Weather Forecasting



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2019 Michigan Winter Operations Conference

What Will We Talk About Today?

- Winter precipitation forecast challenges
- New Snow Squall Warning
- Finding snow information on NWS Gaylord's website

Winter Forecast Challenges in the Great Lakes NWS Gaylord

Lake effect snow Great Salt Lake Courtesy of powderchaser



Winter Challenge #1: Limited Marine Observations Buoys get removed in winter



Winter Challenge #1: Limited Marine Observations Very few ship observations



Winter Challenge #1: Limited Marine Observations Lots of cloudy days in the winter



Why are cloudy days a problem?



Great Lakes Water Temperatures



Great Lakes Ice Cover Mapping



Challenge #2: Slight variations in wind direction have big impacts on snowfall

North-Northwest Flow

Northwest Flow







Snowfall differences with slight differences in wind direction

North-Northwest Flow

Northwest Flow



Challenge #3 Great Lakes Ice Cover



Ice cover varies from year to year



March ice cover differences on Lake Superior 2012 versus 2014



Small Amounts of Ice can make a big difference in Lake Effect Snow



Notice just a relatively small area of ice in Northern Lake Michigan



Northwest winds - No Ice cover





Northwest winds - Ice cover



Challenge #4 Elevation



Seasonally = 8 to 12 inches more snowfall for every 100 foot change in elevation



During winter storms, temperatures generally drop about 1 degree Fahrenheit for every 300-400 foot rise in elevation



December 20-21, 2012



December 20-21, 2012

Gaylord Observations Elevation 1400 feet

9:53 AM	32.0 °F	24.2 °F	30.0 °F	92%	29.74 in	0.5 mi	East	9.2 mph	20.7 mph	0.04 in	Fog , Snow	Snow	
10:53 AM	32.0 °F	23.6 °F	30.9 °F	96%	29.71 in	0.2 mi	East	10.4 mph	19.6 mph	0.07 in	Fog , Snow	Snow	
11:53 AM	32.0 °F	24.2 °F	30.9 °F	96%	29.64 in	0.2 mi	East	9.2 mph	25.3 mph	0.11 in	Fog , Snow	Snow	
12:36 PM	33.8 °F	24.8 °F	30.2 °F	87%	29.52 in	0.5 mi	East	12.7 mph	20.7 mph	0.04 in	Fog , Snow	Snow	
1:31 PM	32.0 °F	22.5 °F	30.2 °F	93%	29.44 in	0.2 mi	East	12.7 mph	24.2 mph	0.03 in	Fog , Snow	Snow	
1:53 PM	32.0 °F	20.8 °F	30.9 °F	96%	29.43 in	100	East	17.3 mph	31.1 mph	0.05 in	Snow	Snow	

Alpena Observations Elevation 600 feet

10:54 AM	35.1 °F	24.5 °F	33.1 °F	92%	29.80 in	5.0 mi	ESE	18.4 mph	27.6 mph	0.00 in	Rain	Light Rain	
11:11 AM	35.6 °F	24.8 °F	33.8 °F	93%	29.76 in	2.0 mi	ESE	19.6 mph	33.4 mph	0.03 in	Rain , Snow	Light Rain	
11:17 AM	33.8 °F	22.8 °F	33.8 °F	100%	29.76 in	1.5 mi	ESE	18.4 mph	31.1 mph	0.05 in	Rain , Snow	Light Rain	
11:38 AM	33.8 °F	23.2 °F	32.0 °F	93%	29.74 in	0.8 mi	ESE	17.3 mph	31.1 mph	0.09 in	Snow	Light Snow	
11:48 AM	33.8 °F	23.5 °F	32.0 °F	93%	29.73 in	0.2 mi	ESE	16.1 mph	25.3 mph	0.12 in	Fog , Snow	Heavy Snow	
11:54 AM	33.1 °F	21.9 °F	30.9 °F	92%	29.74 in	0.2 mi	ESE	18.4 mph	27.6 mph	0.14 in	Fog , Snow	Heavy Snow	
12:06 PM	33.8 °F	22.8 °F	32.0 °F	93%	29.70 in	0.5 mi	ESE	18.4 mph	25.3 mph	0.03 in	Fog , Snow	Snow	
12:22 PM	33.8 °F	24.8 °F	32.0 °F	93%	29.68 in	2.5 mi	East	12.7 mph	23.0 mph	0.04 in	Snow	Light Snow	
12:26 PM	33.8 °F	24.8 °F	32.0 °F	93%	29.67 in	5.0 mi	East	12.7 mph	23.0 mph	0.04 in	Snow	Light Snow	
12:47 PM	35.6 °F	25.2 °F	33.8 °F	93%	29.65 in	8.0 mi	East	18.4 mph	26.5 mph	0.04 in		Overcast	
12:54 PM	35.1 °F	24.8 °F	33.1 °F	92%	29.66 in	8.0 mi	East	17.3 mph	25.3 mph	0.04 in	Rain	Light Rain	

So what happened with regard to snowfall accumulations?

1200 AM	HEAVY SNOW	9 SSW GAYLORD		44.91N 84.74W
12/21/2012	M13.8 INCH	OTSEGO	MI	OFFICIAL NWS OBS
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24 HR TOTAL THRU 12 AM. SNOWDEPTH 12 IN.

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Challenge #5 Radar Limitations







Challenge #6 Varying computer model solutions This is a problem both summer and winter, all across the United States. Differences in computer model solutions - which have a large impact on the forecast.

