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Canadian Meteorological and Oceanographic Society

La Société canadienne de météorologie et d'océanographie

# CMOS BULLETIN SCMO

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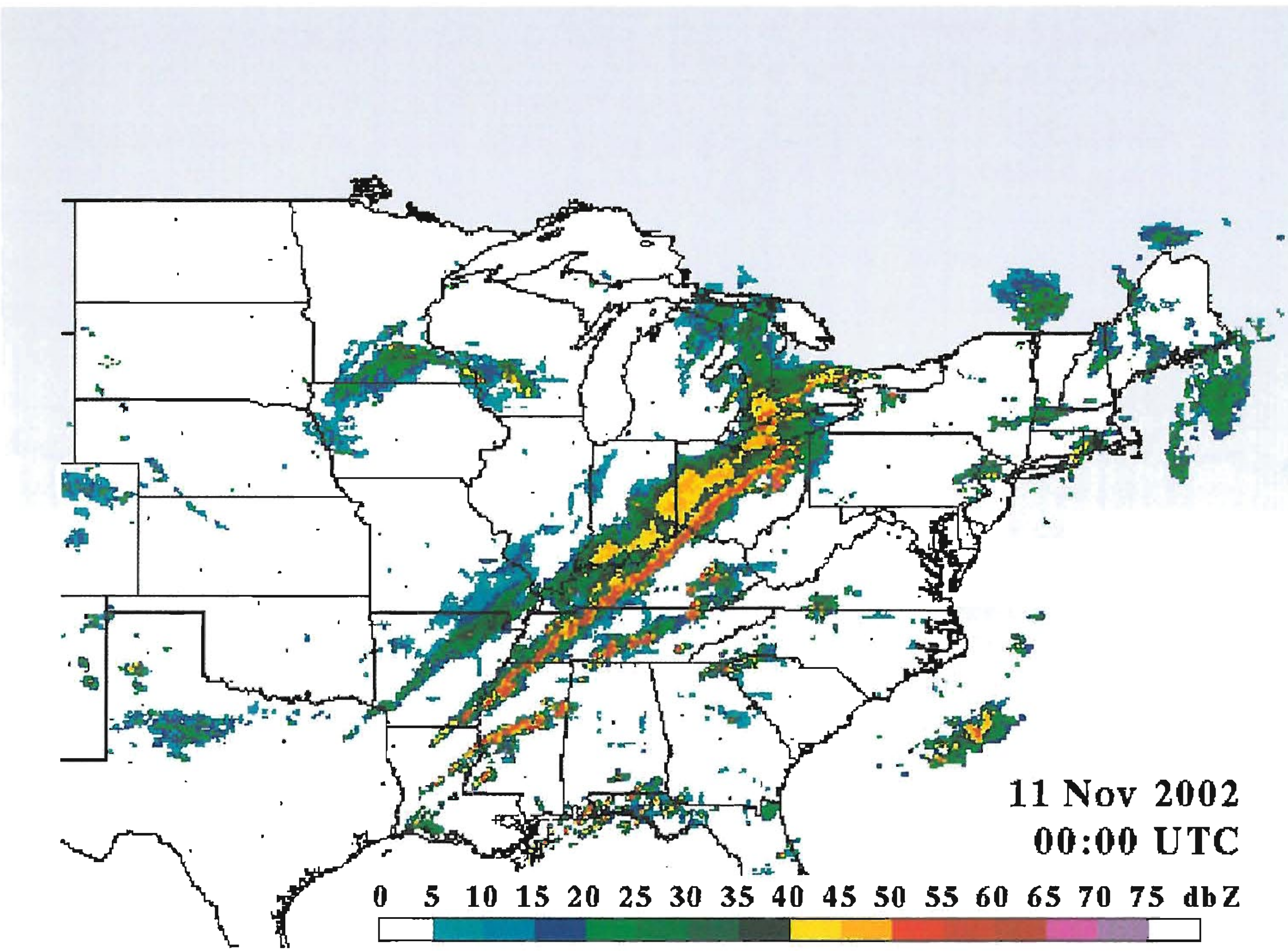

**CMOS Bulletin SCMO**
"at the service of its members
au service de ses membres"

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**Cover page:** Composite radar reflectivity image for 0000 UTC on November 11, 2002 provided by the Global Hydrology Resource Center at the Global Hydrology and Climate Center, Huntsville, Alabama, clearly shows the line of thunderstorms extending southwest from southern Ontario towards Louisiana. According to preliminary statistics from the NOAA Storm Prediction Center, there were 91 reports of tornadoes, 327 reports of wind damage and 190 reports of large hail in the US associated with these storms. Many reports were received from locations just south of Lake Erie in Ohio. North of the lake, in southwest Ontario, there was significant thunderstorm activity, but no severe weather was reported. To learn more, read the article on **page 48.**

**Page couverture:** Image composite de réflectivité radar du 11 novembre 2002 à 0000 UTC, obtenue du "Global Hydrology Resource Center" au "Global Hydrology and Climate Center", Huntsville, Alabama, montre clairement la ligne des violentes tempêtes se propageant vers le sud-ouest, à partir du sud de l'Ontario jusqu'à la Louisiane. Selon les statistiques préliminaires du Centre des prévisions des tempêtes de NOAA, il y aurait eu aux États-Unis, associés à ces tempêtes, 91 rapports de tornades, 327 rapports de dommage causé par les vents et 190 rapports de grosses grêles. Plusieurs rapports furent reçus de localités au sud du lac Érié en Ohio. Au nord du lac, dans le sud-ouest de l'Ontario, malgré une activité orageuse intense, aucun rapport de temps rigoureux n'a été rapporté. Pour en savoir plus, lire l'article à la **page 48.**

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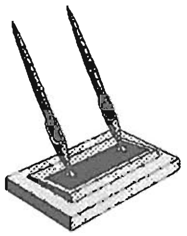
## Canadian Meteorological and Oceanographic Society (CMOS)

## Société canadienne de météorologie et d'océanographie (SCMO)

....from the President's Desk



This week has been an operational forecaster's bonanza! As I sat in my office, cursing at the next winter storm headed for Ontario and then beyond, I listened intensely to the forecasts for the Toronto area for the next three days: Monday, daytime wind chill -42; Tuesday, +2 and cloudy; followed by 20 - 25 cm of snow on Wednesday! There's something just so Canadian about it all!!

Yesterday, I heard CBC interview someone from Victoria who was boasting about the 3.4 billion flower blooms in their fair city while the rest of Canada was in the "deep freeze". You know, I don't mind them boasting. I think it gives the rest of the country hope that spring is indeed coming....slowly. And besides, I had the great fortune to be in Victoria last week, and the 3.4 billion blooms that I saw are worth boasting about!

Last week, Victoria was the host to the MSC-sponsored Forecasters' Forum, a special forum for operational meteorologists from across the country. I felt very privileged to be with such a talented group of people who feel so passionate about their work. The forum had a true collegial air about it, one in which you could sense that they were all working together to change the direction of operational meteorology in Canada for years to come. Several keynote speakers, including Dr. Chuck Doswell, provided inspirational and thought-provoking commentary that truly matched the mood of the conference participants.

This is a group of professionals who care passionately about their profession, care about the quality of their work, and care deeply about the service they provide to Canadians. They truly believe that they are an integral part of the forecast process. And they certainly are. In my first column as President, I talked about the problem of removing the trained human expert from our respective professions, and the resultant lessening of the quality of the product. There is no doubt in my mind that technology alone is rarely a better solution than technology interpreted by skilled professionals.

In an age where technology is becoming more advanced, and where we rely more and more on accurate forecasts and climate and oceanographic predictions, it is easy to leap to the conclusion that technology can do it all. CMOS members know differently. We know that the value lies in the quality of the data fed into the technology and the quality of the interpretation of the analysis of that data, and that this quality is connected to the human element. It remains our job, and ours alone, to continue to educate decision-makers, wherever they may be, of this fact. Whether those decision-makers are employers, bureaucrats, politicians or the public, we must remind them that scientific technology still needs scientists to provide the kind of service that Canadians deserve.

(Continued on next page)

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**Inside / En Bref**



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**CMOS** exists for the advancement of meteorology and oceanography in Canada.

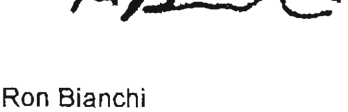
Le but de la **SCMO** est de stimuler l'intérêt pour la météorologie et l'océanographie au Canada.

The Forecasters' Forum wrapped up with participants coming together, face-to-face, to discuss the various difficult issues and challenges that lie ahead of them. They recognized that they need to be heard, and their expertise respected and acknowledged, and that this could only happen if they speak as a unified voice. I believe that CMOS can help in this regard, not just for this group but for all of others who struggle to have their expertise heard, acknowledged and respected. CMOS is the organization that can make the case to decision-makers that it is the human element that adds true value to the technology, and that, as a society, we cannot afford to take scientists out of the equation.

The CMOS Executive is interested in hearing from members who would like to further increase the strength of the voice of our scientific community. Please see the website for our contact information. In the meantime, I encourage all CMOS members to attend this year's Congress, where more discussions of this nature can take place. This Congress is a meeting of your colleagues from across the nation, who meet to share ideas, thoughts, and opinions about a variety of interesting, stimulating and challenging subjects. These subjects are related to the science of our respective professions, or directly to the growth of our professions. I hope each and every member will take this terrific opportunity to come together and meet with colleagues.

Bruce Ramsay and the Ottawa Local Arrangements Committee have worked very hard putting together an excellent conference program. If you go to the website, you'll see that the depth and breadth of abstracts is exceptional; the quality of speakers is first class. With over 400 abstracts to date, it's no surprise that already CMOS has received many registrations for the June event. **Remember:** Ottawa, June 2-5, and **you can register on-line** with a credit card, or by fax or by mail. See the website www.cmos.ca for more details and on-line registration.

I am certain that the forecasters here have got the snow accumulations right...Time to think about shoveling the driveway once more....Whatever happened to that milder and drier winter that many of the computer models predicted?



Ron Bianchi
President / Président
CMOS / SCMO

## Letter to the Editor

22 January, 2003

**Subject: Thank God Einstein wasn't pretty**

Is it just me, or are other broadcast meteorologists out there sick of hearing "you gotta look good for the boob tube, baby"? Oh and "don't forget to dumb it down"! How many of us with solid academic backgrounds, fluent in forecasting, and articulate in atmospherics have been told to check our science at the door and do weather the old showbiz way?

In fact, why did the television stations come after the "meteorologist" in the first place? What was wrong with buxom "Barometric Barbie" and square-jawed "Cumulus Ken" delivering the weather to the masses?

Once upon a time, in a far away place, some since-forgotten television news director, desperate to win a ratings war, decided to put the weather "expert" on air – the argument being that "if you build it (credibility), they will come". Average-looking scientists were thus plucked from their poorly-lit labs and thrust in front of flood-lit, lime green chroma-key screens.

News directors however – driven by consultants of dubious cognition – were still told over and over again to "keep it simple stupid", that showing national satellite maps, regional radar loops and synoptic animations (with, god-forbid, isobars on them) was the self-serving practice of a scientifically-starved weather expert.

So what happens when every station has a fully endorsed, knowledgeable but slightly unattractive broadcast meteorologist on air? Now who has the competitive edge?

News directors today are finding themselves pining after their old pretty presenters. After all, brains are nice, but is not beauty somehow better, more believable – or more importantly – more marketable? Thank God Albert Einstein wasn't brought up in the TV age.

Now I'm not suggesting that every weather presentation should be turned into a doctoral dissertation on the finer points of atmospheric meteorology, but if television stations insist on having well-educated, endorsed broadcast meteorologists on air, then at least let us teach the public some of what we know.

Of course, if news directors really do just want brainy beauties, here's some free consultation. Go to your local college campus and tell all the deep-voiced jocks and beautiful blondes to switch their majors to meteorology with the promise that it is *still* the best way to become a local TV star.

*Claire Martin, Chief Meteorologist, Global TV Edmonton*

# The Top Ten Weather Stories for 2002*

by David Phillips[1]

Last year's droughts wreaked havoc in Canada, costing our economy billions of dollars. But just when we thought it couldn't get worse, it did! This year, more drought - combined at times with floods, freezing, heat, disease and pests - made 2002 even worse, surpassing drought conditions from the infamous 1930s dust bowl. Western producers feared the worst and then had to face it, as fellow Canadians shook their collective heads. Without a doubt, weather woes in the Prairies came up as this year's number one weather story.

For the rest of the country, it was a crazy year for weather. El Niño was back, Gustav came ashore and vineyards harvested ice wine twice - the latest and earliest ever. As for the seasons, it was winter that wasn't, spring felt more like winter, summer overstayed and fall went missing.

On the good news/bad news front, the East had a hot, hazy summer and Central Canada enjoyed near-perfect weekends and holiday weather. Unfortunately, farmers and gardeners in both regions were left wanting for more of the wet stuff. This year's other top stories include a record drought on the Pacific Coast, back-to-back hurricanes, smoke from Québec that traveled to Washington, and the weather travails of the Pope and the Queen who experienced first-hand why Canadians are obsessed with the weather.

The following top weather stories for 2002 are rated from one to ten based on the impact they had on Canada and Canadians, the extent of the area they affected and their longevity as a top news story.

### 1. Prairie Plagues

This year's growing season was the worst ever for farmers in Western Canada. The weather brought drought and deluges of biblical proportions, searing heat, clouds of grasshoppers, pestilence and mid-summer snow and frost, topped off by harvest rains that showed up late and dumped too much. The stress and strain reached the breaking point for thousands of producers, their families and communities. While there is no doubt that farmers and ranchers were hit hard, others, like grain handlers, truckers, feed lot operators, vehicle and equipment dealers, shopkeepers and restaurateurs also felt the sting.

The seeds of this year's misery were sown over the last five years, with two-thirds of the seasons recording warmer and drier than normal conditions during that time. Going into spring 2002, Western Canada was the driest it had been in over a century. Farmers needed 60% more precipitation than usual before the start of the growing season just to replenish water supplies. What they got was a 60% decrease in precipitation, which effectively ended the growing season before it ever got started.

As winter changed to spring, the relentless dryness in the south moved northward to grip the middle Prairies. The most affected area was the central rectangle between Edmonton, Calgary, Moose Jaw and Saskatoon - some of the most productive land in western Canada. Dugouts and ponds dried out or, at best, hit a quarter full. In Saskatoon, June's precipitation was down 56% and marked the eighteenth consecutive month with below-normal precipitation. In the Edmonton area, the period October 1, 2001 to April 30, 2002 was the driest start to a growing season since records began in 1880.

The extremely dry conditions and record cold in April and May delayed seeding and slowed crop growth all year. Then temperatures warmed dramatically, giving Edmonton its second warmest and driest June and July ever. Severe heat stress began to take its toll on all moisture-starved crops, especially cereal and oilseeds. More extremes followed with a shocking record freeze and snowfall in late July and early August. Century-old weather records were shattered in many parts of Saskatchewan when the temperature dipped below zero on August 2, the earliest August frost day in 109 years of records.

**Top Ten Weather Stories for 2002**

1. Prairie Plagues
2. Winter 2001-02 Cancelled
3. A Lazy, Hazy Summer
4. Prairie Rain Gushers - too much too soon
5. Icy Spring Shatters Records
6. Sizzling Summer in the Cities
7. "Wet" Coast Drought
8. Four Hurricanes in Four Weeks
9. Québec Smoke Crosses Borders
10. Canadian Weather Fit for A Pope and A Queen

[1] Environment Canada, Downsview, Ontario.

As the southern districts started harvesting in late August, the weather took a cruel twist. The rains that farmers begged for in June, and didn't want at harvest time, fell from the skies at the worst possible time. What scanty grain the snow and frost had missed was divided up among cattle, grasshoppers and migratory birds. The grasshopper infestation reached far and wide with counts of 100 insects per square metre in one Saskatchewan district. In most areas, the growing season ended after a severe frost in the middle of September. Frequent showers plagued the harvest for the next two weeks, followed by snow at the start of October. The season ended abruptly with 10 to 15% of the crop still left in fields.

In terms of wheat production, figures came in more than 25% below last year's meagre production and the quality was so poor that the majority of the harvest was graded as feed. To make matters worse, poor pasture conditions - along with decimated hay crops - caused feed-strapped livestock producers to sell off some of their herd. The Prairie plagues prompted record crop insurance payouts and government assistance to help producers weather the adversity.

**2. Winter 2001-02 Cancelled**

Nationally, it was the eighth warmest winter in over half a century and the eighteenth driest, pretty much par for the course over the recent past. In fact, the country hasn't seen a really cold winter since 1993-94. For the more than 15 million Canadians living in the Great Lakes-St. Lawrence region, the 2001-02 winter was the warmest ever - the kind that only comes around once every 210 years.

In many parts of Canada, winter barely showed. A persistent stream of Hawaiian air flooded North America, driving the jet stream farther north and nudging out the Arctic air that normally dominates Canada's winter. Without snow cover, the warm Pacific air surged unaltered across North America all the way to the Atlantic Coast. As a result, snowmobiles gathered dust and skaters sat on the sidelines throughout most of the winter season. Ottawa's Rideau Canal, renowned as the world's longest skating rink, was a stretch of slush and puddles for most of the winter. It recorded its latest opening date ever (February 2) and its shortest season (25 days).

