the simulation was 969mb (28.61 inches mercury).

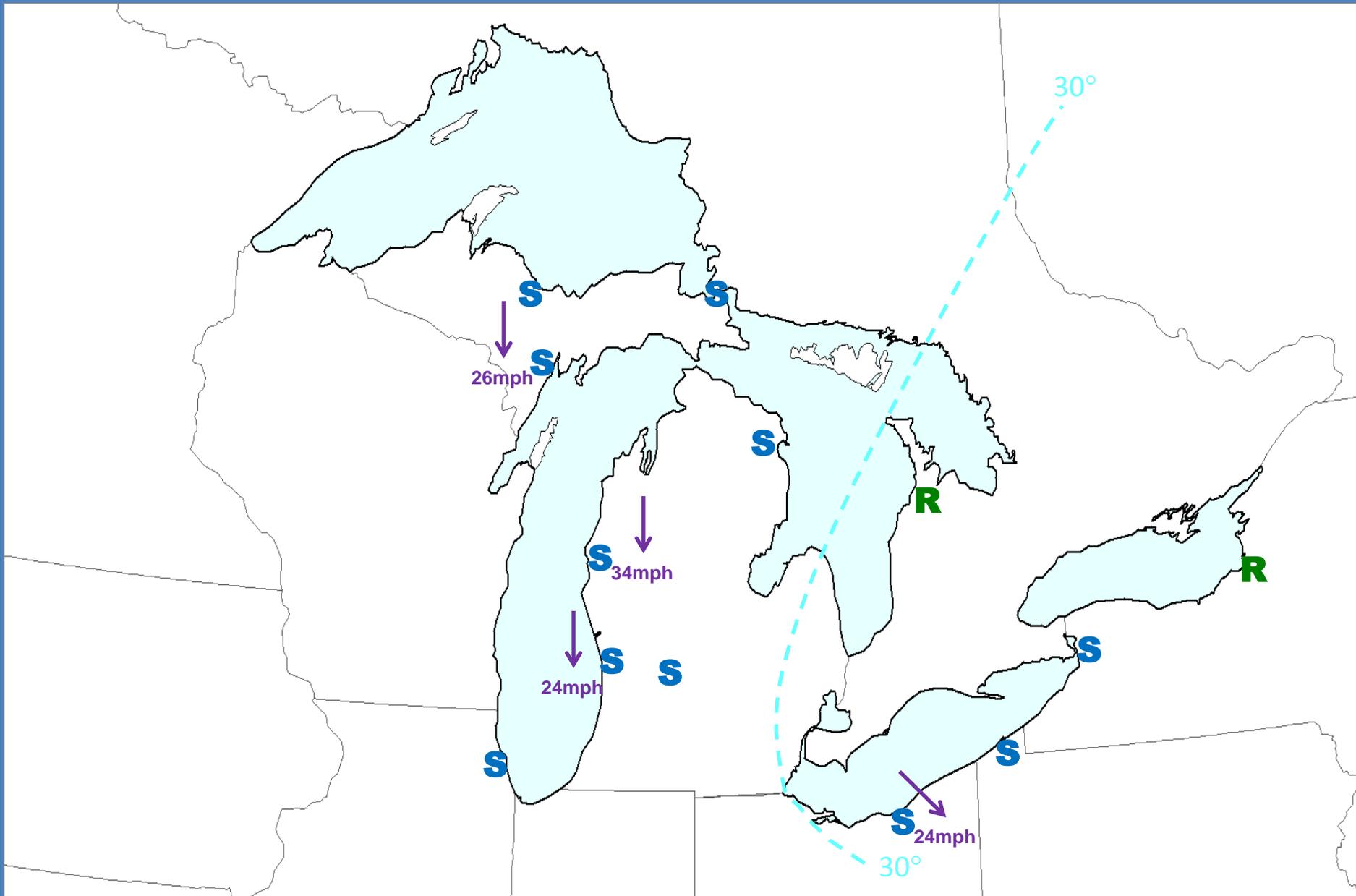
**Great Lakes Hurricane of 1913: Weather Distribution – 8am 7 November 1913**



