



A Study Group of The

Interdisciplinary Centre on Climate Change 

The Reflection Pool

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The winter and early spring of 2014 have been particularly long and cold for Canadians, with ice storms, blizzards, and colder than average temperatures observed across much of the country. This Winter-Spring issue of the Canadian Weather and Society Advisor picks up on this theme with a collection of articles illustrating the types of conditions and impacts felt over the past few months. We start with a summary of the severe winter weather that has taken place across the country. The next article focuses on the impacts of the ice storm that hit southern Ontario in December 2013, followed by a brief review of the technical aspects of freezing rain. The Student Corner further discusses how the ice storm impacted students from the University of Waterloo, as well as local businesses in the Waterloo region.

We hope you enjoy reading the newest edition of the Canadian Weather and Society Advisor.

Sincerely,
Sarah Greene and Joann Varickanickal

Contributors to this Issue:

Jean Andrey
Sarah Greene
Brian Mills
Amber Silver
Joann Varickanickal

If you have weather stories, ideas, photos or expertise that you would like to contribute to future newsletters, please contact Amber Silver at a2silver@uwaterloo.ca



Image of April 15th storm in Waterloo, Ontario
Courtesy of Joann Varickanickal

Wacky Winter Weather Throughout Canada

This winter, the Prairies have seen some of the coldest temperatures in Canada. Extreme weather and warnings were the norm with cities in Saskatchewan and Manitoba experiencing wind-chills as low as -50. This type of extreme cold can freeze exposed skin in under 10 minutes. Many low temperature records were shattered and Winnipeg was even said to have reached temperatures as cold as the surface of Mars. Before the deep freeze in December, Alberta had experienced unusually warm weather that was considered even spring-like with temperatures reaching as high as 8°C, 11°C above the seasonal average. The temperatures quickly dropped back to seasonal, and then well below the national average.

Provinces along Canada's east coast also faced bitter cold temperatures and received lots of snow. At the beginning of January, a blizzard in Newfoundland brought about 38 centimeters to St. John's, with winds of 100 kilometers per hour that persisted even after the snow had stopped falling. Energy consumption in the province was also high due to the bitter cold, and as a result, rolling blackouts were implemented. Worse still, right after the blizzard, a transformer fire at one of the terminal stations left about 190,000 people without power for over a day.

Nova Scotia has also had its fair share of severe winter weather. While the province is accustomed to winter storms, the event at the beginning of January proved to be especially treacherous. Businesses and schools were closed, city bus services were cancelled and police vehicles were pulled from the roads due to the dangerous conditions. Road service crews operating approximately 200 plows fought an uphill battle as the high winds drifted the 40 plus centimeters snowfall back onto highways and roads.



Blizzard in Halifax on January 3rd, 2014 [Andrew Vaughan, the Canadian Press]

Northern Canada was not spared either this winter, as a blizzard hit Iqaluit at the beginning of January. The worst storm to affect the region since 2007, wind speeds exceeded 140km/h, equivalent in strength to a Category 1 hurricane. Business and schools were shut down the afternoon before the storm hit, and while some areas experienced building damage and were without power for up to 16 hours, everything resumed the next afternoon when the weather warning had ended. Fortunately, the number of injuries was also minimal. The next step was to begin cleanup and repairs, a difficult task given that supplies have to be ordered and then shipped to Iqaluit.



Aftermath of the Iqaluit Blizzard, January 7th, 2014 [CTV]

Information collected from the following news sources:

CTV, Victoria Times Colonist, Ottawa Citizen, Yahoo News, Huffington Post, Calgary Sun, Global News and CBC

2013 Ice Storm

Many people in Southern Ontario were impacted by the ice storm that hit the region on December 22, 2013. Thousands of people faced power outages in Hamilton, Niagara, Kitchener-Waterloo and other surrounding areas. In Toronto alone, about 300,000 people were without power, and for some it did not return until about eight days later (Toronto Hydro). As a result, many people were forced to stay at local warming centers, or at houses of friends or relatives. Hotels such as the Eaton Chelsea, with 1600 rooms, were full even after opening up rooms that had been closed for renovations.

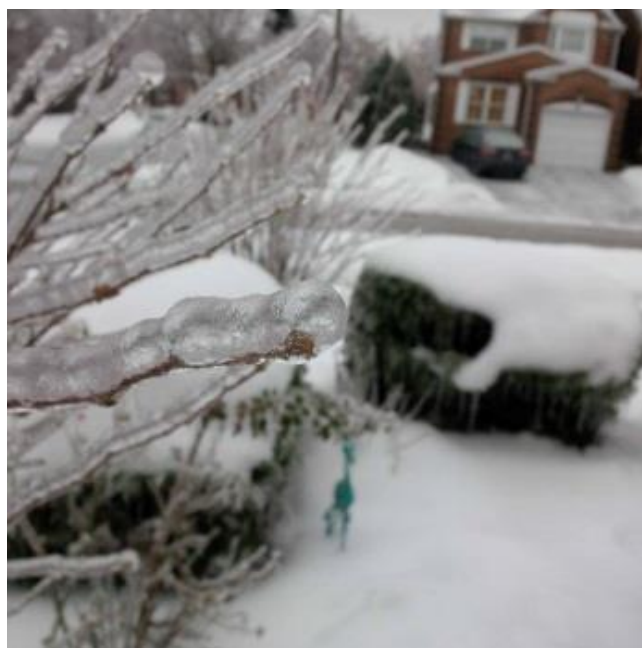
As power outages continued, and people tried to stay warm in their homes, many resorted to using appliances such as gas generators and barbecues; thus, carbon monoxide poisoning became a hazard. The City of Toronto received many more calls than usual about carbon monoxide, with serious consequences for some.