For inhabitants of southern Ontario and parts of Québec, winter was fairly frost-free. In Toronto, only 25 days had daily highs below freezing - less than half the usual number - and the average winter temperature in the city was the warmest since 1840 (when record-keeping began). The real story wasn't that it was so warm but rather it wasn't very cold! In Montreal, for instance, overnight lows never dipped below -19°C (the mark of a cold Canadian day) which was a first for the record books. And places like Toronto, Hamilton, London, Ottawa, Windsor, Québec City, Val D'Or and Bagotville also logged records for the warmest winter to date.

On the positive side, huge sums of money were saved on snow removal, there were fewer traffic accidents and easier commutes, flooding was negligible and home heating bills were down by 25% in central Canada. For people who love and depend on winter, the season was one of the most boring and expensive in years. The warmth wreaked havoc with the construction of ice bridges and winter roads in the North, ski-hill operators in Ontario and Québec lost their shirts, and outdoor enthusiasts were greatly disappointed. Even retail customers stayed home, leaving businesses with large unsold inventories of snowboards, snowmobiles and snow shovels.

**3. Lazy, Hazy Days of Summer**

The summer was generally a quiet time for weather across Canada with fewer thunderstorms, twisters and hailers and less property damaged from severe weather. Like year 2001, there were no strong tornadoes and the thunderstorms that did break out were generally weak and short-lived. But where we lacked in the storm department, we made up for in smog.

This year's summer brought excessive heat, loads of sunshine and sluggish circulation, which meant a record-breaking year for smog advisories in southern Ontario. In the most seriously affected area, between Toronto and Windsor, authorities issued 10 advisories totalling 27 days - more than last year's record - and logged the latest smog episode on the books (September 10).

In Québec, there were 15 smog days on seven separate occasions. Montréal was the most affected with 13 days (normal is 10). The worst air episode lasted four days in August under a weak southwesterly flow that kept re-circulating the same mass of hot, humid, stale air. It was the longest bout of continuous smog in Québec since its air-monitoring program began in 1994. Also of note, the last two summers in Montréal have been the worst for smog in the last 15 years.

Even the Maritimes could not escape the haze. From August 14 to 16, the Annapolis Valley was shrouded in smog so thick that even from the heights of Cape Blomidon, Wolfville could not be seen. Officials issued smog and health advisories on seven occasions with some of these extending over a period of two or three days. Normally, the Atlantic Region can expect two smog episodes per year. And in portions of central and eastern Newfoundland, where the air is normally quite clear, pollution concentrations just short of the threshold for poor air quality were noted.

**4. Prairie Rain Gushers - too much too soon**

After three years of drought, rains finally came to the southern Prairies in early June with a series of large, slow-moving storms. What began on June 6 as a light sprinkle south of the Trans-Canada Highway turned into biblical-sized deluges over three days. For some, record rains dumped up to 280 mm, transforming dustbowls into mudbowls. In Brocket, Alberta the community got a year's worth of rain in three days. Rivers spilled their banks, sewage systems overflowed and roads were washed away. In the higher elevations of Waterton Park, ice and 100-cm high snowdrifts forced campers to leave their campsites. Residents in Lethbridge mopped up flooded basements and others abandoned their homes. While farmers in parched lands should have rejoiced, the deluge of water washed away seeds and further delayed the planting season. Across the Trans-Canada Highway, farmers and ranchers hoping for some spillover rain could only watch in vain when the storm clouds dissipated north of Calgary.

In Saskatchewan, two days of soaking, not flooding, rains were welcomed by drought-stricken farmers, breaking the worst dry spell in living memory. Many locations received between 80 mm and 120 mm - enough to recharge the soil moisture, fill reservoirs and green-up parched pastures. In Saskatoon, a meagre rainfall of 14 to 18 mm (the most in one day in a year) was enough to raise spirits temporarily.

At the same time, violent thunderstorms rolled into southern Manitoba dumping up to 250 mm of rain - the largest drenching in recent memory - and bringing winds of up to 114 km/h. In Winnipeg, only 60 mm of rain fell over two days but that was enough to flood streets and basements, and swamp cars when sewers could not keep pace with the downpour. Several traffic lights and 300 trees toppled over, while the city's popular river walk was submerged under a metre of water, closing it for nearly a month.

Southeast of the Manitoba capital, flash flooding drowned fields and washed out roads. Nine rural communities declared states of emergencies when water rose higher than the "flood of the century" in 1997. Piney and Sprague were the towns hardest hit. Rising waters forced many residents to leave town by boat. At Sprague, a metre of water filled the main street and a boil-water advisory was in place for well users. Half the cereal, canola and soybean crops in southeastern Manitoba were lost. And three weeks later, a new wave of mosquitoes emerged from the sodden ground and standing waters.

### 5. Icy Spring Shatters Records

Spring was the cruelest season for Canadians from coast to coast. Overall, Canada had its fifth coldest spring. What was especially jarring was the fact that it was the first cold season of the past nineteen. For most Canadians between Vancouver and Montréal, spring was just too long, too cold and too much like the winter they didn't get.

On March 20, the temperature dipped to -35°C on the Prairies. For the fourth day in a row it snowed in Victoria and Vancouver (the deepest and latest major snowfall ever). In London, deadly whiteouts swept the region, while in Ottawa and Montréal residents were digging out of their greatest snowfall in a year and southern New Brunswick got hit with 25 cm of wet, sticky white stuff. Welcome to the first day of spring!

On the Prairies, it was the coldest spring since records began 120 years ago. In some areas, March was colder than January and February for the first time ever. And sadly, it was a dry cold. Saskatoon had its second driest spring in over 97 years. It didn't look dry in Calgary because most of the precipitation was snow, 70% more than usual. The city had 25 snow days in spring, 10 more than normal, with the final blast hitting Calgary on the May long weekend. Mental health workers in the city claimed that gloomy weather was responsible, in part, for record numbers of people calling crisis hotlines.

While snow seldom falls in Victoria or Vancouver after the middle of March, the first days of spring brought between 10 and 15 cm of snow. During that month, new low temperature records tumbled throughout British Columbia, eclipsing more than 530 previous daily records. And it wasn't over yet. On May 6, the west coast shivered when temperature highs barely made it above freezing. Snow flurries and ice pellets filled the air across the Lower Mainland.

Across southern Ontario and Québec, a mid-April heat wave shattered high temperature records but it turned out to be a false spring. Just a week later, a wind-whipped storm left the Great Lakes region covered in snow, cold rain and ice pellets. In Ottawa, a record 17 cm of snow fell on April 28. Across the two provinces, a frosty Victoria Day weekend felt more like Remembrance Day as cold arctic air hung overhead bringing in a nasty mixture of rain, ice pellets and snow as far south as Sarnia. Die-hard campers stocked up on blankets, hand warmers, toques and parkas. Tragically, four campers near Kenora who used a propane heater to ward off the long weekend's brisk temperatures died from carbon monoxide poisoning.

The unseasonably cold weather critically delayed farmers planting their crops. In southern Ontario, farmers planted corn three weeks later which created problems when mid-season rains failed. Strawberry farmers irrigated around the clock in an attempt to save the tender plants from frost. The cold also delayed the forest fire season by up to two weeks in areas from Ontario westward.

Nature was confused and so were customers. Golfers and gardeners had been teased all winter by little snow and balmy temperatures and had hoped for an earlier spring. Garden centres and outdoor attractions were virtually empty for much of the spring. Retailers blamed the persistent cool weather for a 30% drop in the sales of weather-sensitive goods and services, such as pools, air conditioners and warm season apparel with many Canadians putting off or outright cancelling purchases.

### 6. Sizzling Summer in the Cities

For the majority of Canadians, it was a summer to remember with record warmth, perfect weekends and little weather. In Eastern Canada, it was a slow start to summer, but once underway, it just wouldn't give up and was topped off by the warmest September ever. At Toronto, the average June 1 to September 30 temperature was 21.5°- a whopping 3.2 degrees warmer than normal and the warmest ever in 63 years. The number of hot days above 32°C was 23 (normal is 5) and hot nights above 20°C a record 19 (normal is 5). Life in the big city was not only hot and steamy, but also downright stinky because of a ten-day garbage strike. Toronto declared 15 heat-alert days and two heat emergencies, the third greatest number of heat days with records dating back to 1955. The blistering heat prompted people to crank up air conditioners, leading to record energy consumption.

In Montréal, the summer period (June 21 to September 20) was both the driest and warmest ever. Incredibly, total summer rainfall was 25% less than last summer's, which was itself a record. In the Maritimes, summer was slow to start. Overall, temperatures were close to normal but for the fifth summer in the past six, rainfall was less than normal. British Columbia had a glorious summer. It was in the top ten of the province's warmest, and the third driest on record, with precipitation 30% below average. And in southern Ontario and Québec, weekends ruled. Of the 31 weekend days and holiday Mondays from June 1 to Labour Day, only four to seven were wet (with often just a sprinkle). Most Canadians didn't want summer's great weather to end, especially for cottage holidays, barbecues and outdoor weddings.

What was good for campers and beach bums, though, was bad for farmers and gardeners. The lack of rain created drought concerns in central Canada for the second summer in a row. For Sarnia, London and Kitchener-Waterloo, among others, it was the driest August and driest month ever. Toronto (Pearson Airport) had its driest August ever since 1937. For the Great Lakes region, concerns were escalated because five of the last six summers have been drier than normal. Most crops were late getting into the ground because of the cool, wet spring. And while hot, dry conditions early on helped corn and soybean production, the lack of rain meant plants couldn't sustain their growth. In the cities, scant precipitation ravaged thousands of trees. Many died, while others just hung on or were badly stressed which made them vulnerable to pests and disease.

### 7. "Wet" Coast Drought

British Columbia's dry season worked overtime this year. In Vancouver, only 105 mm of rain fell from June to October - barely a third of normal and the driest in 65 years of records. It was especially dry in October when a scant 18.3 mm of rain fell at the International Airport compared to its average 112.5 mm. Whistler and Port Hardy also had their driest October ever. In the interior, Vernon experienced its driest ever June-to-October rainfall with only 72 mm - the lowest since records began in 1900. Victoria International Airport also broke a record for least precipitation in a stretch from April to October.

The long dry spell was connected to a persistent high-pressure area over the province that blocked storms from reaching the coast. Further, a mysterious pool of warm water suddenly appeared over the northeastern Pacific Ocean in late summer about 1500 km from the Coast. The resulting lack of rain led to concerns about water levels in several areas of BC, including Vancouver. By early November, reservoirs there fell to about 25% of capacity and were dropping at a rate of 1% per day. The season's salmon run was also threatened as streams over Southern Vancouver Island went dry.

Relief came in early November, when fall storms lashed the coastal region but little moisture fell elsewhere. Heavy rains flooded basements in Vancouver and the city's airport reported almost a month's worth of rain - 147 mm in 17 consecutive days. Unfortunately, the rains ended as quickly as they began, and what was looking like the first wet month in a long time ended up with below-normal rainfall totals. The last two weeks of November, traditionally the wettest two weeks of the year, had no moisture at all. In the interior, things were no better. Kelowna received less than 50% of its normal precipitation in November and, for the first time ever, no snow.

By early December, with rainfall and reservoirs at historic lows, officials in Victoria raised the possibility of winter outdoor watering restrictions - a first! The region's main water supply at Sooke was short three billion gallons and losing ground at 18 million gallons a day. Pacific Coast water managers continue to worry as the last three years have been among the nine driest over 55 years of records, with some 15% less precipitation. Other sectors that depend on a stable amount of water, including forestry, agriculture, sport and commercial fishing, hydro power, and recreation and tourism, are also feeling the pinch.

Finally, on December 10, the rains came! A series of intense Pacific storms began pummeling the west coast with extreme winds and rain. The storms curved northward to the Gulf of Alaska, clipping and occasionally crossing the northern BC Coastline. One storm packed winds in excess of 100 km/h at Point Atkinson and 130 km/h on the outer coast of Vancouver Island, prompting forecasters to issue a rare warning for hurricane-force winds in the Strait of Georgia. Even the relatively sheltered Powell River Airport recorded a powerful gust of 111 km/h.

### 8. Four Hurricanes in Four Weeks

Meteorologists foresaw a normal hurricane season in the North Atlantic Ocean and for the most part they were pretty accurate. At season's end, there were a dozen named storms from Arthur to Lili, four of which became full-blown hurricanes and two that logged in as major storms with winds above 178 km/h. The season was the calmest in five years, explained, in part, by a strengthening El Niño.

While the season itself was considered calm, September stood out as an especially explosive month with the formation of eight of the season's twelve named storms - an all-time record for a single month in the Atlantic - due in part to the sudden warming of the sea surface temperature. All four hurricanes - Gustav, Isidore, Kyle and Lili - developed in September and each had an impact on Canada.

Hurricane Gustav was the first of the year, making it the first hurricane to strike so late in the year in more than 60 years. On September 12, Gustav made landfall near Sydney, NS - a day after being upgraded to a full-fledged hurricane, and the first hurricane to make landfall in Nova Scotia in six years. The storm caused power outages, downed trees and minor flooding. The greatest rainfall (100 mm) occurred near Antigonish, NS and the highest wind speed (122 km/h) on Sable Island. Wind gusts over 100 km/h from the remains of Gustav were still being reported in Newfoundland days afterward. Fortunately, disaster was narrowly averted in Charlottetown as Gustav's storm surge arrived just four to five hours shy of high tide. Had it hit at the tide's peak, an additional 70 cm of elevated water would have inundated the downtown core.

Next came Isidore, one of the season's two intense hurricanes, which moved onshore in Louisiana on September 26. Its leftovers moved south of the Great Lakes and into the Maritimes the next day with welcomed rainfalls of 25 to 35 mm from Ontario eastward.

Fast on Isidore's tail, Hurricane Lili tore through Louisiana one week later. The next day, its tropical remains merged with a storm in the Great Lakes and deepened into an intense low that moved through northern Ontario and Québec. Damage was limited to power outages and fallen trees.

Kyle, the last of the September hurricanes, was not so much forceful as it was persistent. Dubbed this year's "Energizer Bunny", it kept going and going for 22 days making it the third longest-lived storm in history. Even more unusual, Kyle strengthened into a tropical storm on four separate occasions. Bay of Fundy residents feared the storm would fulfill a threatening prediction in the Farmer's Almanac -- that Kyle would be the second coming of the infamous Saxby Gale, a vicious storm in 1869 that destroyed hundreds of boats and drowned over 1000 people. Fortunately, Kyle never even reached Canada's coast and was dubbed the "Saxby Fail."

### 9. Québec Smoke Crosses Borders

In the first week of July, millions of residents in Eastern Canada woke up to the smell of acrid smoke and the sight of hazy skies. Concerned citizens inundated police and fire departments with calls. Satellite images revealed lightning-triggered forest fires south of James Bay in Québec as the source. The fires were deemed the province's worst in a decade, as tens of thousands of pine and black spruce burned near James Bay and the Manicouagan Reservoir. The blazes were so intense that water bombers could not fly close because of thick smoke and strong air currents.

The smoke traveled so widely because it became trapped under a layer of warm air that concentrated the plume. The smoke layer, which measured 200 to 300 km wide, was siphoned by a northerly flow which swept it across southern Québec and southern Ontario, westward into Michigan, eastward to all four Atlantic Provinces, and as far south as Washington and Baltimore. The smoke pall cut visibility to three kilometres in places, and dimmed sunshine for much of the Northeast. Old Québec City was shrouded in a white haze, obscuring visibility in the lower town to less than 500 m. In Montréal, fine ash particles fell on cars, and authorities issued health advisories. In Toronto, with the city in the midst of a civic strike, the smell of smoke was a welcome relief from rotting garbage.

### 10. Canadian Weather Fit for A Pope and A Queen

This year two world-famous dignitaries experienced first-hand why Canadians are so obsessed with our ever-changing weather.

Pope John Paul II arrived in Toronto on July 23 during a triple-whammy weather advisory of heat, haze and humidity. The day before, a powerful thunderstorm rolled across the region bringing heavy rains and high winds and downing power lines and trees. Near London, a World Youth Day event was cancelled because of the threat of tornadoes. On July 28, a crowd of 800,000 packed Downsview Park in north Toronto to celebrate outdoor mass with the Pope. The day before, in scorching heat, hundreds of young people had been treated on site or at local hospitals for heat exhaustion and sun-stroke as temperatures in the shade soared to a steamy 30°C. Prior to the Sunday mass, around 5 a.m., a cold, drenching rain fell for several hours and hundreds of shivering pilgrims had to be treated for hypothermia.

Queen Elizabeth II arrived in Iqaluit, Nunavut on October 2 for the start of her Golden Jubilee tour of Canada. Large crowds came out to welcome the royal couple in sub-freezing temperatures and snow flurries. Two days later, thousands of residents in Victoria greeted the Queen and Prince Philip under majestic clear skies and warm sunshine. But it was the cool and blustery weather on October 8 in Winnipeg that sparked the greatest interest, especially back home. In the afternoon, the temperature hovered close to freezing and strong north-northwesterly winds blew at 35 km/h, gusting to 50. The damp cold felt even colder on the Red River, where the water taxi carrying the Royal Couple stalled and had to be towed to shore.

On October 12, the Royals visited Sussex, New Brunswick in bright sunshine and comfortable fall temperatures. But the next day in Ottawa, the Queen endured a stiff westerly wind and steady driving rain during ceremonies on Parliament Hill and at the National War Memorial. Despite the miserable weather, more than 4000 soaked and shivering spectators attended the event.

* Source: Environment Canada Website.