12Z WED EURO



Computer Variation in storm tracks from 1 model run (Ensemble Forecasts)



Challenge #6 Varying computer model solutions



Why is storm track important? Heaviest snow normally falls 150 to 200 miles to the left of the surface low track



With all of these challenges...How do meteorologists put the forecast together?

Creating a Forecast: Like putting a puzzle together

- Current observations
- Various computer models
- Pattern recognition
- Forecaster expert analysis and assessment



Introduction to Snow Squall Warnings

Winter 2019-2020





What is a Snow Squall?

SROW SQUALLS

A snow squall is an intense, but limited duration, period of moderate to heavy snowfall, accompanied by strong, gusty surface winds and possibly lightning. Snow accumulation may be significant with a snow squall.

For more information visit weather.gov





Why are we issuing Snow Squall Warnings?

There is a long history of deadly accidents associated with snow squalls.

Snow squalls can cause localized extreme impacts to the traveling public and to commerce for brief periods of time.

The rapid onset of whiteout conditions, combined with gusty winds and falling temperatures can cause extremely dangerous conditions for motorists.

Annual highway fatalities from these events can exceed fatalities from tornadoes and floods combined for portions of the U.S.







Winter-related Motor Vehicle Fatalities Lead Other Hazards



Average number of fatalities per year from various meteorological hazards for the period 1996–2011. Totals for all hazards except winter-related motor vehicle and winter-related aviation fatalities are from Storm Data.



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Quick Facts

"Short-fused" in nature

Issued for smaller geographic areas for up to 60 minutes

Lead time will generally be 20 to 30 minutes or longer

Issued in a Polygon Format

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Similar in format to Severe Thunderstorm Warnings

Example of Snow Squall Warning

Snow Squall Warning Valid Until Taylor 9:45 AM EDT Friday Norwich March 16, 2018 McDonough Willet Gilbertsville Marathon Oxford **Threat Information** Guilford mithville Flats Hazard White out conditions Whitney Point Greene Coventry Sidney in heavy blowing snow Glen Aubrey Impact Masonville Afton Dangerouse lifelaine **Chenango Bridge** 88 threatening travel Binghamton **Potential Exposure** Windsor Deposit Conklin Population: 135,894 Vestal Center Highways: I-81 I-88 Susquehanna Hancock 81 US-11 Friendsville New Milford Thompson Montrose Orson NY Brooklyr Union Dale Springville 11 CT Forest City Nicholson PA Meshoppen Prompton Carbondale Factoryville

Warning Text Example

BULLETIN – EAS ACTIVATION REQUESTED Snow Squall Warning National Weather Service Binghamton NY 339 PM EST Sat Feb 13 2016

NYC007-023-107-109-132115-/O.NEW.KBGM.SQ.W.0001.160813T2039Z-160813T2115Z/ Cortland NY-Broome NY- Tompkins NY- Tioga NY-339 PM EST Sat Feb 13 2016

The National Weather Service in Binghamton has issued a

* Snow Squall Warning For... Southern Cortland County in Central New York... Northwestern Broome County in Central New York... Southeastern Tompkins County in Central New York... Northern Tioga County in Central New York...

* Until 415 PM EST

* At 338 PM EST, a dangerous snow squall was located over South Danby or 12 miles south of Ithaca, moving northeast at 50 mph.

HAZARD...White-out conditions in heavy snow and blowing snow.

SOURCE...Radar indicated and webcams.

IMPACT...Dangerous life-threatening travel.

* The dangerous snow squall will be near...

Caroline and <u>Slaterville</u> Springs around 350 PM EST. Berkshire, Richford and Harford around 355 PM EST. Whitney Point and Lisle around 405 PM EST. Marathon around 410 PM EST. Willet and East Freetown around 415 PM EST.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

Conditions will deteriorate rapidly with near zero visibilities in snow and blowing snow. Travel will become impossible. You should wait until the squall passes before traveling or find a safe place to wait out the squall away from any road or highway indoors if traveling.

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LAT...LON 4260 7600 4242 7586 4235 7585 4214 7645

4225 7654 4228 7654 4228 7656 4230 7658

TIME...MOT...LOC 2038Z 240DEG 42KT 4227 7643



What to do during a Snow Squall?

- Remain alert to the latest forecast and travel conditions. Consider avoiding or delaying travel until the snow squall passes your location.
- Leave extra time if you must travel during snow squalls.
- Reduce your speed and turn on headlights!
- Don't slam on brakes!





SNOW SQUALL WARNING means...

Expect severe travel difficulties



Rapid white out conditions and near zero visibility



Snow Squall Warnings

How do I receive a Snow Squall Warning?

- NOAA Weather Radio
- Website: <u>http://weather.gov</u>
- Mobile: <u>http://mobile.weather.gov</u>
- iNWS: <u>https://inws.ncep.noaa.gov</u> (Public Safety Officials only)
- NWSChat: <u>https://nwschat.weather.gov</u>
- Twitter
- Other local and state dissemination systems
- State DOT Variable Message Signs (VMS) in some areas
- Future: Cell Phone Wireless Emergency Alerts (WEA)

Finding Snow Info On NWS Gaylord Website



Three Days of 12 Hour Snowfall Forecast Available

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Three Days of Expected Snow Ratio Data Available



Finding Hourly Weather Graphs



Finding Hourly Weather Graphs



Hourly Weather Graphs



Hourly Weather Graphs

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Temperature: 58 °F Dewpoint: 42 °F Wind Chill: N/A Surface Wind: W 16G26mph Sky Cover (%): 50% Precipitation Potential (%): 4% Relative Humidity (%): 55% Rain: <10% Thunder: <10% Snow: <10% Freezing Rain: <10% Sleet: <10%

Questions or want more information?

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