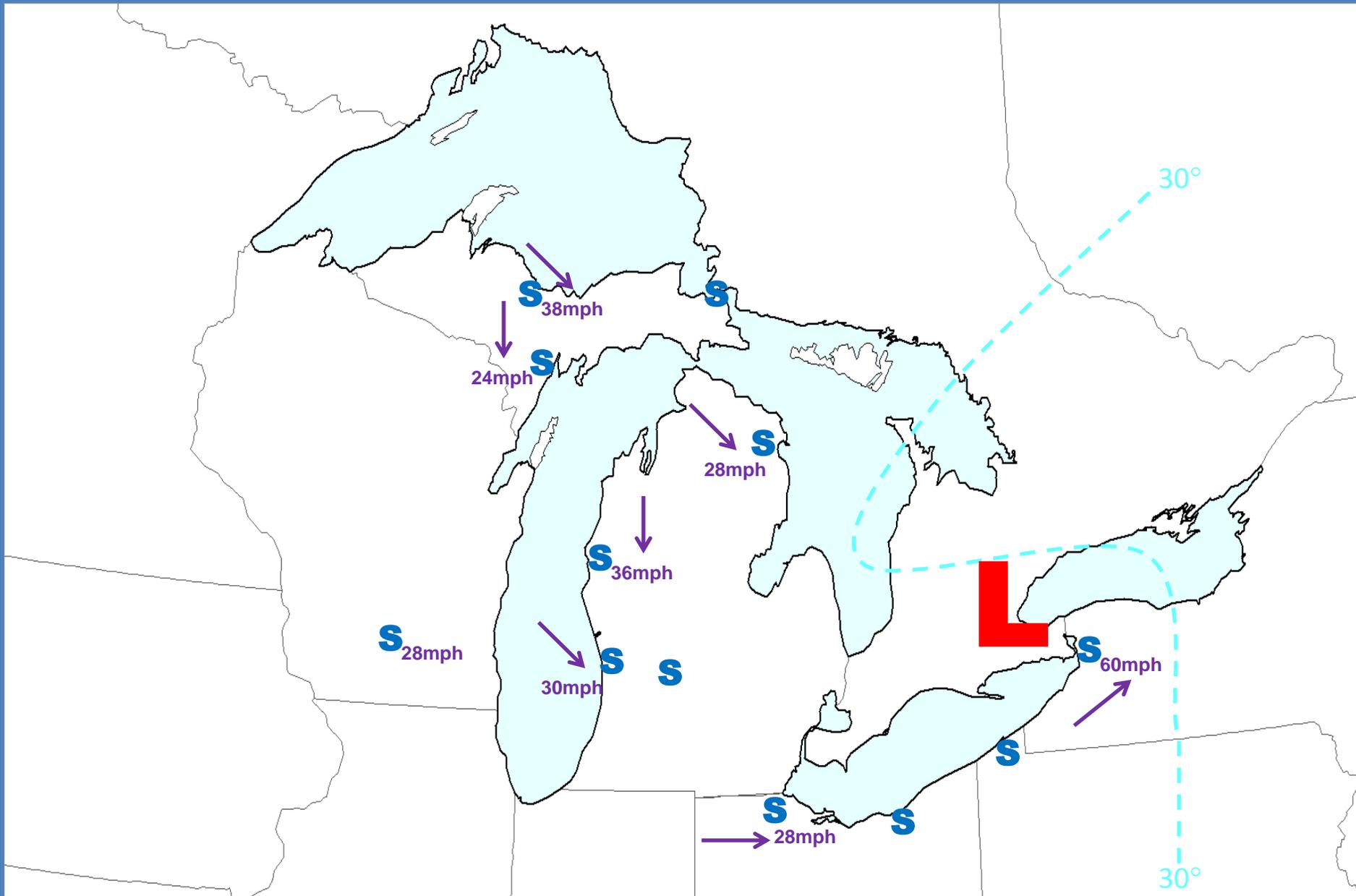
**Great Lakes Hurricane of 1913: Weather Distribution – 8am 8 November 1913**