**Weatherlore**

When a cow tries to scratch its ear...It means a shower is very near.

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## LES DIX ÉVÉNEMENTS MÉTÉOROLOGIQUES MARQUANTS de 2002**

par David Phillips[2]

Les sécheresses de l'an dernier ont fait des ravages au Canada, coûtant à notre économie des milliards de dollars. Alors qu'il semblait que la situation ne pouvait que s'améliorer, elle s'est aggravée! Les sécheresses de cette année, combinées à l'occasion à des inondations, du gel, de la chaleur, des maladies et des parasites, ont fait que 2002 a encore été pire, dépassant même les conditions de sécheresse du « dust bowl » de sinistre mémoire des années 30. Les producteurs de l'Ouest ont craint le pire, puis ont dû y faire face, alors que le reste des Canadiens ne pouvait que constater la situation. Il ne fait aucun doute que la situation dans les Prairies a été l'événement météorologique le plus marquant de l'année au Canada.

Dans le reste du pays, l'année fut également folle. El Niño est revenu, Gustav a touché les côtes et il y a deux vendanges des vignes servant à faire du vin de glace, la plus hâtive et la plus tardive qu'on n'ait jamais enregistrées. Quant aux saisons, l'hiver n'en a pas été un, le printemps a ressemblé davantage à l'hiver, l'été s'est prolongé et l'automne est passé aux oubliettes.

Dans le domaine des bonnes et des mauvaises nouvelles, l'Est a connu un été chaud et brumeux, alors que le Canada central a connu un temps presque parfait pendant les fins de semaine et les vacances. Malheureusement, les agriculteurs et les jardiniers des deux régions ont tous manqué d'eau. Parmi les autres événements météorologiques marquants, on peut citer une sécheresse record sur la côte du Pacifique, des ouragans en série, la fumée des incendies de forêt du Québec qui a été visible jusqu'à Washington et le temps pénible à l'époque des visites du Pape et de la Reine, qui a bien montré pourquoi les Canadiens sont obsédés par les prévisions météorologiques.

Les événements météorologiques marquants ci-dessous, survenus en 2002, sont classés de un à dix en fonction des répercussions qu'ils ont eues sur le Canada et sur les Canadiens et les Canadiennes, de l'étendue de la région qu'ils ont touché et de leur longévité à la une de la presse

**1. Les fléaux des Prairies**

La saison de croissance des cultures de cette année a été la pire que les agriculteurs de l'Ouest du pays ont jamais connu. Ils ont été confrontés à des sécheresses et des déluges à grande échelle, à une chaleur qui a tout desséché, à des nuages de sauterelles, à divers insectes ainsi qu'à de la neige et du gel au milieu de l'été, auxquels sont venues s'ajouter, trop tard, des pluies trop fortes au moment des récoltes. La situation a atteint un point de rupture pour des milliers de producteurs, leurs familles et les collectivités. Il ne fait aucun doute que les agriculteurs et les éleveurs ont été durement touchés, leur situation a également eu des répercussions sur d'autres, comme les manutentionnaires de céréales, les camionneurs, les exploitants de parcs à fourrage, les vendeurs de véhicules et d'équipement, les magasiniers et les restaurateurs, qui ont tous aussi été durement touchés.

**Les dix événements météorologiques marquants de 2002**

1. Les fléaux des Prairies
2. L'hiver 2001-2002 a disparu
3. Un été aux journées mornes et brumeuses
4. Déluges dans les Prairies -- Trop et trop tôt
5. Un printemps glacial qui bat des records
6. En ville, on a grillé cet été
7. Sécheresse sur la verte Colombie-Britannique
8. Quatre ouragans en quatre semaines
9. La fumée du Québec franchit les frontières
10. Un temps idéal pour les visites du Pape et de la Reine

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[2] Environnement Canada, Downsview, Ontario.

Les malheurs de cette année ont pris naissance au cours des cinq dernières années, alors que les deux tiers des saisons ont enregistré un temps plus chaud et plus sec que normalement à la même époque. Au début du printemps 2002, la sécheresse dans l'Ouest du pays était plus marquée qu'elle ne l'avait jamais été depuis un siècle. Les agriculteurs auraient eu besoin de précipitations dépassant de 60 % les volumes habituels avant le début de la saison de croissance, simplement pour reconstituer les stocks d'eau. Au lieu de cela, ils ont subi une diminution de 60 % des précipitations, qui a eu pour effet de mettre fin à la saison de croissance avant même qu'elle ne débute.

Quand le printemps a remplacé l'hiver, la sécheresse sans fin s'est déplacée du sud vers le nord pour toucher le centre des Prairies. La région la plus touchée a été le rectangle délimité par Edmonton, Calgary, Moose Jaw et Saskatoon, c'est-à-dire des terres qui comptent parmi les plus productives de l'Ouest du Canada. Les fosses-réservoirs et les étangs se sont asséchés ou, dans le meilleur des cas, n'ont été remplis qu'au quart. À Saskatoon, les précipitations du mois de juin ont été en baisse de 56 % et c'était le dix-huitième mois consécutif de précipitations inférieures à la normale. Dans la région d'Edmonton, la période allant du 1^er^ octobre 2001 au 30 avril 2002 a été le début le plus sec d'une saison de croissance depuis 1880, année au cours de laquelle on a commencé à tenir des statistiques.

La sécheresse extrême et les froids record des mois d'avril et de mai ont retardé l'ensemencement, et ralenti la croissance des cultures toute l'année. Ensuite, les températures ont grimpé de façon brutale, ce qui a fait que les mois de juin et juillet à Edmonton ont été les seconds plus chauds et plus secs jamais enregistrés. L'excès de chaleur a commencé à se faire sentir sur toutes les cultures qui manquaient déjà d'humidité, en particulier les céréales et les oléagineux. La situation n'a fait que s'aggraver à la fin juillet et au début août alors que cette partie du pays a enregistré des records de gel et de chutes de neige. Les records de température vieux d'un siècle ont été battus dans de nombreuses parties de la Saskatchewan quand la température a plongé en-dessous de zéro le 2 août, la date la plus avancée pour un premier gel en 109 ans de statistiques.

Quand les régions du sud ont débuté les récoltes à la fin août, le temps leur a joué un autre tour cruel. La pluie dont les agriculteurs avaient tant besoin en juin, et dont ils ne voulaient pas à l'époque des récoltes, est tombée au pire moment possible. Les quelques céréales que la neige et le gel avaient épargnées ont alors été réparties entre le bétail, les sauterelles et les oiseaux migrateurs. L'invasion de sauterelles a atteint 100 insectes par mètre carré dans un district de la Saskatchewan. Dans la plupart des régions, la période de croissance s'est terminée après un gel marqué au milieu septembre. Les averses fréquentes ont nui aux récoltes pendant les deux semaines suivantes, et ont été suivies de neige au début octobre. La saison a pris fin de façon abrupte alors que 10 à 15 % des récoltes se trouvaient encore dans les champs.

En termes de production de blé, les chiffres de cette année sont inférieurs de 25 % à ceux de l'an dernier, qui étaient déjà très médiocres, et la qualité est si décevante que la majorité de la récolte est allée à l'alimentation animale. Pour aggraver encore la situation, le mauvais état des pâturages, alors que les prairies artificielles étaient en piteux état, a amené les producteurs de bétail, en manque d'aliments, à vendre une partie de leurs troupeaux. Tous ces fléaux qui ont touché les Prairies ont déclenché des versements records d'assurance-récolte et d'aide gouvernementale pour aider les producteurs à faire face à l'adversité.

**2. L'hiver 2001-2002 a disparu**

À l'échelle nationale, ce fut le huitième hiver le plus chaud en un demi-siècle et le dix-huitième le plus sec, à un niveau proche de celui constaté au cours des dernières années. En réalité, le pays n'a pas vraiment connu d'hiver froid depuis 1993-1994. Les Canadiens vivant dans la région des Grands Lacs et du Saint-Laurent, dont le nombre dépasse 15 millions, ont connu en 2001-2002 l'hiver le plus chaud qu'ils aient jamais vécu, un hiver comme on n'en voit que tous les 210 ans.

Dans certaines parties du Canada, l'hiver s'est à peine montré. Un flux persistant d'air en provenance de Hawaï a inondé l'Amérique du Nord, repoussant le courant atmosphérique à grande vitesse vers le Nord et emprisonnant l'air arctique qui joue normalement un rôle dominant en hiver au Canada. Sans couverture neigeuse, l'air chaud du Pacifique l'est resté en traversant l'Amérique du Nord jusqu'à la côte Atlantique. Les motoneiges n'ont alors pu que soulever la poussière alors que les patineurs n'ont pu pratiquer leur sport pendant une bonne partie de l'hiver. À Ottawa, le canal Rideau, connu comme la plus longue patinoire au monde, n'a été qu'une bande de purée de glace parsemée de marres pendant la plupart de l'hiver. Le canal Rideau n'a jamais été ouvert si tard aux patineurs (2 février) et pendant si peu de temps (25 jours).

Les habitants du sud de l'Ontario et de certaines régions du Québec ont connu un hiver pratiquement exempt de gel. À Toronto, la température maximale n'a été inférieure au point de congélation que 25 jours, moins de la moitié de la normale, et la température moyenne pour l'hiver dans la ville a été la plus chaude depuis 1840 (date à laquelle on a commencé à tenir des statistiques). En vérité, ce n'est pas qu'il a fait très chaud, mais plutôt qu'il n'a pas fait très froid! C'est ainsi qu'à Montréal, les températures inférieures au cours de la nuit n'ont jamais chuté en-dessous de -19° C (la marque d'un jour froid au Canada) et ce fut une première. Dans des endroits comme Toronto, Hamilton, London, Ottawa, Windsor, Québec, Val D'Or et Bagotville, on a également enregistré des records d'hiver le plus chaud jusqu'à maintenant.

Cela a eu des avantages. Des sommes énormes ont été économisées en déneigement, il y a eu moins d'accidents de la circulation et les déplacements ont été plus faciles, l'engorgement du sol a été négligeable, les factures de chauffage des résidences ont baissé de 25 % dans le centre du pays. Par contre, pour les gens qui aiment l'hiver et qui en dépendent, la saison fut une des plus ennuyeuses et des plus coûteuses depuis des années. La température a nui à la construction de ponts de glace et de routes d'hiver dans le Nord, les exploitants de centres de ski de l'Ontario et du Québec ont perdu leurs chemises, et les amateurs de grand air ont été très déçus. Même les clients de commerce de détail sont restés à la maison, laissant dans les magasins des stocks invendus importants de planches à neige, de motoneiges et de pelles.

**3. Un été aux journées mornes et brumeuses**

Du point de vue météorologique, l'été a été généralement calme dans tout le pays puisqu'on a enregistré moins d'orages, de tornades et de grêle, et moins de dommage aux biens causés par le mauvais temps. Comme l'an dernier, il n'y a pas eu de tornades dévastatrices et les orages n'ont pas été très puissants et ont le plus souvent duré peu de temps. À la place des orages, nous avons par contre eu du smog.

Cet été a connu de fortes chaleurs, beaucoup de soleil et peu de déplacements des masses d'air, ce qui a donné une année record pour les alertes au smog dans le sud de l'Ontario. Dans les régions les plus gravement touchées, entre Toronto et Windsor, les responsables ont lancé dix avertissements couvrant au total 27 jours, soit plus que le record de l'an dernier, et ont enregistré la présence de smog la plus tardive dans les livres, le 10 septembre.

Au Québec, il y a eu au total 15 jours de smog répartis en sept périodes. Montréal a été la plus touchée avec 13 jours alors que la normale est de dix. Le cas le plus grave a duré quatre jours en août avec des vents légers du sud-ouest qui faisaient tourner la même masse d'air chaud, humide et vicié. Ce fut la manifestation la plus longue de smog en continu au Québec depuis que le Programme de surveillance atmosphérique a débuté en 1994. Il faut également signaler que les deux derniers étés montréalais ont été les pires en matière de smog pour les 15 dernières années.

Même les Maritimes n'ont pas échappé à la brume. Du 14 au 16 août, la vallée Annapolis a été couverte d'un smog si épais qu'on ne pouvait même pas apercevoir Wolfville des hauteurs du Cap Blomidon. Les responsables ont publié des alertes au smog et des avis en matière de santé à sept occasions, dont certains se sont prolongés sur des périodes de deux ou trois jours. Normalement, dans la région de l'Atlantique, on s'attend à deux manifestations de smog par année. On a également signalé dans les régions du centre et de l'est de Terre-Neuve, où l'air est normalement passablement clair, des concentrations de pollution qui se situaient juste en-dessous du seuil d'une mauvaise qualité de l'air.

**4. Déluges dans les Prairies -- Trop et trop tôt**

Après trois ans de sécheresse, la pluie est enfin arrivée sur le sud des Prairies au début juin avec une série d'orages importants se déplaçant lentement. Ce qui a débuté le 6 juin sous forme de crachin au sud de l'autoroute Transcanadienne s'est ensuite transformé en déluge qui a duré plus de trois jours. À certains endroits, les précipitations ont atteint 280 mm, transformant les cratères de poussière en cratères de boue. Brocket, en Alberta, a reçu en trois jours les précipitations qu'elle a d'habitude en un an. Les rivières et les égouts ont débordé et les routes ont été emportées. Dans les parties les plus hautes du parc Waterton, la glace et les accumulations de neige poussée par le vent, qui atteignaient un mètre, ont contraint les campeurs à partir. Certains résidents de Lethbridge ont dû éponger leurs sous-sols inondés pendant que d'autres ont été contraints à l'abandon de leurs résidences. Alors que les agriculteurs aux terres desséchées auraient dû être ravis, le déluge a emporté les semences et retardé la saison de plantation. De part et d'autre de l'autoroute Transcanadienne, les agriculteurs et les éleveurs qui espéraient voir les eaux ruisseler jusqu'à eux n'ont pu qu'observer les nuages d'orage qui se dissipaient au nord de Calgary.

En Saskatchewan, deux jours de pluie qui ont bien trempé la terre sans l'inonder ont été bien accueillis par les fermiers touchés par la sécheresse, interrompant ainsi la pire période de sécheresse de mémoire d'homme. Beaucoup d'endroits ont reçu des précipitations entre 80 et 120 mm, soit assez pour redonner son humidité au sol, remplir les réservoirs et faire verdir les pâturages desséchés. À Saskatoon, une maigre pluie qui a donné des précipitations de 14 à 18 mm, la plus importante en un jour en un an, a suffi à remonter le moral de façon temporaire.

Au même moment, des orages violents touchaient le sud du Manitoba en y déversant jusqu'à 250 mm de pluie, la précipitation la plus forte dans l'histoire récente, avec des vents atteignant 114 km/h. À Winnipeg, il n'y a eu que 60 mm de pluie à tomber sur deux jours et cela a suffi à inonder les rues et les sous-sols, et à transformer des quartiers en marécages quand les égouts n'ont plus été en mesure d'absorber l'eau. Plusieurs feux de circulation et 300 arbres se sont effondrés, alors que les berges populaires de la rivière étaient submergées sous un mètre d'eau, obligeant à les fermer pendant plus d'un mois.

Au sud-est de la capitale du Manitoba, les inondations brusques ont couvert les champs et les routes. Neuf collectivités rurales ont déclaré un état d'urgence quand le niveau d'eau a dépassé celui des inondations du siècle en 1997. Les villes les plus durement touchées ont été Piney et Sprague. La hausse du niveau de l'eau a contraint de nombreux résidents à quitter la ville en bateau. À Sprague, il y avait un mètre eau dans la rue principale et les utilisateurs de puits ont été informés qu'ils devaient faire bouillir l'eau. La moitié des récoltes de céréales, de colza canola et de soya du sud-est du Manitoba ont été perdues. En plus, trois semaines plus tard, une nouvelle vague de moustiques a pris naissance dans les terrains détrempés et les étendues d'eau.

**5. Un printemps glacial qui bat des records**

Le printemps a été la saison la plus cruelle pour les Canadiens d'un océan à l'autre. Dans l'ensemble, le pays a connu son cinquième printemps le plus froid. Ce qui a le plus surpris a été qu'il s'agissait du premier printemps froid depuis dix-neuf ans. Pour la plupart des Canadiens résidant entre Vancouver et Montréal, le printemps a été tout simplement trop long, trop froid en ressemblant trop à l'hiver qu'ils n'avaient pas eu.

Le 20 mars, les températures ont chuté à -35°C dans les Prairies. Il a neigé pendant quatre jours d'affilée à Victoria et à Vancouver avec la chute de neige la plus importante et la plus tardive jamais enregistrée. À London, des voiles blancs mortels ont balayé la région alors que les résidents d'Ottawa et de Montréal affrontaient leur plus importante chute de neige depuis un an et que le sud du Nouveau-Brunswick recevait 25 cm de neige humide et lourde. Vive l'arrivée du printemps!

Les résidents des Prairies ont, eux, connu le printemps le plus froid depuis que des statistiques sont tenues, soit depuis 120 ans. Dans certaines régions, le mois de mars a été pour la première fois plus froid que les mois de janvier et de février, et, malheureusement, il s'agissait d'un froid sec. Saskatoon a connu son deuxième printemps le plus sec en plus de 97 ans. On n'a pas eu l'impression de sécheresse à Calgary parce que l'essentiel des précipitations est tombé sous forme de neige, 70 % de plus que d'habitude. La ville a connu 25 jours de neige au printemps, dix de plus que la normale, alors que la dernière chute de neige touchant Calgary a duré toute une fin de semaine en mai. Les travailleurs en santé mentale de la ville ont prétendu que le temps sombre était responsable, dans une certaine mesure, du nombre record d'appels de personnes téléphonant à des services d'aide en cas de crise.