Images courtesy of Sarah Greene

Transportation services were also hindered by the storm. Icy roads made for poor driving conditions, and streetcar services in Toronto were shutdown. Both GO Transit and VIA Rail services across the province were also delayed. About 27 percent of flights at Pearson International Airport in Toronto were cancelled, and several were delayed frustrating passengers attempting to reach various holiday destinations

While this storm proved to be difficult for many, southern Ontario has experienced worse. Over 100 millimeters of ice fell in some regions during the ice storm of 1998, which also lasted longer, in contrast to the 30 millimeters accumulated during this storm. Nevertheless, clean up for the 2013 ice storm has taken a long time, and the price has been high, as costs for all areas affected have been estimated to be between \$250 and \$275 million.



Information collected from the following news sources:

The Hamilton Spectator, The Welland Tribune, The National Post, Toronto Hydro, Canwest News Service, Macleans

Getting Technical: Freezing Rain

Freezing precipitation is a hazard in many parts of Canada. Heavy icing, especially when accompanied by strong winds, damages trees and brings down wires, disrupting communications and power supplies. Sidewalks and roadways become extremely hazardous, and ice loads on roofs may become unbearable. Freezing rain or drizzle begins as liquid water droplets that fall from warmer-than-freezing upper air into a shallow layer of colder air near the ground. When the temperature of objects or surfaces are below freezing, the droplets freeze upon contact, glazing everything with a silver coat of ice. If the layer of below-freezing air near the surface is very cold or thick, then the droplets freeze into ice pellets (also called sleet) before reaching the ground.

In most situations and locations, the conditions necessary to support freezing rain typically last only a few hours. However, in some cases, for instance where the boundary between warmer and colder air becomes stationary, where a persistent source of low-level cold air continuously feeds into a region, or in river valleys, where the denser, cold air takes longer to be displaced by warmer air, several hours or more of icing can occur. These situations are responsible for the great ice storms experienced in Canada—all three were evident in the Ice Storm of 1998 which left many parts of the Ottawa and St. Lawrence Valleys encased in several centimetres of ice, and millions of residents without electricity, for upwards of a week.

Adapted from: Phillips, D. 1990. *The Climates of Canada*. Minister of Supply and Services Canada, Ottawa.

Student Corner: Ice Storm Impacts on the Community

**Joann Varickanickal, 2A and Sarah Greene, 3A
Geography and Environmental Management**

Many students in the University of Waterloo's Faculty of Environment were also impacted by the ice storm that hit southern Ontario in December 2013. Kaitlin Murray, a second year student in the International Development program, experienced power outages at her home in Kitchener, Ontario. Another second year student, Michael Wideman who is in the faculty's planning program, also resides in Kitchener and experienced power outages at his home for over 12 hours.

While both students were affected by the storm, the impacts were not significant enough to make them take measures to mitigate the effects of future storms of this nature. Nevertheless, Sarah Greene, a third year student in Geography and Environmental Management, feels that she will try to better prepare for the next storm. Power was out for three days at her family's home in Thornhill, and while they had bought extra flashlights and salt,

there was nothing they could do to save the food in their fridge and freezer. To reduce the impacts of the storm for next time, Sarah and her family will try to better store food, and perhaps even avoid buying a lot of frozen food if they are anticipating a storm.

Along with students at the University of Waterloo, local businesses were also greatly affected by the ice storm – sometimes in a positive way. Ryle Perera, the manager of a local Canadian Tire store, says there was a huge increase in the sales of generators, propane, stoves, and ice removers. The logistics team at head office had even worked with the company Sifto, to secure 200 loads of salt. Nevertheless, while they did try to prepare for the demand that the storm would bring, the salt was gone within one day. Thus, as a result of the storm, Perera's store managed to sell more salt than they did in all of last winter.

Upcoming Events

- ***“Integrated Disaster Risk Science: A Tool for Sustainability,”*** from 7 – 9 June 2014 at the Beijing International Convention Center (BICC) in Beijing, China.
<http://www.irdrinternational.org/conference-2014/>
- ***“Canadian Association of Geographers Annual Meeting”***, from 26-30 May 2014 at Brock University, in St. Catherine’s, Ontario.
http://www.cag-acg.ca/en/cag_annual_meeting.html
- ***“World Conference on Disaster Management”***, from 15-18 June in Toronto, Ontario.
<http://www.wcdm.org/>
- ***“World Weather Open Science Conference”***, from 16-21 August 2014 in Montreal, Quebec.
<http://wwosc2014.org/>
- ***“Canadian Risks and Hazards Network (CHRNNet) 11th Annual Symposium”***, 22-24 October in Toronto, Ontario.
<http://www.crhnet.ca/symposium>

Worth Reading

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Balagh, A. K., Naderkhani, F., & Makis, V. (2014). Highway accident modeling and forecasting in winter. *Transportation Research Part A* , 59 (7-8), 384-396.

Hu, A., Xie, W., Xu, X., Ji, Z., & Wu, J. (2014). Analyzing regional economic impact and resilience: a case study on electricity outages caused by the 2008 snowstorms in southern China. *Natural Hazards* , 70 (2), 1019-1030.

Ludvigsen, J., & Klæboe, R. (2014). Extreme weather impacts on freight railways in Europe. *Natural Hazards* , 70 (1), 767-787.