**Great Lakes Hurricane of 1913: Weather Distribution – 8am 9 November 1913**



**Great Lakes Hurricane of 1913: Weather Distribution – 8am 10 November 1913**



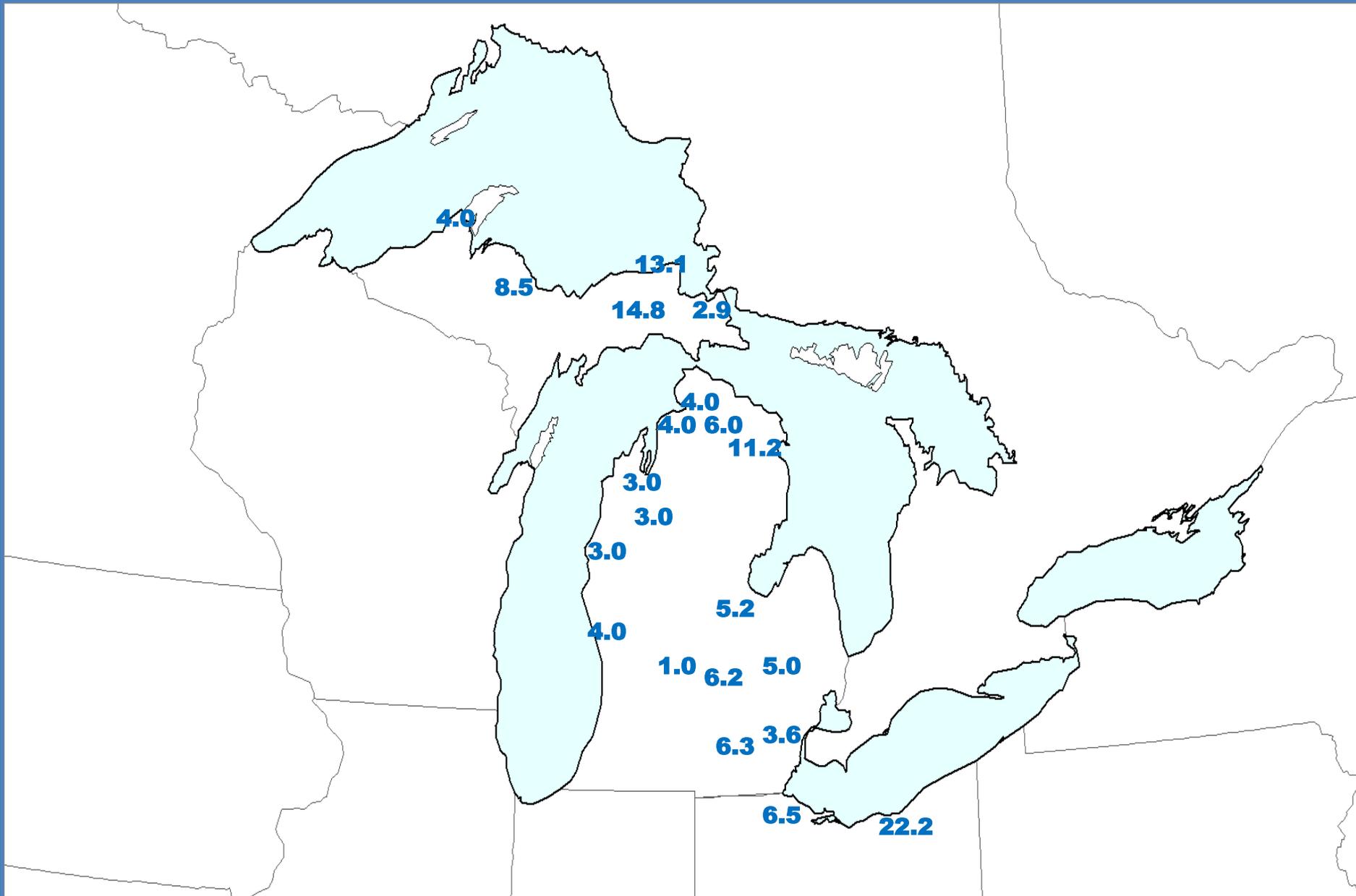
## ***Great Lakes Hurricane of 1913: Snowfall***

As the previous slides indicated...precipitation initially started as rain on the warm side of the initial area of low pressure crossing Wisconsin...then changed to snow on the 9<sup>th</sup> as colder air swept across the Great Lakes.

Snowfall intensity increased on the 9<sup>th</sup> and continued into the 10<sup>th</sup> as warm and moist air from the Atlantic was pulled over the cold surface air. This process helps wring moisture out of the atmosphere in the form of copious amounts of snow. In addition...the development of lake effect snow squalls in the cold air behind this system added to the snow totals especially over the Lower Great Lakes.

The result was a significant early season winter storm for much of the Great Lakes...