Alors que Victoria et Vancouver ont été largement épargnées par les chutes de pluie après la mi-mars, les premiers jours du printemps ont vu des chutes de neige de 10 à 15 cm. Pendant ce mois, diverses régions de la Colombie-Britannique ont enregistré des records de froid effaçant plus de 530 records quotidiens antérieurs. Et ce n'était pas fini. Le 6 mai, la côte Ouest a été touchée par des températures qui dépassaient à peine le point de congélation. Des flocons de neige et du grésil sont tombés sur toutes les terres basses continentales.

Dans le sud de l'Ontario et du Québec, une vague de chaleur a fait atteindre des températures record à la mi-avril, mais ce n'était qu'au faux-semblant de printemps. Une semaine plus tard, une tempête balayait la région des Grands-Lacs en la laissant couverte de neige, de pluie et de grésil. Ottawa a enregistré une chute record de 17 cm de neige le 28 avril. Dans les deux provinces, un week-end glacial à l'occasion du Jour de Victoria a davantage fait penser à la Journée du Souvenir alors que de l'air arctique froid apportait un méchant mélange de pluie, de grésil et de neige aussi loin au sud qu'à Sarnia. Les campeurs ont dû recourir à des couvertures, des chauffe-mains, des bonnets et des parkas. Quatre d'entre eux, qui utilisaient un chauffage au propane près de Kenora, ont été empoissonnés par le monoxyde de carbone alors qu'ils luttaient contre la température épouvantable de cette longue fin de semaine.

Le temps froid, inhabituel pour la saison, a gravement retardé la plantation des cultures. Dans le sud de l'Ontario, les agriculteurs ont planté le maïs avec trois semaines de retard, ce qui a provoqué des problèmes quand les pluies du milieu de saison ne sont pas arrivées. Les agriculteurs qui cultivent des fraises ont irrigué à longueur de journée pour tenter de sauver leurs plants fragiles du gel. Le froid a également retardé la saison des incendies de forêt de deux semaines dans les régions situées à l'ouest de l'Ontario.

La nature semblait avoir perdu le nord et les gens ont aussi été déboussolés. Les golfeurs et les jardiniers, séduits par le peu de neige tombée au cours de l'hiver et par les températures douces, espéraient un printemps précoce. Les centres de jardin et les attractions extérieures sont restés vides pendant une grande partie du printemps. Les commerçants de détail ont imputé au temps froid persistant une diminution de 30 % des ventes des produits et des services sensibles au temps qu'il fait. C'est ainsi que nombre de Canadiens et de Canadiennes ont annulé ou reporté à plus tard leurs achats de piscines, de climatiseurs d'air et de vêtements pour la saison chaude.

**6. En ville, on a grillé cet été**

Pour la majorité des Canadiens, ce fut un été mémorable avec des records de chaleur, des fins de semaine parfaites et peu de mauvais temps. Dans l'Est du pays, l'été a démarré lentement mais, une fois sur sa lancée il s'est poursuivi en beauté et s'est terminé avec le mois de septembre le plus chaud qu'on n'ait jamais eu. À Toronto, la température moyenne entre le 1$^{er}$ juin et le 30 septembre a été de 21.5°, soit une moyenne supérieure de 3,2 degrés à la normale, et la plus chaude enregistrée en 63 ans. Le nombre de jours chauds, c'est-à-dire dépassant 32°C, a été de 23 alors que la normale est de 5, et le nombre de nuits chaudes, avec une température supérieure 20°C, a aussi battu un record avec 19, alors que la normale est de 5. Dans la grande ville, non seulement il a fait chaud et humide mais, en plus, l'air était nauséabond avec la grève des éboueurs qui a duré dix jours. Toronto a déclaré 15 fois des alertes à la chaleur d'une journée et deux fois des situations d'urgence imputables à la chaleur. Ce fut le troisième grand nombre de jours de chaleur et les records précédents remontaient à 1955. Cette chaleur étouffante a incité les gens à pousser leurs climatiseurs, ce qui a provoqué des records de consommation d'énergie.

À Montréal, la période estivale, qui va du 21 juin au 30 septembre, a été à la fois la plus sèche et la plus chaude jamais enregistrée. De façon surprenante, les précipitations totales de l'été ont été inférieures de 25 % à celles de l'été dernier, qui constituaient déjà un record. Dans les Maritimes, l'été a démarré lentement. Dans l'ensemble, les températures ont été proches de la normale mais pour le cinquième été au cours des six derniers, les précipitations ont été inférieures à la normale. La Colombie-Britannique a connu un été splendide. Il compte parmi les dix plus chauds de la province et le troisième en terme de sécheresse avec des précipitations inférieures de 30 % à la moyenne. Dans le sud de l'Ontario et du Québec, les fins de semaine ont été splendides. Sur les 31 jours de fin de semaine et les lundis fériés que l'on compte entre le 1er juin et le Jour du travail, il n'y en a eu que de quatre à sept à connaître de la pluie, avec souvent simplement une petite averse. La plupart des Canadiens ne voulaient pas que ce temps estival splendide cesse, en particulier pour aller au chalet, faire des barbecues et pour célébrer des mariages à l'extérieur.

Ce qui a séduit les campeurs et les amateurs de plage s'est par contre révélé néfaste pour les agriculteurs et les jardiniers. Le manque de pluie a amené à craindre la sécheresse dans le centre du pays pour le second été de suite. C'est ainsi qu'à Sarnia, London et Kitchener-Waterloo, entre autres, le mois d'août fut le plus sec des mois d'août enregistrés et aussi le mois le plus sec jamais subi. À la station de l'aéroport Pearson de Toronto, on a enregistré le mois d'août le plus sec depuis 1937. En ce qui concerne la région des Grands-Lacs, les craintes ont été accrues parce que cinq des six derniers étés avaient été plus secs que la normale. La plupart des cultures avaient été plantées en retard à cause du printemps froid et humide. Si les conditions chaudes et sèches du début ont favorisé la production de maïs et de soya, la pénurie de pluie qui a suivi a nui à leur croissance. Dans les villes, la rareté des précipitations a endommagé des milliers d'arbres. Beaucoup sont morts alors que d'autres ont souffert et sont devenus plus vulnérables aux ravageurs et aux maladies.

**7. Sécheresse sur la verte Colombie-Britannique**

Le temps sec a fait « du temps supplémentaire » cette année en Colombie-Britannique. À Vancouver, il n'y a eu que 105 mm de pluie à tomber de juin à octobre, à peine le tiers de la normale et le temps le plus sec en 65 ans. Le climat était particulièrement sec en octobre quand tout juste 18,3 mm de pluie sont tombés à l'aéroport international contre une moyenne de 112,5 mm. Whistler et Port Hardy ont également connu leur mois d'octobre le plus sec de tous les temps. Dans l'intérieur des terres, Vernon a connu ses plus petites chutes de pluie entre juin et octobre, avec seulement 72 mm, un record depuis 1900, l'année au cours de laquelle on a commencé à comptabiliser ces chiffres. L'aéroport international de Victoria a également battu un record pour les précipitations les plus faibles sur la période allant d'avril à octobre.

Cette longue période de temps sec est due à une zone de haute pression persistante sur la province qui a empêché les orages de parvenir sur le littoral. De plus, un surprenant bassin d'eau chaude est apparu de façon soudaine dans la partie nord-est du Pacifique à la fin de l'été, à environ 1 500 km de la côte. L'absence de pluie qui en a découlé a amené à s'inquiéter des niveaux d'eau dans plusieurs régions de la Colombie-Britannique, y compris à Vancouver. Au début novembre, les réservoirs n'étaient pleins qu'à 25 % de leur capacité et leur niveau baissait de un pour cent par jour. Les migrations des saumons ont également été menacées parce que les cours d'eau du sud de l'île de Vancouver étaient à sec.

La situation s'est améliorée au début novembre, quand les orages de l'automne ont touché la région côtière, mais le reste de la province n'a pas reçu beaucoup d'humidité. Les fortes pluies ont inondé les sous-sols à Vancouver et l'aéroport de la ville a fait état d'une quantité de pluie correspondant presque à un mois (147 mm) en 17 jours consécutifs. Malheureusement, les pluies ont cessé aussi rapidement qu'elles étaient venues et ce qui semblait être le premier mois mouillé depuis longtemps s'est terminé par des précipitations totales inférieures à la normale. Les deux dernières semaines de novembre, en règle générale les plus humides de l'année, n'ont pas du tout connu de pluie. Dans l'intérieur des terres, la situation n'a pas été meilleure. Kelowna a reçu moins de 50 % de ses précipitations normales pour un mois de novembre, et pour la première fois, pas de neige du tout.

Au début décembre, alors que la faiblesse des précipitations et des niveaux des réservoirs battait des records, les responsables de la région de Victoria ont soulevé la possibilité de restrictions à l'arrosage extérieur en hiver, une première! La principale source d'approvisionnement en eau de la région, à Sooke, était en déficit de trois milliards de gallons et en perdait 18 millions par jour. Les gestionnaires de l'eau de la côte du Pacifique continuent à s'inquiéter étant donné que les trois dernières années ont fait partie des neuf plus sèches sur la période de 55 ans pour laquelle on a des données, avec des précipitations inférieures d'environ 15 %. D'autres secteurs d'activité qui ont besoin d'approvisionnements stables en eau, y compris ceux de la forêt, de l'agriculture, de la pêche sportive et commerciale, de l'hydroélectricité, des loisirs et du tourisme, le risque de pénurie fait aussi peser une menace.

Enfin, le 10 décembre, la pluie est arrivée! Une succession de forts orages du Pacifique a commencé à toucher la côte Ouest avec des vents très forts et de la pluie. Ils se sont ensuite dirigés vers le nord, en direction du golfe de l'Alaska, franchissant à l'occasion le littoral du nord de la Colombie-Britannique. Au cours d'un orage, les vents ont dépassé 100 km/h à Point Atkinson et 130 km/h sur la côte ouest de l'île de Vancouver, obligeant les spécialistes des prévisions à publier un avertissement fort rare de risque de vents de type ouragan dans le détroit de Georgia. Même l'aéroport relativement abrité de Powell River a enregistré de puissantes rafales à 111 km/h.

**8. Quatre ouragans en quatre semaines**

Les météorologues s'attendaient à une saison normale d'ouragans dans la partie nord de l'océan Atlantique et leurs prévisions se sont, pour l'essentiel, avérées passablement exactes. À la fin de la saison, il y avait eu une douzaine de tempêtes dont les noms allaient de Arthur à Lili, dont quatre sont devenues de vrais ouragans et deux ont pris la forme de très gros orages avec des vents dépassant 178 km/h. La saison a été la plus calme en cinq ans et cela s'explique, en partie, par le renforcement d'El Niño.

Si la saison elle-même a été jugée calme, septembre s'est distingué avec un mois particulièrement explosif puisqu'on a vu la formation de huit des 12 tempêtes ayant hérité d'un nom au cours de la saison - un record de tous les temps pour un seul mois dans l'Atlantique - qui s'est expliqué en partie par le réchauffement soudain de la température de l'eau de surface. Les quatre ouragans -- Gustav, Isidore, Kyle et Lili - sont apparus en septembre et ont tous touché le Canada d'une façon ou d'une autre.

L'ouragan Gustav a été le premier de l'année, et le premier à frapper si tard dans l'année en plus de 60 ans. Le 12 septembre, Gustav a touché terre près de Sydney, en Nouvelle-Écosse, une journée après être devenu un ouragan et ce fut le premier à toucher le littoral de la Nouvelle-Écosse en six ans. La tempête a provoqué des pannes d'électricité, fait tomber des arbres et provoqué des inondations mineures. Les pluies les plus importantes (100 mm) ont eu lieu près d'Antigonish, en Nouvelle-Écosse, et les vents les plus forts (122 km/h) sur l'île de Sable. Les restes de Gustav ont encore provoqué des rafales à plus de 100 km/h à Terre-Neuve quelques jours plus tard. Heureusement, un désastre a été évité de justesse à Charlottetown étant donné que Gustav a touché la région quatre à cinq heures avant la pleine mer. S'il était arrivé à marée haute, il y aurait eu 70 cm d'eau de plus à inonder le centre-ville.

Il y a ensuite eu Isidore, un des deux ouragans les plus forts de la saison, qui a pénétré dans les terres en Louisiane le 26 septembre. Même affaibli, il a réussi à toucher le sud des Grands Lacs et la région des Maritimes le lendemain avec des chutes de pluie fort bienvenues de 25 à 35 mm à l'est de l'Ontario.

Une semaine plus tard, l'ouragan Lili a touché la Louisiane à la suite d'Isidore. Le jour suivant, la tempête tropicale qu'il était devenu s'est combinée avec un orage de la région des Grands Lacs et a provoqué une forte dépression qui s'est déplacée dans le nord de l'Ontario et du Québec. Elle n'a provoqué que des pannes de courant et des chutes d'arbres.

Kyle, le dernier ouragan de septembre, n'a pas été si puissant que cela mais il a duré longtemps. Il est resté actif pendant 22 jours, ce qui en a fait la troisième plus longue tempête de l'histoire. Encore plus rare, Kyle a pris de la force pour devenir une tempête tropicale à quatre occasions distinctes. Les résidents de la baie de Fundy ont craint que la tempête ne concrétise une prédiction menaçante de l'Almanach de l'agriculteur voulant que Kyle vienne en seconde place pour ses dégâts avec la tempête Saxby de triste mémoire, une tempête vicieuse qui, en 1869, avait détruit des centaines de bateaux et emporté plus de 1 000 vies. Heureusement, Kyle n'a jamais atteint les côtes du Canada et la prédiction s'est avérée un échec.

**9. La fumée du Québec franchit les frontières**

Au cours de la première semaine de juillet, des millions de résidents de l'est du Canada se sont réveillés en sentant une odeur de fumée acre et en découvrant un ciel voilé. Les services de police et de lutte contre les incendies ont été inondés d'appels. Les images satellites ont montré que cette fumée provenait des incendies de forêt provoqués par des éclairs qui faisaient rage dans le sud de baie James au Québec. Ces feux ont été considérés comme les plus graves que la province ait connus en une décennie, étant donné que des dizaines de milliers de pins et d'épinettes noires ont brûlé dans la région de la baie James et du réservoir Manicouagan. Les incendies étaient si intenses que les bombardiers à eau ne pouvaient s'en approcher à cause de l'épaisseur de la fumée et des fortes perturbations des courants d'air.

Cette fumée s'est vue aussi loin de son point de départ parce qu'elle a été enfermée sous une couche d'air chaud qui a concentré son panache. La couche de fumée, d'une largeur de 200 à 300 km, a été aspirée par un flux d'un nord qui s'est répandu sur tout le sud du Québec et de l'Ontario, à l'ouest jusqu'au Michigan et à l'est jusqu'aux quatre provinces atlantiques, et aussi loin au sud qu'à Washington et Baltimore. Le nuage de fumée a réduit la visibilité à trois kilomètres par endroit et a voilé le soleil dans une grande partie du nord-est du continent. La ville de Québec a été noyée dans un brouillard blanc, limitant la visibilité dans la basse ville à moins de 500 mètres. À Montréal, de fines particules de cendre sont tombées sur les voitures et les autorités ont publié des avertissements en matière de santé. À Toronto, qui se trouvait en plein milieu d'une grève des fonctionnaires municipaux, l'odeur de la fumée s'est révélée un substitut agréable à celui des ordures pourries.

**10. Du temps typiquement canadien pour les visites du Pape et de la Reine**

Cette année, deux dignitaires connus dans le monde entier ont pu constater directement pourquoi les Canadiens sont si obsédés par le temps qui change si souvent.

Le pape Jean-Paul II est arrivé à Toronto le 23 juillet alors qu'un triple avertissement météorologique était en cours pour la chaleur, la fumée et l'humidité. Le jour précédent, un fort orage avait touché la région avec des pluies importantes et des vents élevés, provoquant des pannes de courant et faisant tomber des arbres. Près de London, une activité de la Journée mondiale de la jeunesse a dû être annulée à cause de la menace de tornades. Le 28 juillet, 800 000 personnes se sont regroupées à Downsview Park, au nord de Toronto, pour célébrer une messe à l'extérieur avec le Pape. Le jour précédent, sous une chaleur étouffante, des centaines de jeunes avaient dû être traités sur place ou dans des hôpitaux voisins à cause de malaises provoqués par la chaleur et des coups de soleil car la température à l'ombre avait atteint 30° C. Avant la messe du dimanche, aux alentours de 5 h du matin, une pluie serrée et froide est tombée pendant plusieurs heures et il a fallu traiter des centaines de pèlerins frissonnants pour l'hypothermie.

** Source: site d'Environnement Canada sur la toile.

La Reine Elizabeth II est arrivée à Iqaluit, au Nunavut, le 2 octobre pour débuter sa visite du Canada à l'occasion de son Jubilée d'or. Des foules importantes sont venues accueillir le couple royal par des températures inférieures au point de congélation, et avec des flocons de neige. Deux jours plus tard, des milliers de résidents de Victoria ont accueilli la Reine et le Prince Philippe sous un ciel clair majestueux et un chaud soleil. Mais c'est le temps frais avec un régime de tempêtes du 8 octobre, à Winnipeg, qui a suscité le plus d'intérêt, en particulier une fois revenus à domicile. Au cours de l'après-midi, la température est descendue près du point de congélation et de forts vents nord-nord-ouest ont soufflé à 35 km/h, avec des rafales à 50. Le froid pénétrant est apparu encore plus froid sur la rivière Rouge où le bateau-mouche qui transportait le Couple royal est tombé en panne et a dû être remorqué jusqu'à la rive.

