

LAKE EFFECT: HOW IT DEFINES BUFFALO'S WEATHER & CLIMATE

A Panel Discussion at the
Burchfield Penney Art Center
January 29, 2012



**BURCHFIELD PENNEY
ART CENTER**
at Buffalo State College

www.BurchfieldPenney.org

PANELISTS

Aaron Mentkowski — WKBW News 7
Don Paul — WIVB-TV 4
David Zaff — The National Weather Service

MODERATOR

Dr. Stephen Vermette, Ph.D., Buffalo State College
co-curator of Weather Event

AUDIENCE QUESTIONS AND ANSWERS

1. What are the dynamics of waterspouts in winter?

Over our lakes, waterspouts are most often seen in the late summer and fall, when air (cold) and lake temperatures (warm) are at their greatest difference. Fair-weather water spouts (differentiated from the tornadic variety) usually occur under developing cumulus clouds during light wind conditions. They build from the surface of the water to the cloud base, as rising air currents of moist air. The spin is attributed to a changing shear (wind direction) with height. Given these conditions, waterspouts in winter would be less common and even rarer when the lake is frozen. Having said this, recent observations by the folks at SUNY Oswego found numerous cases of tiny velocity couplets embedded within lake effect bands - like mini-mini supercells. Perhaps winter waterspouts are more common than originally believed. They are snow- and steam fog-wrapped rather than water-wrapped - the term 'snowspout' may be an appropriate term here. Contrary to popular belief, waterspouts do not suck up lake water, rather the waterspout is made up of condensing water vapor.

2. Global warming has been occurring since the last ice age. It seems to be occurring more quickly since the industrial revolution. Is this rate increase due primarily to increased CO₂ levels? Are there any other significant causes?

There are numerous cycles of warming and cooling that have taken place on this planet. As you mentioned, the ice age is an example of a cycle between glacial (cold) and inter-glacial (warm) periods that stretch back millions of years. We are currently experiencing an inter-glacial period. More recently, historians refer to the 'Medieval Climate Optimum' (warmer) where we learned of the Vikings' travel to Greenland and the 'Little Ice Age' (cooler) that followed. While not a true ice age, the cooling temperatures of the Little Ice Age had a devastating effect on crops. Washington Crossing the Delaware is a painting that shows far more ice on the river than possible today. Since the Industrial Revolution, global temperatures have been increasing, and this increase has been attributed to greenhouse gases, including CO₂. While there are some natural explanations for increasing temperatures (e.g. increase in solar output -referred to as natural forcing), they cannot account for the level and pace of warming we are experiencing today.

3. We know that CO₂ is a greenhouse gas. Is water vapor a greenhouse gas as well?

Yes, water vapor is a greenhouse gas. Water, along with the other greenhouse gases, in a process known as the 'Greenhouse Effect,' keeps our planet at a livable temperature (average surface temperature of about 60°F). Without the greenhouse gases and the Greenhouse Effect, the average global temperature would be at about 0°F.

4. What effect does lake effect precipitation have on aviation?

Lake effect precipitation has a limited effect on aviation simply because most flights fly over the clouds and associated rain or snow. Its impact on aviation is greatest when a plane is planning to land or take off within a lake effect event (including thundersnow). However, the impact on aviation is no different than other rain (thunderstorm) or snow events.

5. Is the number of “real weathermen” on TV going down or is that a misperception? Due to what effect?

Our answer depends on what you mean by ‘real weatherman.’ The term most often used is ‘broadcast meteorologist.’ As far as the American Meteorological Society (AMS) is concerned, the contemporary definition of a broadcast meteorologist does not really differ much from that of the non-broadcast meteorologist. Those who apply for the Certified Broadcast Meteorologist designation (which has replaced the AMS Seal of Approval for new applicants) must have completed the normal four-year academic requirements to attain the bachelor’s degree in meteorology (or equivalent). There is no licensing involved, nor sanctions for misuse of the title, so the term broadcast meteorologist does include individuals in the business with varying education backgrounds in meteorology. When hiring, the decision on the level of education in meteorology often depends on the station manager or news director of individual stations. To answer your question directly: I believe the level of training, and the requirements for certification, are higher today than ever before.

6. What makes Snowbelt areas and do they vary much?

A ‘Snowbelt’ is a geographic area where lake effect snow (snowfall attributed to the presence of a lake) is common. Lake effect snow is produced when a number of parameters line up correctly, the most important of which is a temperature gradient where the air passing over the lake is considerably colder than the water temperature. Key to a snowbelt area is its position on the leeward side (downwind side) of a lake. In addition, a rising topography contributes to the lake effect (e.g. Tug Hill) by increasing snow amounts. There are about six snowbelts around the Great Lakes: 1) Upper Peninsula of Michigan (lee of the western basin of Lake Superior); 2) Ontario (lee of the eastern basin of Lake Superior); 3) northern Indiana and western Michigan (lee of Lake Michigan); 4) Ontario (lee of Lake Huron and Georgian Bay); 5) northeast Ohio, northern Pennsylvania, and Western New York (lee of Lake Erie); and 6) New York (lee of Lake Ontario). While the amount of snow may vary from lake effect to lake effect storm, the snowbelt areas remain constant.

7. Why does Buffalo have a reputation for poor weather when the weather in Syracuse and Rochester are considerably worse?

This is a good question, one I know others have asked over the years. It is my belief that our reputation for snow stuck with the Blizzard of ’77. The storm was so severe and so well defined geographically that it placed a stamp on Buffalo in our country’s collective memory. Even people born well after the Blizzard are aware of it. Because of lake effect, our winters are often defined by individual storms, and every storm is compared to the Blizzard.