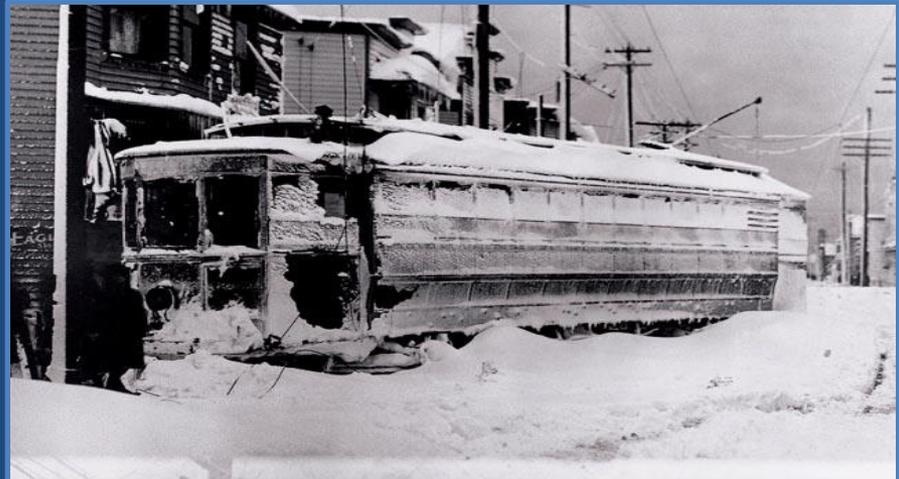
**Great Lakes Hurricane of 1913: Snowfall Totals...7-11 November 1913**



**Great Lakes Hurricane of 1913: Cleveland Blizzard**

Cleveland, Ohio was slammed particularly hard from the storm...with nearly two feet of snow falling from the 9<sup>th</sup> through the 11<sup>th</sup>...including 17.4 inches on the 10<sup>th</sup> alone.

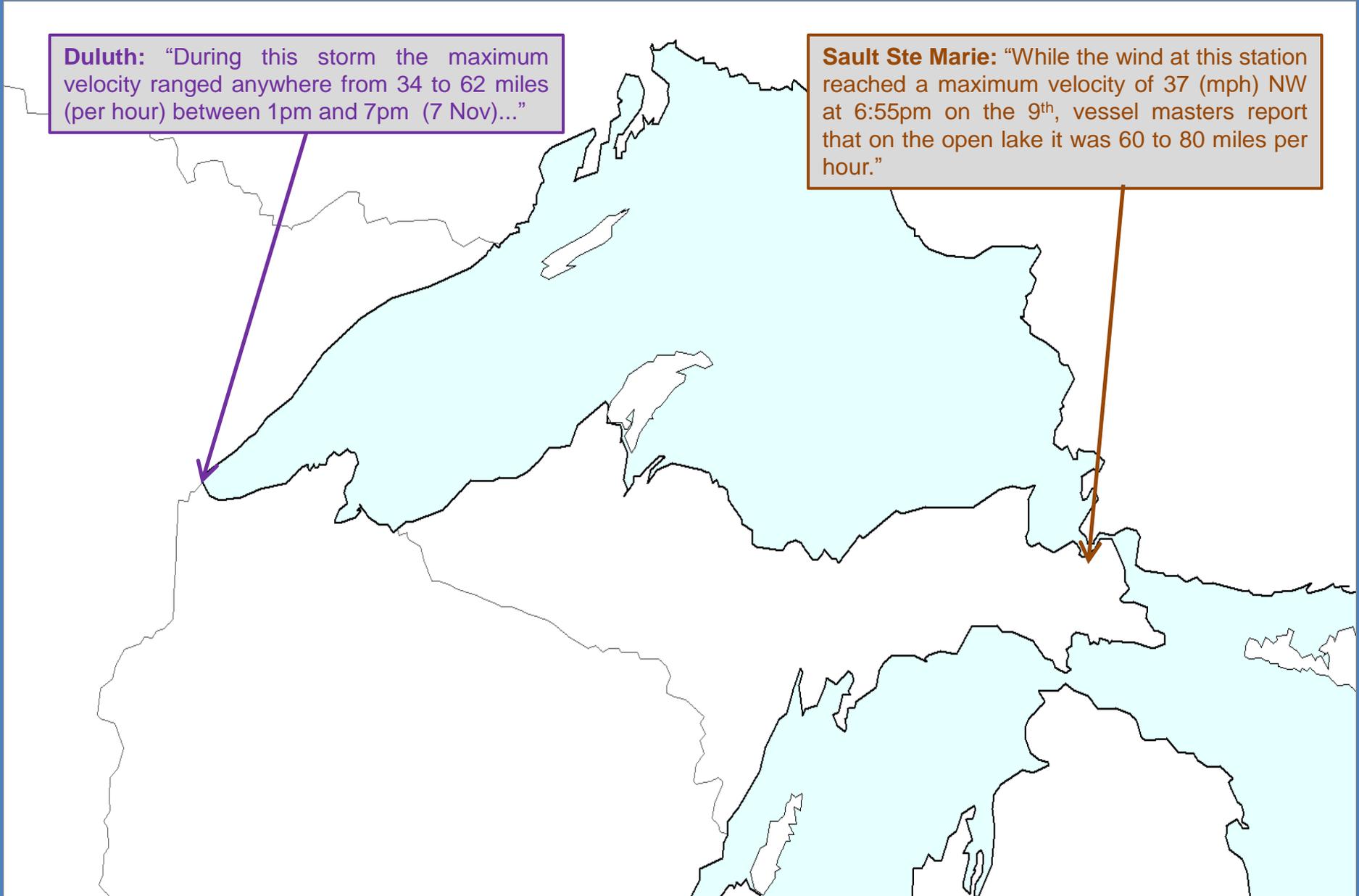
Travel was paralyzed by snow clogging streets...and power was out for multiple days.