Le 12 octobre, le Couple royal s'est rendu à Sussex, au Nouveau-Brunswick, sous un soleil étincelant et avec des températures automnales agréables. Toutefois, le jour suivant, à Ottawa, la Reine a dû supporter un vent d'ouest frais et une pluie tenace pendant les cérémonies sur la colline du Parlement et au Monument commémoratif de guerre du Canada. Malgré ce temps misérable, plus de 4 000 spectateurs se sont fait tremper et ont frissonné pour assister à cet événement.

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## The Evolving Field of Broadcast Meteorology in Canada - from a Woman's Perspective

by Claire Martin[3]

From hairspray to high-pressure cells, the role of the Canadian broadcast meteorologist is finding itself undergoing a slow but steady metamorphosis. For years Canadian TV viewers have been bombarded with American TV channels. As the US has begun to "smarten up" its own weather presenters, Canadians have started demanding more from their own native on-air counterparts. The once superficial facade of our science is gradually becoming knowledgeable, educated and truly passionate about the field of meteorology.

But it has - and in fact continues to be - a rather stormy transition. Most Canadian television News Directors still view the "weather presenter" job (within a newsroom) merely as an industry training position. In the eyes of many News Directors, delivering the weather was, and is, for ex-disc jockeys (both male and female) who already possess certain broadcaster qualities. These "ex-jocks", working as the TV station weather presenters, are expected to do little more than hone the following skills:

1. They learn to ad-lib fast and to think and react quickly on their feet;

2. They have to develop composure to go "live" in all weathers and all situations;

3. They will be relied upon to fill time on an impromptu basis; and

4. They will always go on air "timed" but unscripted - which can be likened to asking a circus performer to do a complicated trick without the aid of a safety net!

(Continued next page)

[3] Chief Meteorologist, Global TV Edmonton

Photo: Claire Martin

These are all very admirable qualities for someone with aspirations to be a career broadcaster. But show business then overshadows the science – and let's face it - the science should really be the fundamental part of the weather presentation.

The irony of all this – is the fact that "science", contrary to popular belief, "sells"! Television consultants across Canada and the USA unconditionally agree that "breaking news" and "weather" are the single biggest audience draws on local TV news shows. Armed with that knowledge, those in charge of TV newscasts are beginning to understand how having an expert "in house" adds value to the news, and furthermore can be a significant potential audience draw.

So the tide is slowly turning.

And there has been great support for professional meteorologists who have turned to the field of broadcasting, from within the ranks of the Canadian scientific world. The Canadian Meteorological and Oceanographic Society (CMOS) – again following the lead of their counterparts in America – have set about to promote broadcasters with a solid science background with the aid of an endorsement program. Qualified candidates – both male and female – are encouraged to seek endorsement to bolster their on-air credibility.

CMOS guidelines for endorsing weather presenters state that "Ideally the Society would like to see the presentation of weather information carried out by professionally trained meteorologists with appropriate communication skills or by professional broadcasters with appropriate training in weather analysis and forecasting and in applications of meteorology and climatology".

There is a list of "endorsed" weather broadcasters on the Canadian Meteorological and Oceanographic Society's web site (http://www.cmos.ca) – the list is compiled of on-air presenters that have been judged by various panel members from the Society to have "increased scientific competence as well as effective communication skills". Once the candidate has been endorsed by the Society, they are able to prominently display the CMOS logo on-air as a very visible sign to their audience that they have achieved a high degree of credibility from their scientific peers.

To date, women make up only 19% of the Canadian on-air meteorologists that have been endorsed. The fact remains, therefore, that although there is absolutely nothing in the way of this profession that women cannot do, we do not exactly thrive in meteorology in Canada.

However, the future looks bright. CMOS President Ron Bianchi is also the Vice President of "The Weather Network" – Canada's national weather broadcast network. With an estimated weekly audience of 10.5 million viewers, and ranked as one of the top five specialty channels in Canada, TWN has achieved a great deal of success with the on-air delivery and dissemination of weather products. (They provide very high quality weather and weather-related programming 24 hours a day, seven days a week.) Bianchi has also pledged support for his own on-air staff (male and female) to achieve the academic requirements needed to apply for the CMOS endorsement. (As an aside - to date all their "Bureau Correspondents" are women, and they have 6 female weather presenters on national TV out of a total of 16 presenters, although none holds a CMOS endorsement.)

On a personal level, I would encourage every female scientist who happens upon this article to do one thing. If you see a female student exhibiting an interest or an aptitude in this wonderful field – encourage them – MENTOR THEM – and maybe, gradually, one by one, we'll see our numbers swell.

Note from the Editor: This article was also submitted to WMO for publication. It is first published here at the request of the author.

# An analysis of the Tornado Outbreak of Nov 10/11, 2002 in the United States

by Lisa Alexander[1], Xiurong Sun[1], David Sills[2] and Peter Taylor[1]

Abstract

Meteorological conditions over the course of the tornado outbreak of Nov 10/11 are analysed, in terms of surface data and upper air plots and of soundings in some outbreak regions. The analyses show that a synoptic pattern that favoured tornado outbreaks occurred in the eastern United States. Radiosonde analyses from tornado outbreak regions further confirm that abundant helicity and convective available potential energy (CAPE) corresponded with the tornado outbreak regions. Synoptic conditions in southern Ontario and nearby radiosonde soundings are also discussed. The analyses show that, despite the proximity to events in Ohio, severe weather predictors were weak or not favourable for tornado incidence in southern Ontario.

Résumé

Les conditions météorologiques le long du trajet d'éruption de tornades du 10 et 11 novembre sont analysées. Dans quelques régions propices aux tornades, on a utilisé les données de surface et celles obtenues par sondage. Les analyses montrent qu'une situation synoptique qui a contribué au développement de tornades, s'est développée dans l'est des États-Unis. Les analyses de radiosondage des régions propices aux tornades ont démontré plus tard que la forte hélicité et l'énergie convective potentielle disponible ("CAPE-Convective Available Potential Energy") sont conformes avec les régions propices aux tornades. On discute aussi des conditions synoptiques dans le sud de l'Ontario et près des sondages par radiosonde. Malgré la proximité des événements dans l'Ohio, les analyses montrent que les prédicteurs de temps violent sont faibles ou aucunement favorables au développement de tornades dans le sud de l'Ontario.

## 1. Introduction and Climatology

At noon (EST) on Nov. 10, 2002, tornadic supercells began to form along a squall line from Ohio to Alabama in the eastern United States. The outbreak lasted more than sixteen hours. According to preliminary statistics from the NOAA Storm Prediction Center, there were 91 reports of tornadoes, 327 reports of wind damage and 190 reports of large hail. Thirty people died and about 224 people were injured. Some of the most serious events, including 18 tornado reports, were in Ohio, just south of Lake Erie. The squall line also moved through Southern Ontario, but no severe weather was reported. Tornadoes are relatively frequent in the USA and have a broad seasonal pattern (see Fig. 1). Tornadoes occur mainly in April, May, June and July, but have been reported in every month of the year, with an average of 29 tornadoes in November. So far as tornado outbreak regions are concerned, Ohio lies in the 7$^{th}$ place in the ranked states (1950-1994), according to data from the Storm Prediction Center (SPC).

Monthly tornado frequency across Canada shows that the tornado season runs from April to October, reaching a maximum in July, and it has been found that almost no tornadoes have occurred from November to March based on 617 F0 (see Fujita, 1981) or greater tornadoes for the period 1950-1979 across Canada (Newark, 1984). Figure 2 shows Southern Ontario confirmed tornadoes for the period 1950-1992. As shown in the figure, tornadoes are most frequent in summer and, from a climatological point of view, tornadoes occur infrequently in November. Newark's analyses found that tornadoes have occurred in all the Canadian provinces and territories. South-western Ontario and south-eastern Manitoba are areas of maximum tornado activity. Regarding the seasonal variation of tornadoes by region, the farther a province is from the centre of the North American continent, the later is its seasonal maximum and the shorter its tornado season. Tornadoes in Ontario and Québec are at a maximum in June, about a month earlier than in Alberta and British Columbia and around two months earlier than in Atlantic Canada.

The average length of the season is a maximum of 107 days in Ontario where the "season" begins May 17 and ends August 31. The diurnal variation of tornado occurrence shows little regional difference with the peak between 1500 and 1700 local standard time.

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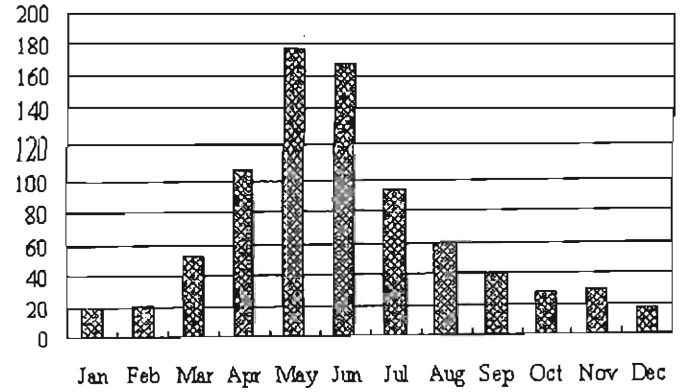


Fig.1 Monthly tornado frequency in the USA, 1950-1999. Data from U.S. Severe Weather Meteorology & Climatology.

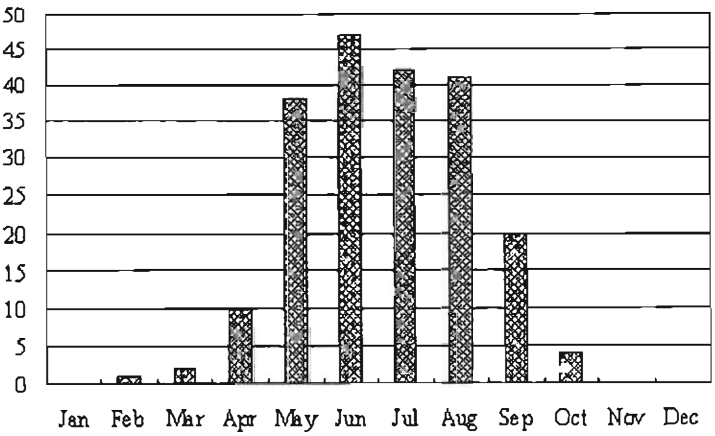


Fig.2 Southern Ontario confirmed tornado occurrence for the period 1950-1992 (from data assembled mainly by Mike Newark, MSC). Southern Ontario is defined here as all of Ontario south of Sudbury.

**2. The synoptic setting.**

2.1 Background

Past studies have suggested that the major features of the environments of long-lived severe weather such as tornadic storms are convective instability, vertical wind shear and low-level moisture, in addition to a convective trigger mechanism. Most supercells occur in strongly unstable environments. Abundant helicity favours the development of strong low-level storm rotation, and increases the likelihood of significant tornadoes. The features of the "classical" tornado outbreak pattern identified by Miller (1972) and described by Johns and Doswell (1992) is shown in Fig. 3. In this pattern, a strong synoptic-scale cyclone is located at the surface, with cold and warm fronts. Crossing upper and lower jet streams produce a vertically sheared environment that favours supercell formation. A southerly low-level jet can continuously bring sufficient low-level moisture into tornado outbreak regions. If an upper trough is approaching and/or there is upper-level diffluence downstream, the tornado potential is greatly enhanced. Of course, patterns are different in some tornado events, but our analysis of this event will concentrate on the factors mentioned above.

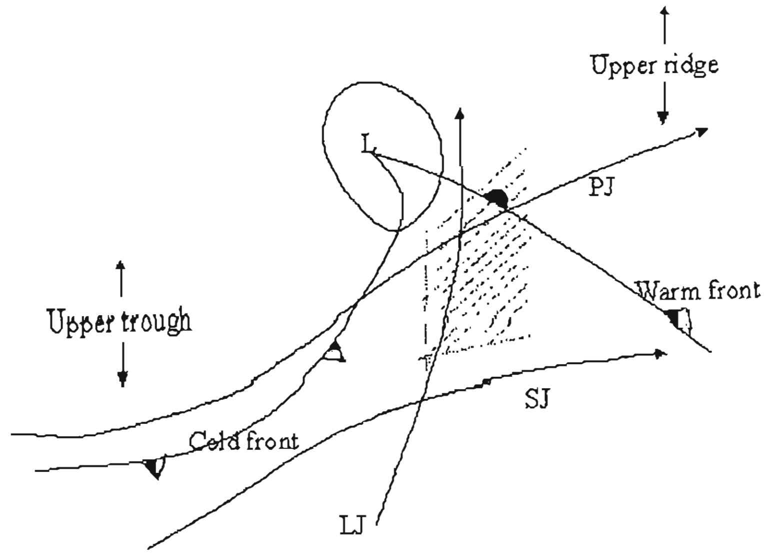


Fig 3 Classic severe weather pattern favourable for the production of tornadoes; LJ – low-level jet; Upper level, PJ – polar jet, SJ – subtropical jet. (adapted from Johns and Doswell 1992).

2.2 Overview

At 1700 UTC on November 10th, a line of severe storms began to form ahead of a cold front moving through the eastern United States. South of Lake Michigan, these storms quickly organized into a squall line producing severe weather through much of the eastern United States (see Figure 4). Storms near the north end of this squall line did penetrate into Southern Ontario, but an interesting thing about this event was that no severe weather (such as strong wind damage, large hail or tornado activity) was reported north of Lake Erie. Severe hail, wind and tornadoes were reported in Ohio (just south of Lake Erie) during the mature phase of the squall line.

The squall line, composed of tornado-spawning supercells, was an unusual event in the United States for the month of November. This type of severe activity usually occurs during warmer months. Reports of hail started at 1800 UTC in Alabama, Indiana, and Illinois. Wind reports for this developing line began at 1842 UTC in Indiana. By 1930 UTC, damage and injuries were reported in Indiana and shortly after in Illinois. A possible tornado touchdown was reported for Ohio at about 2130 UTC. Tornado (or suspected tornado damage) reports continued for Ohio, Alabama, Tennessee, Florida (waterspout moving on land), and Georgia until the early morning hours of November 11th. Hail and wind reports covered an even larger area in Eastern US (see Fig 5). The last report for the outbreak was a hail report for South Carolina at 1015 UTC on November 11th (SPC, 2002).

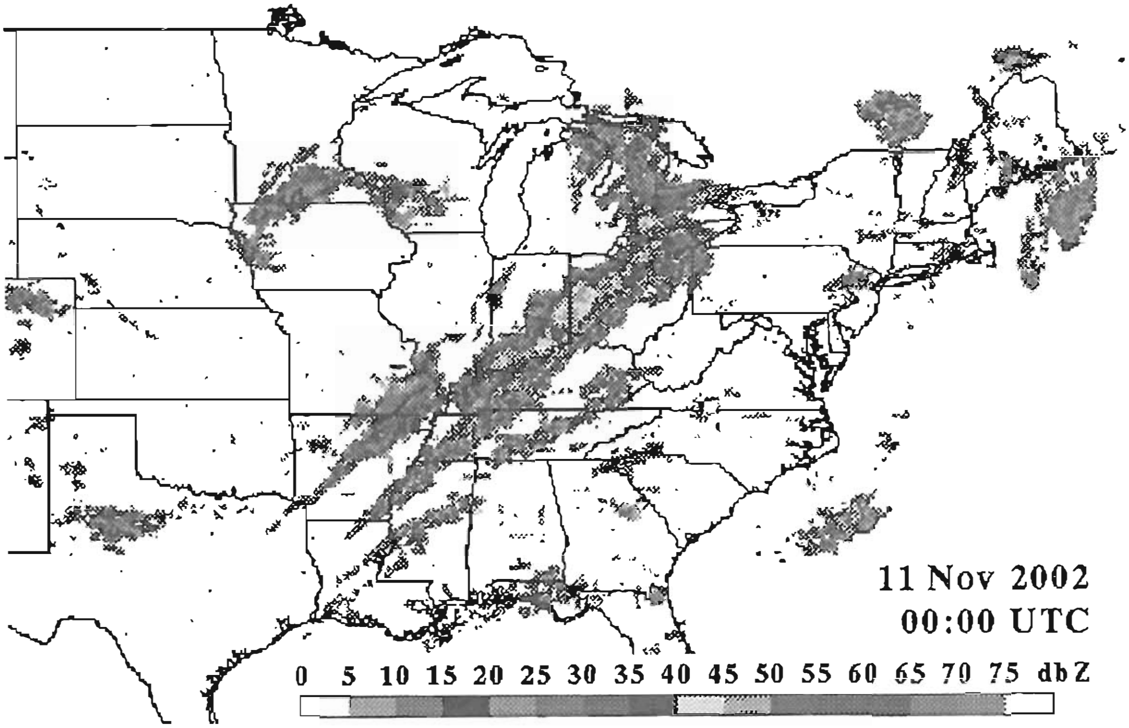


Figure 4. Composite radar reflectivity image for 0000 UTC on November 11, 2002 provided by the Global Hydrology Resource Center (GHRC) at the Global Hydrology and Climate Center, Huntsville, Alabama. Note the line of thunderstorms stretching from southern Ontario southwest towards Louisiana. Also shown in colour on cover page.

