Case Study of Late November 2014 Buffalo Lake Effect Snowstorm

Marcella Rodgers and Matt Case

Introduction

Lake effect snow occurs when a cold air mass moves across a warm body of water, absorbing heat and moisture to form narrow, intense bands of clouds that deposit heavy snow upon reaching land. The historic "Snowvember" storm of November 2014 devastated Western New York when an extreme lake effect event produced over 65 inches of snow, a total that far exceeded the region's typical 1–2-foot averages and caused severe regional impacts.

Storm Analysis

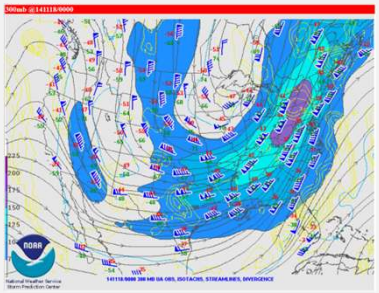

Figure 1 Upper-level wind speeds of 150 knots (170 mph) at 300mb right over the WNY region at 00z November 18th, 2014.

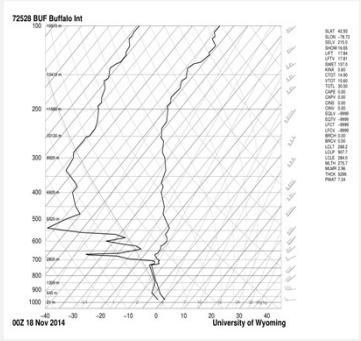

Figure 2 A sounding from 00z November 18th, 2014, from the Buffalo International Airport.

- Strong southwesterly winds of nearly 50 mph were driven by strong upper-level winds (Figure 1).
- A cold front associated with a low-pressure system north of Lake Huron brought a deep column of sub-zero temperatures over the warm Lake Erie waters.
- There was a deep, unstable layer with a lot of moisture that allowed the storm to grow (Figure 2).

Meteorological Impacts

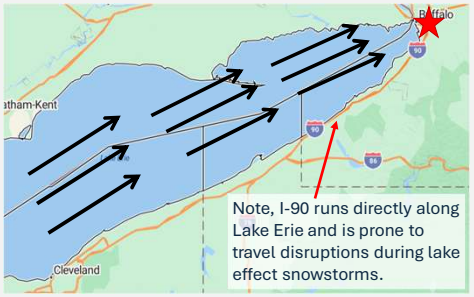

Figure 3 Lake Erie's long lake axis parallel (LLAP) band.

- Cold air passed over the warm lake water, picking up moisture quickly, increasing convection as the storm tracked along Lake Erie's LLAP band (Figure 3).

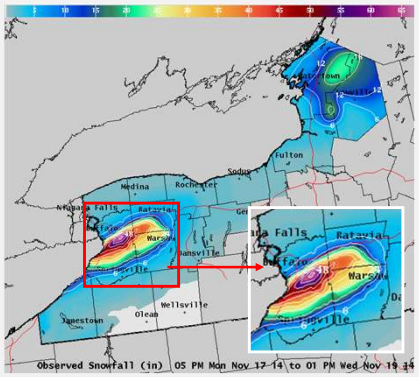

Figure 4 Accumulated snowfall with the highest amount being in Buffalo, NY.

- Highly concentrated snowfalls from the LLAP snow bands resulted in accumulations exceeding 65" (Figure 4).
- Extreme snowfall rates of 3" per hour along with strong winds resulted in white out conditions creating near zero visibility.
- The Buffalo National Weather Service Office issued several blizzard warnings.

Societal Impacts

- Governor Cuomo stated that the storm caused $46 million in damages.
- Many people were left stranded in their homes without power for multiple days.
- The weight of the snow caused over 350 cases of roof damage (Figure 5), and 38 structures were destroyed.
- Interstate 90 and various highways in and around Lake Erie were shutdown for days due to snow covered roads and stranded motorists.
- The storm caused 14 storm-related deaths.
- Local economies suffered during the start of the holiday season due to lack of business and lack of inventory able to arrive.

Figure 5 A collapsed building from intense wind and snowfall.

Response & Conclusion

- Communication failures led to new protocols that require earlier coordination and clearer chains of command.
- Struggle to move plows and emergency vehicles prompted changes in how equipment is staged and how travel bans are issued.
- Delays in emergency operations center activation resulted in more frequent briefing cycles from across partners in the emergency management and meteorological fields.

References

- **CBS News (2014): Deadly snowstorms cause roof collapses in Buffalo area**
  https://www.cbsnews.com/news/deadly-snowstorms-cause-roof-collapses-in-buffalo-area/
- **COL Richard Goldenberg(2014): New York National Guard responds to historic snowfall in Western New York**
  https://dmna.ny.gov/news/?id=1416517338
- **Fox Weather (2014): A look back on Buffalo's historic 2014 'Snowvember' storms that left 7 feet of snow in some spots**
  https://www.foxweather.com/extreme-weather/a-look-back-on-buffalos-historic-2014-snowvember-storms-that-left-7-feet-of-snow-in-some-spots
- **James Comer (2015): Buffalo Beefs Up Emergency Response Planning in Response to 2014 Blizzard**
  https://www.govtech.com/em/safety/buffalo-beefs-up-emergency-response-planning-in-response-to-2014-blizzard.html
- **Jay Burney (2015): GreenWatch: November 2014 Snow**
  https://www.dailypublic.com/articles/11222015/greenwatch-november-2014-snow
- **NYS Climate Impacts Assessment: 2014 Lake-Effect Snowstorms Kick Off Decade of Disaster**
  https://nysclimateimpacts.org/explore-the-assessment/case-studies/lake-effect-snowstorms/
- **NWS: SPC Upper Air Maps**
  https://www.spc.noaa.gov/cgi-bin-spc/getuadata.pl?MyDate1=141118&Time1=00&MyDate2=&Time2=00&align=V&Levels=All
- **NWS: Lake Effect Summary: November 17-19, 2014**
  https://www.weather.gov/buf/lake1415_stormb.html
- **The Associated Press (2014): Cuomo: Buffalo snowstorm cost more than $46M**
  https://www.northcountrypublicradio.org/news/story/26898/20141212/cuomo-buffalo-snowstorm-cost-more-than-46m