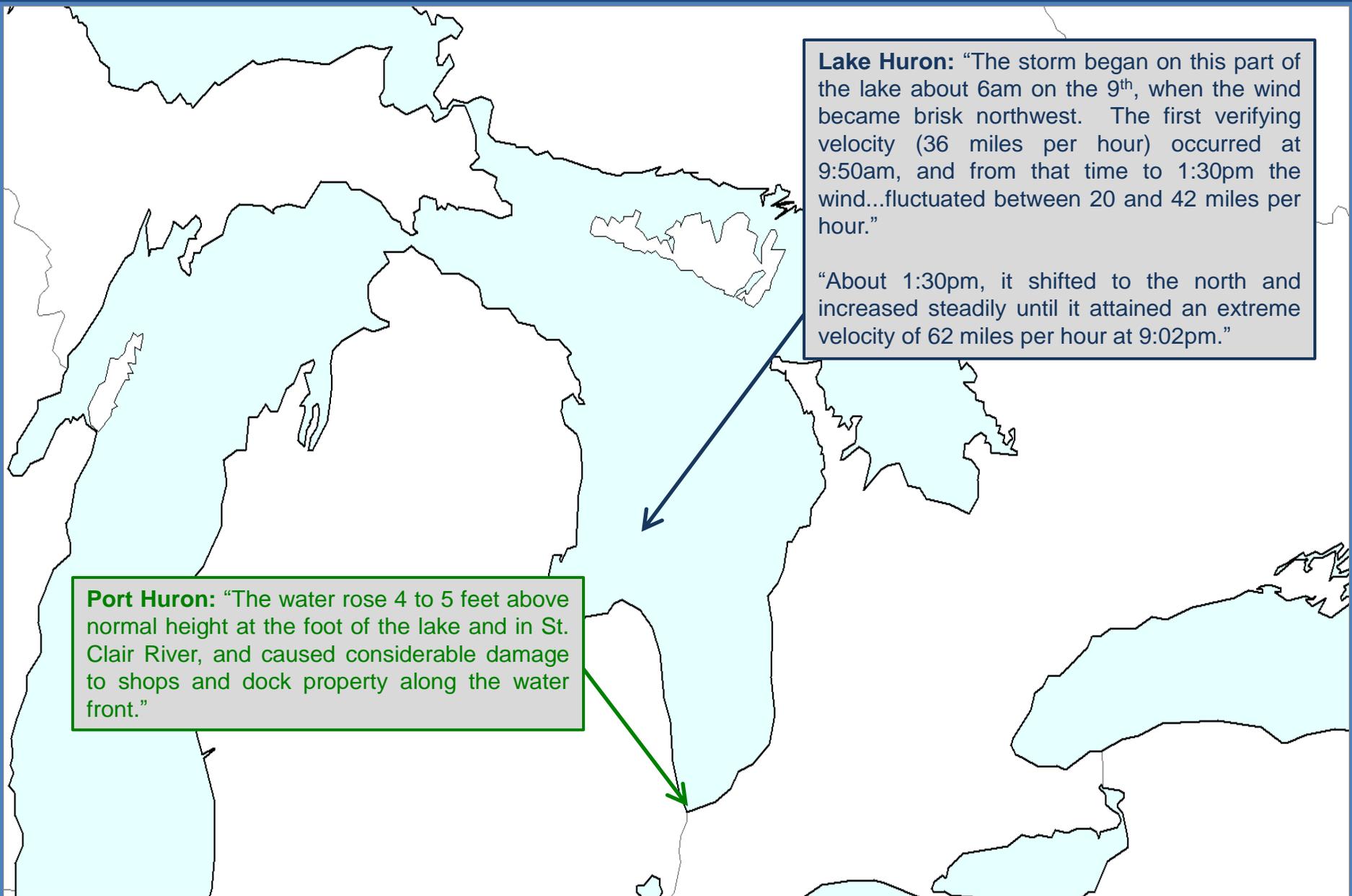
**Great Lakes Hurricane of 1913: Excerpts from Local Weather Bureau Reports**