2.3 Surface Synoptic Features

At 1200 UTC on November 10th, a surface low pressure centre existed to the west side of Lake Michigan, with a second low pressure centre to the north-northeast of this (see Figure 6). A double cold front feature was present at this time; one front extended from the southern low pressure centre to northern Texas and the second was located to the northwest. This allowed for a south-westerly gradient flow through the eastern US, changing to more southerly in Southern Ontario. Southerly surface winds were present through the affected area. The warm air mass in the region produced unusually warm temperatures for this time of year. Southern Ontario recorded temperatures into the mid to high teens, while the south-eastern US had temperatures into the low twenties. By 0000 UTC on November 11th, storm activity was very organized. Severe hail, winds, and tornadoes had been reported for a number of hours prior to 0000 UTC. The low pressure centres at the surface moved towards the east-northeast. A deep pressure trough extended south-south-westward and preceded the fronts. The leading cold front moved east over Michigan and extended down towards Louisiana (see Figure 7). The squall line was mainly over a trough which was preceding the leading cold front.

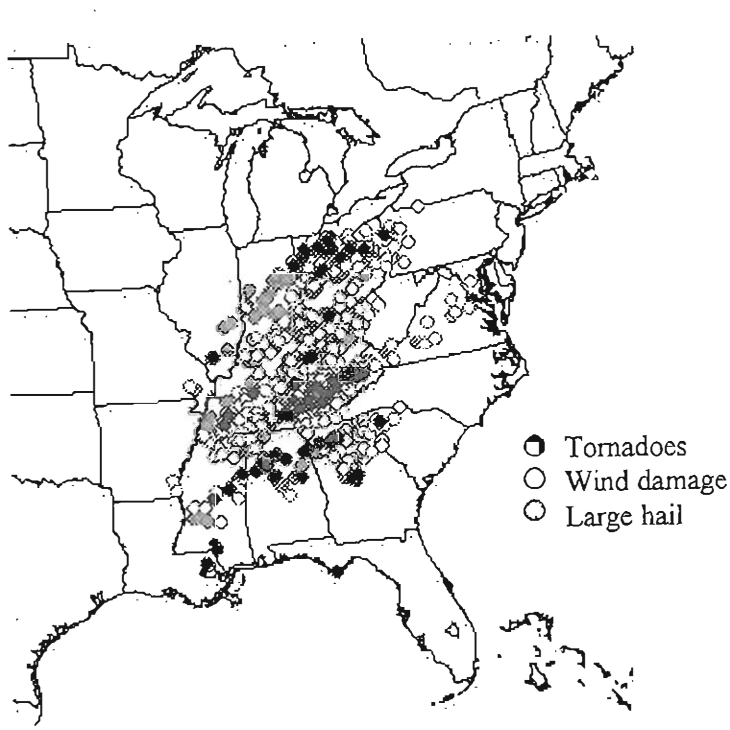


Fig.5. Map of preliminary storm reports for Nov 10/11, 2002 (from Storm Prediction Center, NOAA).

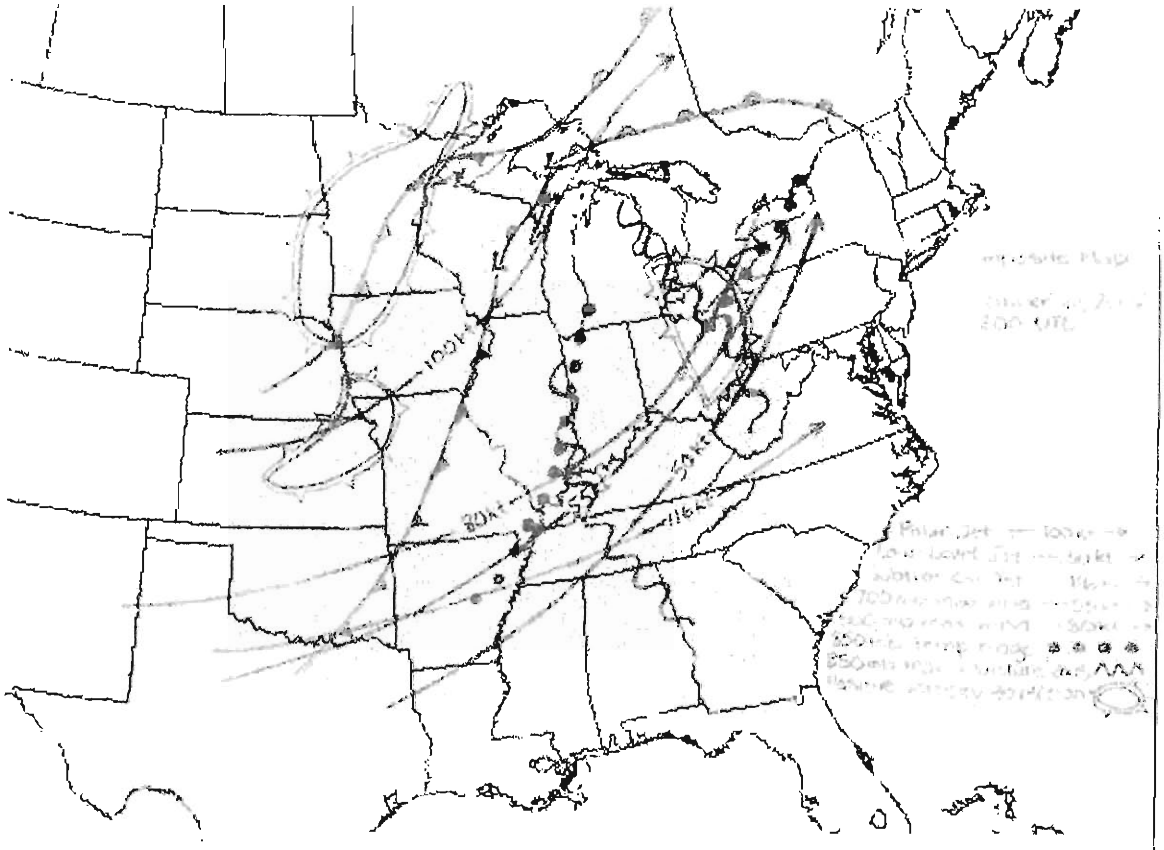

**Figure 6. Composite map for 1200 UTC on November 10, 2002. Map put together using an SPC background map, and data from Environment Canada (MSC), NOAA/NCDC, Unisys Archives, and University of Wyoming upper air maps.**

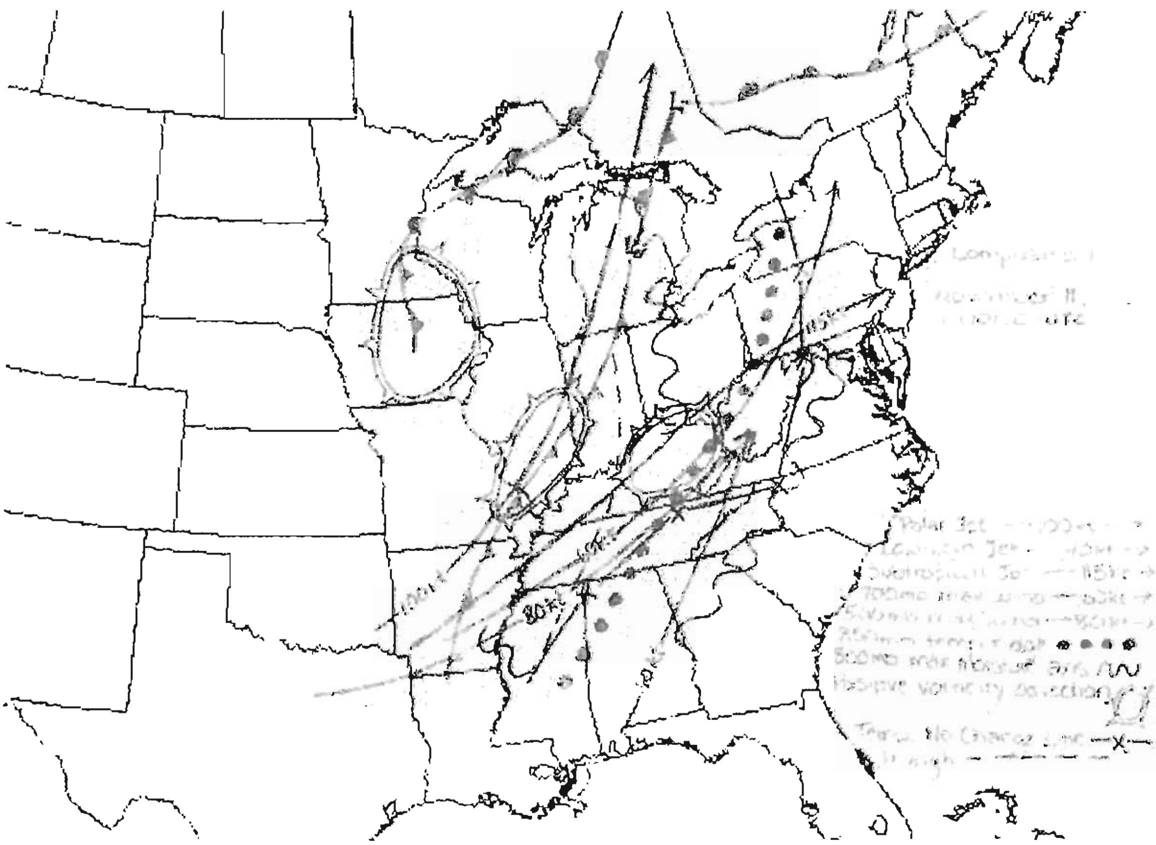

**Figure 7. Composite map for 0000 UTC on November 11, 2002. Map put together using an SPC background map, and data from Environment Canada (MSC), NOAA/NCDC, Unisys Archives, and University of Wyoming upper air maps.**

## 2.4 Upper Air Features

Figures 6 and 7 bring together some of the upper air features extracted from MSC upper air analysis maps (2002). The upper-level jet for 1200 UTC November 10th shows wind speeds up to 116 kts for the area affected by the squall line. Polar and subtropical jets move apart around the southern Great Lakes, producing upper-level divergence. From the upper-air analysis maps for 0000 UTC on November 11th (not shown), it can be seen that the upper-level jets remained strong (wind speeds up to 115 kts). The two jet streams came closer together in the southern United States, but they diverge as they flow north towards the Great Lakes. The low-level jet flows from a south-southwesterly direction (over Alabama, Georgia, and Tennessee), which helps to advect warm, moist air from the Gulf of Mexico into the area.

Overall, we have moisture and warm air advected through the southerly flow into Ohio and many of the states in the southeast. Surface heating helped to create instability. The splitting upper-level jet suggests divergence aloft and compensating convergence at the surface, creating lift. A trough preceding the cold front allowed for development as it pushed through the area. The orientation of the upper- and lower-level jets at 0000 UTC suggests vertical shear, which can allow storms to become stronger and continue over a longer period of time. The vertical shear can allow for storms to tilt vertically so that storm downdrafts are well-separated from updrafts, therefore preventing early dissipation (Ford, 1995). All of these features combine to produce a storm-favourable environment, but such a severe case is not generally expected in mid-November. In the next section we will take a closer look at the factors that allowed for development through the Miller Technique.

## 2.5 The Miller Technique

Miller (1967) studied 328 tornado cases and found that 14 parameters were very important in the development of severe thunderstorms. These 14 parameters were incorporated into a ranking system, which were listed from 1 [the most important] to 14 [least importance], and were given values to classify them as weak, moderate, or strong (see Table I, adapted from Miller, 1967 by Ford, 1995). In order to study the November squall line case, composite maps were created for November 10th at 1200 UTC and November 11th at 0000 UTC (see Figures 6 and 7) following the symbols used in Ford (1995). Important features for this event, selected from Miller's 14 parameters, are depicted on these maps, drawn using a number of other weather maps from Environment Canada, Unisys Archives, University of Wyoming, NOAA and SPC as guidance. Features that could not be plotted through the composite map symbols, such as Lifted Index, Totals, 12-hour pressure change, and so on, will be discussed along with the composite maps.

### 2.5.1 1200 UTC Composite Map Discussion Using the Miller (1967) Ranking Values

Figure 6 is the composite map for 1200 UTC. The area of strongest 500 hPa positive vorticity advection (PVA) is around Lake Erie. It was in a favourable location, relative to the synoptic pattern and other Miller indicators, for storm development, and the height contours crossed the vorticity at the greatest angle just south of Lake Erie. There were two more PVA areas through Minnesota, Iowa, and Kansas; however, the jet values were weaker there (only the polar jet passes through) and frontal features were moving out of the Minnesota area. Vasquez (2001) notes that positive vorticity advection can mean divergence at upper levels, and therefore convergence at the surface allowing for development to occur. "Experience has shown that moderate-to-strong positive vorticity advection is probably present in all significant severe weather outbreaks" (Miller, 1967).

Using Miller's technique we note that the low-level 850-hPa jet was strong (using the criteria from Table I). The mid-level 500-hPa jet and upper-level 250-hPa jets were also strong. Of course, as the upper jet moved up towards the Great Lakes area the speed dropped somewhat due to the area of divergence. The horizontal shear for the 500-hPa and 250-hPa jets was weak, but became moderate over Kansas.

The 850-hPa maximum temperature axis (stretching south from Lake Michigan) was west of the 850-hPa moisture ridges around Kentucky and Tennessee (strong) but at the Illinois/Indiana border it was over the southern 850-hPa moisture ridge (moderate). A second maximum temperature axis existed near Lake Erie and over Lake Ontario, which was east of the 850-hPa moist ridge into southern Ontario (weak), but it crossed over the ridge just south of Lake Erie (moderate). Mid-level dry air intrusion was analysed from water vapour satellite images. If we assume this to have been a 700-hPa intrusion (due to lack of 700-hPa humidity data) the winds at that level were strong and intruded at an angle (from dry to moist) greater than 40 degrees in northern Kentucky and just east of Lake Michigan (strong parameter), however this became weaker in Indiana due to the smaller angle at which the winds crossed the dry air intrusion. Surface moisture seemed to be high in southern Michigan and extended southward, which became moister moving towards the south (larger dew point values). The 850-hPa moisture seemed to be higher into Tennessee, Kentucky and southern Illinois and Indiana. The low-low level moisture Miller ranking value suggests that the strongest threat area is in Alabama and Georgia. Lower mixing ratios (8 to 9 g/kg seemed to be intruding into Ohio (9 g/kg indicating moderate), Minnesota and the southern tip of Ontario (fairly weak).

## Table I: Miller Parameters with Threshold Values

From Ford (1995)

| Rank | Parameter | Weak | Moderate | Strong |
|---|---|---|---|---|
| 1 | 500 mb vorticity | neutral or negative | contours cross vorticity at 30 deg | contours cross vorticity at more than 30 deg |
| 2 | Stability LI<br>Totals | -2<br>50 | -3 to –5<br>50 to 55 | -6<br>55 |
| 3 | Middle Level Jet<br>Shear | 35 kts<br>15 kts / 90 nm | 35 to 50 kts<br>15 to 30 kts / 90 nm | 50 kts<br>30 kts / 90 nm |
| 4 | Upper Level Jet<br>Shear | 55 kts<br>15 kts / 90 nm | 55 to 85 kts<br>15 to 30 kts / 90 nm | 85 kts<br>30 kts / 90 nm |
| 5 | Low-Level Jet | 20 kts | 25 to 35 kts | 35 kts |
| 6 | Low-Level Moisture (g/kg) | 8 | 8 to 12 | 12 |
| 7 | 850 mb Max Temp Axis | East of Moist Ridge | Over Moist Ridge | West of Moist Ridge |
| 8 | 700 mb No-Change Line | Winds cross line at 20 deg | Winds cross line at 20 to 40 deg | Winds cross line at 40 deg |
| 9 | 700 mb Dry Air Intrusion | Not available or weak winds | Winds from dry to moist intrude at an angle of 10 to 40 deg and at least 15 kts | Winds intrude at an angle of at least 40 deg and are greater than 25 kts |
| 10 | 12 Hour Sfc Pressure Fall | | 1 to 5 mb | 5 mb |
| 11 | 500 mb Height Change | 30 m | 30 to 60 mb | 60 m |
| 12 | Height of Wet-Bulb-Zero Above Surface | Above 11000 ft<br>Below 5000 ft | 9000 to 11000 ft<br>5000 to 7000 ft | 700 to 900 ft |
| 13 | Surface Pressure over_Threat Area | 1010 mb | 1010 to 1005 mb | 1005 mb |
| 14 | Surface Dewpoint | 12 °C | 12 to 18 °C | 18 °C |

Lifted Index values were mainly weak, but became moderate into Mississippi and Florida (values of –3 and –4 °C). For the surface pressure over the threat area, the pressure was less than 1005 hPa from the east side of Lake Ontario, extending down to Mississippi and west of this line. Miller (1967) indicates that this parameter is strong when the surface pressure is less than 1005 hPa.

After looking into the majority of the Miller threshold values, it looks as though the threat area for severe storm development was southern Michigan, the tip of south-western Ontario, Ohio, Kentucky, and south to Tennessee. This area had the stronger parameter values overall. Southern Ontario had some positive vorticity advection into the southern tip, but the moisture seemed to be intruding from Ohio towards Michigan, which left weak ranking values due to the temperature ridge over Lake Erie and Lake Ontario. If more moisture had intruded into southern Ontario, perhaps development would have been stronger. Some of the southern states, such as Alabama, Georgia, Mississippi and Florida, showed one or two strong parameter values, but overall they did not seem to have as much potential as the states to the north.