8. Was the blizzard of ’77 caused by the snow on the lake? Or by surface snow that was on the ground?

The Blizzard of ’77 is part of Buffalo, NY’s psyche. Lake Erie froze early (December 14th), and prior to January 28th there was 33 inches of snow on the ground. The snow was not only on the ground but also on the ice covering Lake Erie. Strong winds blowing off of the lake-ice blew the accumulated snow into Buffalo. The blizzard is noted for its strong winds, cold temperatures, even colder wind chill, and large amounts of blowing snow – of which most of it came off of the lake.

9. What’s the current status of the weather museum? (Great idea – so sustainable not only to Buffalo but because of the parallel with Erie Canal Harbor – both weather and social history come from that pivotal location – Erie and Ontario).

The International Weather Experience Center (IWEC) is quite active and is moving toward an eventual siting on the Outer Harbor. The IWEC is actually further along in its planning than nearly all other groups who wish to be located on the waterfront and is moving along quite nicely relative to the bureaucratic and developmental requirements. The IWEC has presented many public programs, including several on the waterfront this past summer, as well as at Winterfest last winter - the IWEC has been invited again this year.

10. How do volcanic eruptions alter your ability to predict weather trends?

For the most part, volcanic eruptions have little impact on weather trends. Every once in a while a major volcanic eruption releases gasses high into the atmosphere (stratosphere). The cooling effect is attributed to high level sulfur particles (gases converted to particles) reflecting sunlight away from the Earth, cooling the climate by about 1°F. The effect is usually limited to a year or two. The most famous example of this occurred during the year-without-a-summer (1816), where the eruption of Mount Tambora (Indonesia) brought abnormally cold temperatures, mid-summer frosts, June snowfalls, river ice in summer and failed harvests to the Northeast United States. Other areas of the world were also impacted. More recently (1991), the eruption of Mount Pinatubo (Philippines) caused a global cooling for about a year.

11. Does nuclear testing cause significant change? (Or events like Chernobyl's meltdown - or the more recent events in Japan after the earthquake and tidal wave / tsunami?)

As related to weather and climate, there is no strong evidence to suggest links with between nuclear tests and weather patterns. It is interesting to note that the first limitation on nuclear explosions was on atmospheric and underwater testing. This limitation, however, has little to do with weather, and more to do with atmospheric fallout from these blasts. It is the fallout of radioactive material from Chernobyl's explosion and Japan's reactor breach that is of concern to areas downwind of these events. On a larger scale, there is a potential that a massive number of nuclear blasts (as in a nuclear war) might change our climate - the theory was first introduced by Carl Sagan and is known as 'Nuclear Winter.' Under this scenario, numerous nuclear explosions combined with the resulting fires, would send up enough soot to prevent most of the sun's energy from reaching the Earth. In addition to radiation, the Earth's atmosphere would darken and cool to the point where most plants and animals would die off. Many post-nuclear movies, made after the 1980s reflect this type of world.

12. Farmers' Almanac? Any validity?

Not much. Originally the Farmers' Almanac based its long range forecasts on astrology, animal behavior, and other secret factors locked away in a vault. If you were to ask the folks at the Almanac today how they came up with their forecasts, they would say that they hire trained meteorologists. More and more the Farmers' Almanac looks at the same oscillations (El Nino, NAO) and models used by the National Weather Service to come up with their long-range outlooks. The difference is where the NWS speaks in generalities and percentages (due to their low confidence in looking so far out into the future), while the Farmers' Almanac is unabashedly confident in giving specific temperatures and precipitation amounts months and years into the future. This degree of accuracy is nothing but a guess.

13. Will massive releases of methane due to fracking affect our climate?

Hydrofracking is a controversial extraction method for natural gas. Pressurized fluids (a mix of many chemicals) are injected into bedrock the cause it to break and allow trapped natural gas to be released and captured. Along with natural gas, methane is also released. While the amount of methane released is uncertain at this time, methane is a greenhouse gas. Any increase in atmospheric methane will enhance the greenhouse effect, furthering the impacts of global warming.

14. For Zaff: Talk about the clouds in Western New York. How are they unique to this area? How are they related to our weather?

The only thing that's unique about the clouds in Western New York is the prevalence of a single or multi-banded convective (cumulus) clouds in the winter, and an arc of cloud-free areas downwind of the lakes in the summer (often called a lake shadow). In the winter, while most areas see a stratified or layered cloud deck, clouds in Western New York are often puffy when conditions are favorable to lake effect (warm lake, cool atmosphere). In late spring through mid-summer, the opposite is the case (cool lake, warm atmosphere). This typically produces a cloud-free area with a stable low level air-mass, with a ring or arc of clouds that develop along a lake breeze boundary. The boundary is often responsible for the development of thunderstorms later in the day.

15. For Mentkowski: What is a forensic meteorologist, what do you do as one, and why do they work with lawyers?

A forensic meteorologist reconstructs weather events for a certain place and time. I look at surface reports, satellite data, radar imagery and zone/short-term forecasts to recreate what the weather was for a client. Clients include law firms and insurance companies. A lawyer will ask me to prove what the weather was to see if the accident they are representing was caused by the weather. I produce a detailed report to the lawyer and work for either the defense or plaintiff, whoever contacts me first. I deal with a lot of slip and fall cases, snow, ice, wind, and flooding cases mostly here in Western New York. You can check out my website at www.weatherindetail.com.

The Museum For Western New York Arts

1300 Elmwood Avenue Buffalo, NY 14222

716 878 6011 www.BurchfieldPenney.org