**Duluth:** "During this storm the maximum velocity ranged anywhere from 34 to 62 miles (per hour) between 1pm and 7pm (7 Nov)..."

**Sault Ste Marie:** "While the wind at this station reached a maximum velocity of 37 (mph) NW at 6:55pm on the 9<sup>th</sup>, vessel masters report that on the open lake it was 60 to 80 miles per hour."



# Great Lakes Hurricane of 1913: Excerpts from Local Weather Bureau Reports

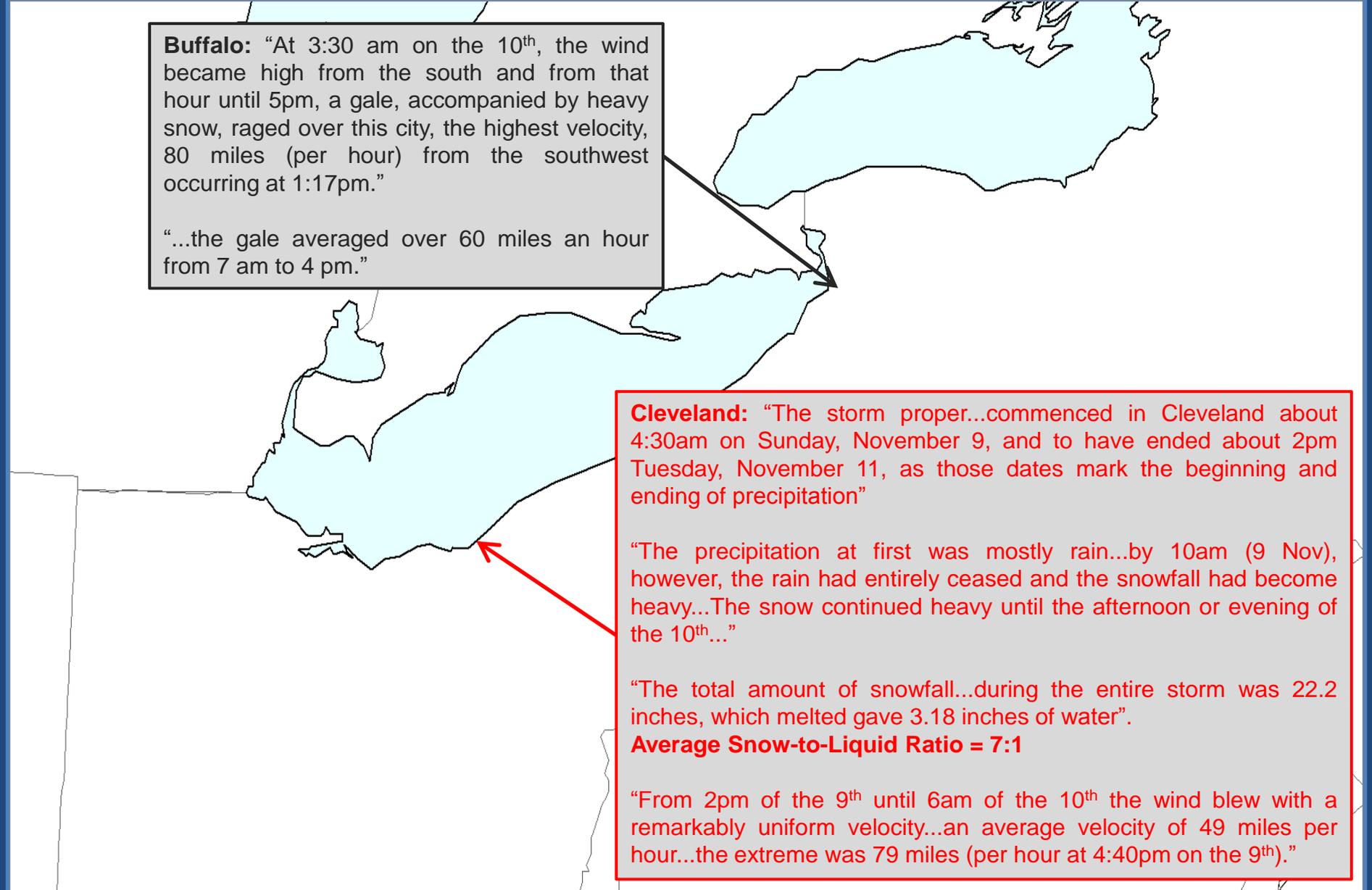


**Lake Huron:** “The storm began on this part of the lake about 6am on the 9<sup>th</sup>, when the wind became brisk northwest. The first verifying velocity (36 miles per hour) occurred at 9:50am, and from that time to 1:30pm the wind...fluctuated between 20 and 42 miles per hour.”

“About 1:30pm, it shifted to the north and increased steadily until it attained an extreme velocity of 62 miles per hour at 9:02pm.”

**Port Huron:** “The water rose 4 to 5 feet above normal height at the foot of the lake and in St. Clair River, and caused considerable damage to shops and dock property along the water front.”

# Great Lakes Hurricane of 1913: Excerpts from Local Weather Bureau Reports



**Buffalo:** "At 3:30 am on the 10<sup>th</sup>, the wind became high from the south and from that hour until 5pm, a gale, accompanied by heavy snow, raged over this city, the highest velocity, 80 miles (per hour) from the southwest occurring at 1:17pm."

"...the gale averaged over 60 miles an hour from 7 am to 4 pm."

**Cleveland:** "The storm proper...commenced in Cleveland about 4:30am on Sunday, November 9, and to have ended about 2pm Tuesday, November 11, as those dates mark the beginning and ending of precipitation"

"The precipitation at first was mostly rain...by 10am (9 Nov), however, the rain had entirely ceased and the snowfall had become heavy...The snow continued heavy until the afternoon or evening of the 10<sup>th</sup>..."