2.5.2 0000 UTC Composite Map Discussion Using the Miller (1967) Ranking Values

Continuing with the Miller technique, Figure 7 shows the composite map for 0000 UTC on November 11th. The 500-hPa PVA areas were located in Kentucky, southern Illinois, and Iowa. The 250-hPa, 500-hPa and 850-hPa jets all gave strong Miller values. Between 500 hPa and 250 hPa the horizontal shear was mainly weak, but it had moderate values around Kansas, Oklahoma, and northern Texas.

The 850-hPa maximum temperature axis was east of one of the surface moist ridges around Ohio (weak), but it was west of the surface moist ridge closer to the coast (strong). This axis of maximum moisture extended from Georgia up into Virginia. In Mississippi, the temperature ridge was east of a small moisture ridge indicating a weak parameter.

Miller (1967) indicated that the greater angle that the winds crossed the 700-hPa no change line, the stronger the parameter. Here, we used the 700-hPa winds to determine the strength of the parameter. At 0000 UTC the parameter seemed strongest in Pennsylvania and south into Virginia, yet weak in Tennessee. This parameter seemed to be moderate moving north into the Lake Ontario area. In looking at water vapour satellite images, no dry air intrusion occurred in our area of concern. It mainly occurred off the coast and too far west (well behind the activity).

Lifted Index values were strong in Kentucky, Tennessee, Georgia, Alabama, Mississippi, and Florida (-4 to –5° C). The area north of these states showed weak values. The 12-hour surface pressure fall seemed to be fairly moderate through the area, but a little stronger around Lake Ontario and south-southwest into Pennsylvania. The surface pressure parameter over the threat area was strong, but weaker closer to the coast and down into Georgia and the south-eastern states. The surface dew point value was higher from Lake Ontario and extending south into Kentucky, as well as to the east. It became even higher into the south-eastern states. The 850-hPa moisture intrusion was seen into Mississippi, from the Gulf into northern Georgia and up into Virginia, and even a little into Kentucky and Ohio. The low-level moisture parameter was strong into eastern Kentucky, Virginia and south towards the Gulf of Mexico. Overall, the 000 UTC composite shows the threat area for severe storm development to have been to the east of the area in the 1200 UTC map, and a little more elongated. It seems to have been from Pennsylvania extending down through Kentucky, Virginia, Tennessee, northern Mississippi and Alabama.

In estimating how well these maps (Figures 6 and 7) showed possible areas of severe storm development, they did fairly well. The 1200 UTC map, however, did not strongly indicate the threat area in the south and did not catch the states being affected closer to the coast. It seemed to catch the initial threat area, but it did not indicate the states which were affected later in the night. It seemed to miss Pennsylvania, Virginia and West Virginia, and a number of the states to the south did not have many strong parameters. Perhaps we applied the Miller Technique too early to capture all of the activity. An application at 1800 UTC (closer to the time of threat) might be more effective. The 0000 UTC map did not show many high parameters into the north, such as in Ohio. It seems that the area of first activity was better captured by the 1200 UTC threat area, but the area where most of the activity had occurred by 0000 UTC was not indicated well by the 0000 UTC threat area.

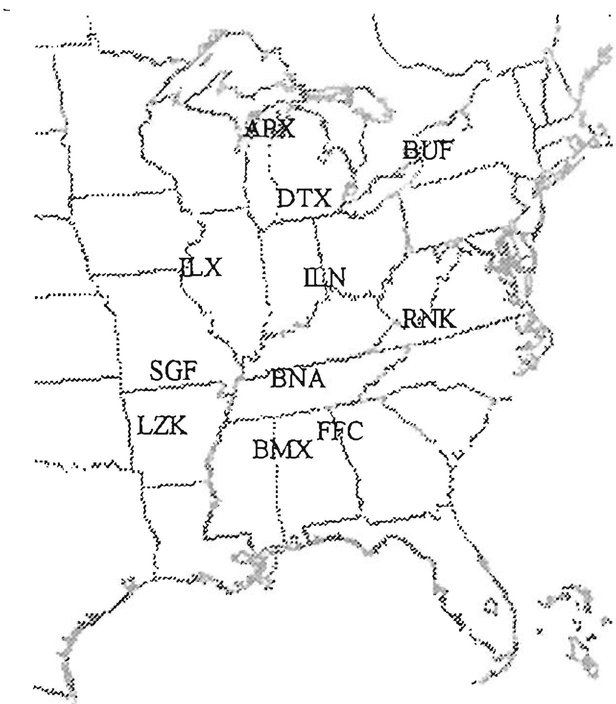


Fig.8 Selected upper-air sounding station locations

| Station | SGF (MO) | ILX (IL) | APX (MI) | DTX (MI) | LZK (AR) | ILN (OH) | BUF (NY) | BNA (TN) | RNK (VA) | FFC (GA) | BMX (AL) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Time UTC | 12Z Nov 10 | 12Z Nov 10 | 18Z Nov 10 | 18Z Nov 10 | 18Z Nov 10 | **19Z Nov 10** | 00Z Nov 11 | **00Z Nov 11** | 00Z Nov 11 | **00Z Nov 11** | 00Z Nov 11 |
| CAPE (J/kg) | 42 | 745 | 992 | 1098 | 1394 | **1638** | 504 | **1873** | 843 | **2108** | 2546 |
| LI | 0.9 | -4.0 | -2.9 | -2.4 | -2.3 | **-4.5** | -0.3 | **-4.8** | -2.5 | **-4.2** | -5.5 |
| SREH 0-3 km, $m^2s^{-2}$ | 176 | 52 | 91 | 237 | 241 | **336** | 267 | **573** | 266 | **348** | 290 |

Table II. Values of CAPE, LI and SREH for soundings

**3. Radiosonde analyses for selected locations**

In order to further analyse this event, some proximity soundings from the storm or tornado outbreak regions are analysed. Soundings chosen were considered not to have been affected by fronts and taken before convective activity had begun. Figure 8 shows the selected station locations based on the tornado outbreak regions (see Figure 5) (stations ILN, BNA, FFC, BMX) and their adjacent areas (stations ILX, SGF, LZK, RNK) and the areas surrounding south-western Ontario (stations APX, DTX, BUF). The soundings of some selected stations will be used to analyse the conditions associated with tornadic storms, while the others represent the conditions similar to the conditions over southern Ontario. The values of convective available potential energy (CAPE), lifted index (LI) and storm-relative environmental helicity (SREH) were calculated to assess convective instability and vertical wind shear (see Table II). Some soundings are modified based on the timing and movement of the outbreaks and the effects of solar heating between 12Z and later in the day. CAPE and LI calculations used the virtual temperature correction and the most unstable parcel in the lowest 300 hPa of the sounding. CAPE, calculated using this parcel, is sometimes designated as "most unstable CAPE" or MUCAPE (Matthew et al, 2002). This is used to assess the potential for elevated convection (Rochette et al, 1999) and is especially useful overnight when the surface layer cools and stabilizes, but elevated instability still exists (Matthew et al, 2002).

As we can see in Table I, the values of SREH show a large low-level vertical wind shear in the tornado outbreak regions. According to threshold values given by Ford (1995) for severe weather indices, weak, moderate and strong mesocyclones are related to SREH ranges 150-299, 300-449 and greater than 450 $m^2s^{-2}$, respectively. Table I in particular shows abundant helicity in the warm air mass in eastern United States. The values of CAPE and LI show considerable instability in the air mass; values of LI greater than –3 are linked to increased likelihood of severe weather and values of CAPE more than 1500 J/kg are related to tornado cases (Ford, 1995). Compared with these threshold values, the regions for tornado potential clearly correspond to the tornado outbreaks. Tornado events could be expected to occur in areas whose soundings have a significant product of CAPE and SREH (Rasmussen and Wilhelmson, 1983). Note however that tornadic storms can be spawned in environments that possess high CAPE and relatively low SREH, as well as in those that have relatively low CAPE and high SREH (Johns and Doswell, 1992). Based on their work, storm potential is evaluated in terms of CAPE and wind shear 0-4 km AGL, computed using the RAOB program (Shewchuk, 2002). On this basis we note that supercells could have occurred at BMX and FFC. Supercells or Ordinary cells might have occurred at BNA and ILN while mere storms would have been expected at others. This analysis is in agreement with the reports of severe weather.

Furthermore, we can see that the values of CAPE increase from north to south and that the north-south difference increases with time. The large values of CAPE move south-eastward with time, which suggests that severe storms would also move south-eastward. Such is the case from the NWS tornado and other storm reports for the outbreak. New tornadic supercells usually form at the south end of the squall line because they need to be fed with warm and moist air. These factors indicate a lack of significant energy or helicity for the development of tornadic supercells in the northern part at the start of the outbreak, and that warm and moist air could not move northward with time. The lack of severe weather in southern Ontario is similar to the situation in Buffalo (BUF), White Lake (DTX) and Gaylord (APX).

## 4. Comparison to Typical Severe Weather Outbreak Pattern

We can compare our composite sketches (Figures 6 and 7) to a typical pattern, which would cause a severe weather outbreak (see Fig. 3). As we can see, the low-level jet in the typical pattern is moving into the threat area from the south. In Figure 6 at 1200 UTC, we can see that the low-level jet is delivering air from the southwest instead of the south. However, it would still be advecting warm air into the region. In Figure 7 for 0000 UTC, we can see that the low-level jet is starting to look a little more like the typical pattern. It is coming in from the south, advecting warm, moist air from the Gulf of Mexico. The air has acquired a higher moisture level all through the area compared to 1200 UTC. However, the low-level jet seems to be much further ahead of the cold front than in the typical pattern.

As for the subtropical and polar jets, we can see that our composite maps show them both to be very different from the typical pattern. Both of the patterns show the jets to be directed more towards the north than in the typical pattern. In the 0000 UTC composite, the polar jet does not even appear to position itself ahead of the cold front behind the squall line. However, both patterns still do show a greater degree of separation as they move out in front of the leading cold front. This indicates divergence aloft and suggests convergence at the surface, which contributes to development. At 0000 UTC the subtropical and polar jets have moved closer together coming from the east into Arkansas. This shows a convergence in the upper level, and suggests a divergence at the surface, which would most likely suppress development. The squall line at 0000 UTC has already passed through this area and therefore no more development is taking place. The surface divergence could potentially have caused the dissipation of activity in the area.

## 5. Lack of Severe Weather in Ontario

There were numerous reports of severe weather, including a number of damaging tornadoes in Ohio, yet north of Lake Erie, there were no reports of any such activity. It is possible that effects from the lakes prevented severe weather from occurring in southern Ontario. The lake temperatures for that day were significantly cooler than the maximum inland air temperatures. Southern Ontario was experiencing mid-teen temperatures, while Lake Erie had a surface temperature between 7 to 10 °C as shown by NOAA lake surface temperature data fro November 10$^{th}$. So, the southerly surface flow into southern Ontario was likely advecting cooler, lake-modified air into the area. This could mean that storm development started from an elevated level, above the cold air intrusion, and kept instability from occurring in the lower levels. This would create a high-based storm event, which is not favourable for tornado development, especially if there is no warm moist air from the lower levels helping to feed the storm. There was, however, vigorous convection and plenty of thunder and lightning. As we could see in the composite maps (Figures 6 and 7), the moisture intrusions only seemed to skim the tip of southern Ontario and mainly moved into Michigan. There was a temperature ridge over Lake Ontario through the day. Through the Miller Technique this temperature ridge may have given a good reason why this area had no severe activity and a lack of moisture could keep strong storms from developing. Also, many of the jets seemed to move up around Ontario to the east (see Figures 6 and 7). In the case of the low-level jet, its direction could keep warm, moist air from being advected into the area.

It would be easier to analyze the low-level conditions with the use of atmospheric soundings; however, there were no soundings taken in Southern Ontario on November 10, 2002. So it is difficult to compare local vertical temperature profiles in Ohio and Ontario.

## 6. Conclusions

The Miller Technique works well, and is especially useful for students and others who do not have much experience in identifying threatening meteorological patterns. However, it seems that the technique may have better results when it is used with data collected closer to the time of the outbreaks. In this case the 1200 UTC analysis only caught the first half of the severe weather events.

The lack of severe storms in Southern Ontario on November 10/11 could have been a result of a lack of moisture in the area, a temperature ridge to the east, and possible inversions near the surface due to a cooling effect coming off Lake Erie. Overall, most of the Miller parameter values indicated weak values for Southern Ontario except for the area around Windsor and Sarnia. In order to find out why there was a lack of severe weather in Southern Ontario, it would be useful to have atmospheric soundings in this region since a local, vertical view of the temperature field would have been very useful.


### Acknowledgements

This article is an extension of an assignment completed as part of a York University graduate course on Severe Summer Storms. Graduate students (LA, XS) involved in this work are supported through the ELBOW 2001 project, funded by a grant from CFCAS. Thanks to Geoff Coulson, Patrick King and Brian Murphy (Meteorological Service of Canada) for supplying Environment Canada weather maps, satellite images and enhanced radar imagery. Also, thanks to Paul Ford of MSC for use of material from Ford (1995).


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From deciding whether to reach for an umbrella on the way out the door to determining whether it is safe to go to sea, everything from our comfort to our very lives and livelihoods depends on accurate, reliable and timely weather information.

Source: Improving Canada's Weather Service, Environment Canada, Press Release, March 13, 2003.

## Reid V. Dexter

### 1915 - 2002

Reid Vincent Dexter, well known forecaster, CBC radio and TV weatherman and longtime member of CMOS, has died at age 86.

Reid was born in Halifax on 20 December, 1915 and was a graduate of Dalhousie University. He joined the Meteorological Division of the Department of Transport in 1941 and was posted to Head Office in Toronto for the Second Wartime Intensive Short Course in Meteorology. A brief spell followed as metman at No. 10 Air Observers School at Chatham, New Brunswick, prior to returning to Toronto to take the first Advanced Course in Meteorology from October 1941 to January 1942. On successful completion of this course he was posted as Officer-in-Charge of the Met Office at #31 Operational Training Unit, RAF Debert, N.S. Postings followed to the Dominion Aviation Forecast Office in Moncton and the Dominion Public Weather Office in Halifax. In July 1948 he was posted to the Main Meteorological Office in Gander where he remained for two years before returning to the DPWO in Halifax as forceaster and 2 i/c.

In September 1961, Reid resumed his career with the military, becoming Officer-in-Charge of the Maritime Headquarters Forecast Office and Staff Officer Meteorology at the Headquarters of the Maritime Forces Atlantic in HMC Dockyard, Halifax. Following unification of the Canadian Forces in 1967 he become Senior Staff Officer Meteorology to the Commander of Maritime Command, the most senior meteorologist position in the Command. He remained in this position until his retirement from the public service in December 1973.

In June 1970 Reid began a second career as radio weatherman on the CBC Information Morning talk show. This association with CBC would last for many years after his retirement from the public service and made him very well known across the Maritimes. It entailed commuting from his home on St Margaret's Bay in the early hours of each morning in order to be prepared to go on the air soon after 6:00am. Not satisfied with radio, Reid on numerous occasions also presented the evening TV weathercast on CBC Gazette. His efforts were recognized with the award of a CMOS Citation in 1983.

While Reid enjoyed carpentry and built his own cottage on St Margaret's Bay, his lifelong passion was sailing. He was extremely generous in inviting his friends and colleagues to accompany him sailing and will be remembered for the tickets he issued by way of invitation and which bore the caption "Good For Any Number of Repeats".

Reid was a talented meteorologist and forecaster who had a tremendous knowledge of local weather and wind conditions gained, at least in part, through his extensive sailing experience. He was all too well aware of the need for weather observations and that there were never enough. He therefore set about organizing a group of amateur volunteers who would phone in their observations to a retired gentleman living in East Green Harbour who then relayed them to Reid for use in his radio weather broadcasts. This resulted in the small community of East Green Harbour becoming a well known Nova Scotia landmark.

Reid was a talented meteorologist and forecaster who had a tremendous knowledge of local weather and wind conditions gained, at least in part, through his extensive sailing experience.

*D.N.*

I first met Reid in 1961 when serving as Weather Officer in HMCS Bonaventure and he joined the ship for a few days familiarization with the Navy. I last met him in the summer of 2001. By then he had many health problems and had moved into assisted living accommodation in order that his diabetes could be better controlled. He cheerfully accepted these problems and was busy reading, yet again, Joshua Slocum's Sailing Alone Around the World. As he remarked, the print of that edition was much larger than previous editions he had read!

In early 2002 he suffered a stroke from which there would be no recovery. He died a week later on Sunday, 24 February 2002.

Reid will long be remembered by all who knew him for his generosity, his ready wit and good humour. He is survived by his wife Bernice, his daughter Barbara and son Glen to whom we extend heartfelt sympathy.

*David Nowell,*
*Ottawa Centre*

## Rube Hornstein[1]

## 1912 - 2003

Weatherman Hornstein dead at 90

Grey clouds are in the hearts of many Nova Scotians after the death of Rube Homstein, a pioneer radio and television weather personality. Mr. Hornstein died in Halifax on Thursday, January 30, 2003. He was 90.

"He was just one of the last great gentlemen," said Don Tremaine, a longtime friend and television colleague. "They don't make those birds anymore."