"The total amount of snowfall...during the entire storm was 22.2 inches, which melted gave 3.18 inches of water".

**Average Snow-to-Liquid Ratio = 7:1**

"From 2pm of the 9<sup>th</sup> until 6am of the 10<sup>th</sup> the wind blew with a remarkably uniform velocity...an average velocity of 49 miles per hour...the extreme was 79 miles (per hour at 4:40pm on the 9<sup>th</sup>)."

# ***Thanks for your attention!***

## **Excerpts from Weather Bureau "Daily Local Record" November 7-11 1913...**

### **Friday, November 7**

Storm Warning: "Hoist southwest storm warning 10:00am. Storm over upper Mississippi valley moving northeast. Brisk to high southwest winds this afternoon and tonight, shifting to northwest Saturday on upper Lakes. Warnings ordered throughout Great Lakes."

### **Saturday, November 8**

Storm Warning: "Change to northwest storm warning 10:00am. Storm over eastern Lake Superior moving east-northeast. High west to northwest winds."

### **Monday, November 10**

Storm Warning: "Continue northwest storm warning 10:00am."

The daily press (*Free Press*) reports the following: "Steamer Pollock (thought to be) blown ashore above ship canal at St. Clair Flats. Forty vessels driven to anchor in St. Clair and Detroit Rivers. Fifty reported anchored in Thunder Bay. Fifty more reported as finding refuge between 'Soo' and White Fish Point."

### **Sunday, November 9**

Storm Warning: "Continue northwest storm warning. Storm over Virginia moving northeast."

The press reports four ships driven ashore or on rocks, viz.: "Louisiana" off Port Washington, Wisconsin; "Mary" aground near Algonac; unidentified ship on Point Pelee, Lake Erie; "Mary Elphicke" on Bar Point (aground).