Mr. Homstein, raised on a farm in London, Ont., came to Halifax during the Second World War as head meteorologist for the military's eastern air command.

He began doing radio reports for the CBC in 1946 and hosted a popular show called "Ask the Weatherman".

When the CBC launched a TV news program, Gazette, in 1954, Mr. Hornstein did the weather forecasts. "We were there the first time television was on in Halifax," said Mr. Tremaine, who read the news on the show.

Mr. Tremaine said he hit it off with Mr. Hornstein right away. He recalled the weatherman's sly sense of humour.

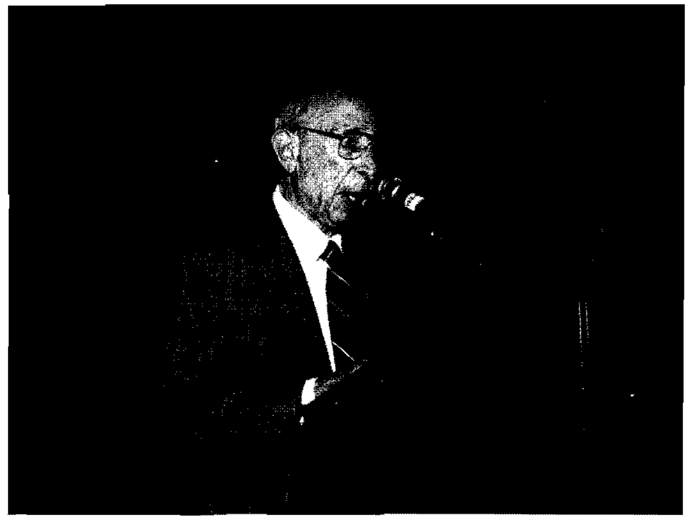
One day a young boy who was observing the making of Gazette asked Mr. Homstein how he remembered all the temperatures and numbers. "He answered, 'There are two people in the makeup room: one puts the makeup on my face, the other tattoos the numbers on my eyes,' " Mr. Tremaine said. Mr. Hornstein had an influence on another young man who would follow his career path.

ATV meteorologist Peter Coade says a day he spent with the CBC personality while he was still in high school piqued his interest in the weather.

The CBC was hosting a career day and teachers were looking for interested students to visit the station. Everyone wanted to hang out with the reporters, Mr. Coade said, but when they asked who was interested in meteorology, "nobody put their hand up because I don't think anybody knew what it was."

He volunteered. "I saw it as a way of getting out of school for a day."

But Mr. Hornstein's enthusiasm rubbed off on him, Mr. Coade said. "It's sort of a cliché to say this about people, but he really loved his work. It wasn't just a job, it was a passion."



Photograph of Rube Homstein

When it came to weather, Mr. Hornstein was a trusted figure, Mr. Coade said. "People could believe that if Rube said it was going to snow, it snowed," he said.

Weather-watchers valued his judgment so much that they wouldn't hesitate to track him down for a personal report, Mr. Hornstein told The Herald in 1985, 13 years after he retired.

"I used to keep my number unlisted," he said. "People used to phone me in the middle of the night to find out the next day's weather."

After retiring, Mr. Hornstein pursued another passion: recording books on tape for the blind. At one point he was making more than 300 90-minute tapes a year - everything from children's books to university texts.

His work with the blind was a lifelong thing, Mr. Tremaine said. Mr. Homstein's father had lost his sight and young Rube used to read the paper to him every day before doing his homework.

"He sort of had an idea of how difficult it was for someone who was visually impaired," Mr. Tremaine said.

Between his career and his volunteer work, Mr. Hornstein earned countless accolades.

He was awarded the Patterson medal for distinguished service to Canadian meteorology in 1962. King George VI granted him membership in the Order of the British Empire

[1] Reprinted with permission from The Halifax Herald Limited.

in 1946 for his weather service during the war. He was also named a member of the Order of Canada in 1991 and given a commemorative medal for Canada's 125th anniversary a year later.

But one thing he was most proud of was establishing a scholarship in his name at the University of Western Ontario, Mr. Tremaine said.

The Ontario native graduated from the school with a degree in physics in 1934 and relied on scholarships to pay his way. He wanted to give the same help to others, Mr. Tremaine said.

"The thing he always really enjoyed was hearing from the people who won the scholarship," Mr. Tremaine said. "They always wrote and said thank you."

*Chad Lucas*
*The Halifax Herald Limited*

Rube Hornstein was a longtime member and supporter of the Canadian Meteorological and Oceanographic Society. He joined the Canadian Branch of the Royal Meteorological Society in 1940 and served that Society as a Councillor for several office terms. He maintained his association with its successor, the Canadian Meteorological Society and later when it became the Canadian Meteorological and Oceanographic Society. He was made a Life Member of the Society in 1986. He established the Rube Hornstein Prize in Operational Meteorology in 1975 and was later honoured by the Society when it created the Rube Hornstein Medal in Applied Meteorology. He was the first recipient of this medal. Despite failing health he continued his interest in the Society and meteorology by publishing a book review on "Hurricane Watch" authored by Bob Sheets and Jack Williams in the December 2002 issue of the CMOS Bulletin SCMO (Vol.30, No.6, pages 177-178).

*Neil Campbell*
*Executive Director*

## 37th CMOS Annual Congress
## Ottawa, Ontario, Canada
## 2 - 5 June 2003

The Local Arrangement Committee would like to extend an invitation to participate in the CMOS Congress 2003 in Ottawa. You can take advantage of express registration on our web site. Go to www.cmos.ca and choose "Ottawa Congress 2003", and "Registration".

The 2003 Congress will be held at the Crowne Plaza Hotel, within walking distance of Parliament Hill, during the week of June 2nd to 5th. This is a beautiful time of year in Ottawa, so I do hope you will block these dates off on your calendar and plan to attend the CMOS Congress this year.

The theme of the CMOS 2003 Ottawa Congress is: ATMOSPHERE-OCEAN SCIENCE: IMPACTS AND INNOVATION. Under the guidance of Dr. Peter Taylor of York University, the Science Committee is developing a program that will appeal to a broad range of interests throughout the meteorological and oceanographic communities in Canada, as well as internationally. Sessions will be organized on such topics as:

- Air Quality and Atmospheric Chemistry;
- Arctic Oceanography and Meteorology;
- Air-Sea Interaction;
- Boundary layer and Mesoscale Meteorology;
- Canadian Community Model (NWP);
- Cloud Physics;
- Global Ocean Ecosystem Dynamics;
- Icing effects on aircraft and structures;
- Impacts of weather (land and ocean) and climate on society;
- Mackenzie GEWEX study;
- Numerical Weather Prediction;
- Ocean Engineering;
- Operational Meteorology and Oceanography;
- Radar Meteorology and Lightning;
- Remote Sensing;
- Road Weather Systems;
- Surface Ocean - Lower Atmosphere Study (SOLAS);
- Weather, Climate and Health (Impacts);
- Weathercaster sessions.

The Local Arrangements Committee is actively working to make it a great Congress. The facilities have been reserved at the Crowne Plaza Hotel and I am sure that they will prove to be first rate. A special Congress room rate has been negotiated and an additional block of rooms set aside for students.

Plans are already under way for a very interesting science program, for social events and tours, an expanded commercial exhibition, and email abstract submission and on-line registration.

Again, I hope you will plan ahead to come and join us in Ottawa, June 2nd to 5th, 2003, for the next CMOS Congress. And please visit our web site occasionally (from www.cmos.ca) to keep in touch with the science and social programs as they evolve.

See you all in Ottawa!!!

*Bruce Ramsay*
*Chair, Local Arrangements Committee*
*CMOS Congress 2003 Ottawa*
*Bruce.ramsay@ec.gc.ca*

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## 37ième Congrès annuel de la SCMO
## Ottawa, Ontario, Canada
## 2 au 5 juin 2003

Le comité organisateur local aimerait vous inviter cordialement à participer au Congrès 2003 de la SCMO, à Ottawa. Vous pouvez bénéficier de l'inscription express sur notre site web. Allez à www.scmo.ca, choisissez "Congrès d'Ottawa 2003" et ensuite "Inscription".

Le congrès 2003 de la SCMO se tiendraà l'hôtel Crowne Plaza, situé à distance de marche de la colline parlementaire, durant la semaine du 2 au 5 juin 2003. Le temps est magnifique à Ottawa à cette période de l'année, et j'ose espérer que vous réserverez ces dates dans votre agenda et participerez au congrès de la SCMO cette année.

Le thème du congrès de cette année est : SCIENCE DE L'ATMOSPHÈRE-OCÉAN : IMPACTS ET INNOVATION. Sous la direction de Peter Taylor, de l'Université York, le comité scientifique est présentement à élaborer un programme, qui saura plaire à une vaste gamme d'intérêts au sein des communautés météorologique et océanographique, autant au Canada qu'ailleurs dans le monde. Les séances porteront sur des sujets tels :

- La qualité de l'air et la chimie atmosphérique;
- L'océanographie et la météorologie arctique;
- Les interactions atmosphère-océan;
- La couche limite et météorologie de méso-échelle;
- Le modèle communautaire canadien (prévision numérique);
- La physique des nuages;
- La dynamique des systèmes océaniques mondiaux;
- Les effets du givrage sur les aéronefs et les structures;
- Les impacts du temps et du climat sur la société;
- L'étude GEWEX du Mackenzie (MAGS);
- La prévision numérique du temps;
- Le génie océanographique;
- La météorologie opérationnelle;
- L'océanographie opérationnelle;

- Les radars météorologiques et la foudre;
- La télédétection;
- La météo routière;
- La surface océanique - études sur la basse atmosphère (SOLAS);
- Les présentateurs météo.

Le comité organisateur local travaille activement afin de faire du congrès un événement mémorable. Nous avons réservé l'hôtel Crowne Plaza et je suis persuadé que vous aimerez ses installations de première classe. Un tarif spécial pour les chambres d'hôtel a été négocié. De plus, nous avons réservé un certain nombre de chambres pour les étudiants à un tarif encore plus avantageux. Nous sommes à élaborer un programme scientifique des plus intéressants, des événements sociaux et des visites touristiques agréables, une exposition commerciale plus élaborée que jamais, un service courriel de soumission des résumés de présentation et un service d'inscription électronique.

J'espère que vous projetez de vous joindre à nous à Ottawa du 2 au 5 juin 2003 pour le prochain congrès de la SCMO. Jetez un coup d'oei à l'occasion sur notre site web (www.scmo.ca) pour suivre l'évolution de nos programmes scientifiques et sociaux.

Au plaisir de vous accueillir à Ottawa !

*Bruce Ramsay*
*Président du comité organisateur local*
*Congrès 2003 de la SCMO à Ottawa*
*bruce.ramsay@ec.gc.ca*

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## SCOR Call for Working Group Proposals

The Scientific Committee on Oceanic Research (SCOR) is accepting proposals for new working groups, from now until April 30, 2003. SCOR considers several proposals for new working groups each year but usually only a few (1-3) can be funded each year, depending on SCOR's budget situation. Working groups are usually formed of not more than 10 members, to deliberate on a narrowly focused topic and develop a publication for the primary scientific literature. The intent is to have their work completed within 4 years or less. SCOR has sponsored (alone or with other organizations) over 120 working groups, including the current ones. Funding is available for at least one new working group starting in 2004, and SCOR will attempt to arrange funding for more than one. Selection of new working groups will be made at the 36$^{th}$ SCOR Executive Committee Meeting in Moscow, Russia on September 15-19, 2003. The intervening May-August time frame will allow for proposal review and modification. A model proposal and other information about working groups may be found at www.jhu.edu/scor/wkgrpinfo.htm

National SCOR committees are an important aspect of SCOR's operation and play a key role in reviewing working group proposals. Proponents should consider submitting their proposals through their national committees, although SCOR will also accept proposals from individuals and other organizations. Information regarding the Canadian National Committee for SCOR may be found at www.cncscor.ca

*Richard Stoddart,*
*CNC SCOR Secretary*

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## Atelier d'été en météorologie Projet Atmosphère

Demande de candidats de niveau pré-collégial

Comme par les années passées, la Société canadienne de météorologie et d'océanographie (SCMO) a été invitée à choisir un enseignant canadien qui participera au PROJET ATMOSPHÈRE en 2003. Il s'agit d'un atelier d'été à l'intention des enseignants de niveau pré-collégial spécialistes en sciences atmosphériques; cet atelier est parrainé par l'American Meteorological Society (AMS) et la National Oceanic and Atmospheric Administration (NOAA) américaine. Il aura lieu du 21 juillet au 1 août 2003 au centre de formation du National Weather Service à Kansas City au Missouri.

Les dépenses de l'enseignant choisi seront assumées par l'AMS et la NOAA, à l'exception des déplacements à destination et au retour de Kansas City. La SCMO et le Conseil canadien pour l'enseignement de la géographie offrent chacun jusqu'à 300 $ (canadiens), soit au total 600 $, pour les déplacements.

Les anciens participants du Canada ont trouvé leur expérience très enrichissante et stimulante (lire *CMOS Bulletin SCMO*, Vol. 30, No. 6, p. 181). Les exposés de l'atelier sont présentés par des experts américains les plus réputés dans les sciences atmosphériques et océanographiques. Les enseignants sont revenus avec du matériel, des ressources et des modules didactiques qu'ils peuvent facilement adapter dans leurs cours.

Les enseignants intéressés sont priés de demander un formulaire de candidature à l'adresse suivante :

Directeur exécutif
SCMO - Atelier d'été
Bureau 112, Immeuble McDonald
150, rue Louis-Pasteur
Ottawa (Ontario) K1N 6N5
Téléphone: (613) 990-0300; Télécopie: (613) 993-4658
Courriel: cmos@meds-sdmm.dfo-mpo.gc.ca

Ces demandes doivent être soumises au plus tard le **18 avril 2003.**

## Summer Meteorology Workshop
## Project Atmosphere

Call for Applications by Pre-college Teachers

As in several previous years, the Canadian Meteorological and Oceanographic Society (CMOS) has been invited to select a Canadian teacher to participate in PROJECT ATMOSPHERE in 2003. This is a summer workshop for pre-college teachers of Atmospheric Science topics sponsored by the American Meteorological Society (AMS) and the National Oceanic and Atmospheric Administration (NOAA) of the United States. It takes place July 21 - August 1, 2003 at the National Weather Service Training Center, Kansas City, Missouri.

The expenses for the participating teacher are paid by AMS/NOAA, except for the travel to and from Kansas City. CMOS and the Canadian Council for Geographic Education contribute up to $300 (Canadian) each (total $600) towards the travel expenses.

Previous Canadian participants have found their attendance a very rewarding and significant experience (see *CMOS Bulletin SCMO*, Vol.30, No.6, p.181). Presentations are made at the Workshop by some of the most respected American Scientists in the fields of atmospheric and oceanographic sciences. Participants have returned with material, resources and teaching modules readily adaptable to classroom presentations.

Interested teachers should request, as soon as possible, an application form from the following address:

Executive Director
CMOS - Summer Workshop
Suite 112, McDonald Bldg
150 Louis-Pasteur
Ottawa, ON K1N 6N5
Tel: (613) 990-0300; Fax: (613) 993-4658
e-mail: cmos@meds-sdmm.dfo-mpo.gc.ca

These requests should be submitted no later than **April 18, 2003.**

## 2003 A.G. Huntsman Award
## Call for Nominations

The A.G. Huntsman Award for Excellence in Marine Sciences will be given in the category of Physical/Chemical Oceanography in 2003. You are invited to visit the Huntsman website at

http://www.bio.gc.ca/huntsman/huntsman-e.html

for information on submitting nominations, which have a deadline of 30 April 2003.

For more information, please contact John Loder at loderj@mar.dfo-mpo.gc.ca

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## Prix d'excellence A.G. Huntsman 2003
## Appel de candidatures

Le prix d'excellence A.G. Huntsman en océanologie sera donné cette année dans la catégorie de l'océanographie physique et chimique. Vous êtes invités à visiter le site web Huntsman à

http://www.bio.gc.ca/huntsman/huntsman-f.html

pour obtenir de l'information sur la soumission des nominations qui devront parvenir avant le 30 avril 2003.

Pour plus d'information, n'hésitez pas à contacter John Loder à loderj@mar.dfo-mpo.gc.ca

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## Next Issue CMOS Bulletin SCMO

Next issue of the *CMOS Bulletin SCMO* will be published in June 2003. Please send your articles, notes, workshop reports or news items at the earliest to the address given on page ii. We have an **URGENT** need for your articles.

## Prochain numéro du CMOS Bulletin SCMO

Le prochain numéro du *CMOS Bulletin SCMO* paraîtra en juin 2003. Prière de nous faire parvenir au plus tôt vos articles, notes, rapports d'atelier ou nouvelles à l'adresse indiquée à la page ii. Nous avons un besoin **URGENT** d'articles.

## News / Nouvelles
## Future Directions of CICS*

During the past Spring and Summer, the Board of Directors of the Canadian Institute for Climate Studies (CICS) commissioned a study of possible future options for CICS. The impetus for this was the fact that 2002 is the last year of operations for the Climate Research Network and it was felt that CICS needed to find new links with the climate research community in order to remain a credible organization advising climate-sensitive sectors. The study produced two reports, a preliminary one in mid-June and a phase-2 report in mid-October.

The preliminary report identified four options:

1. Business as usual;
2. Participation as a partner in a proposed UVic "Climate Change Science, Technology and Policy Institute";
3. Leadership of the proposed UVic Institute;
4. Close down CICS.

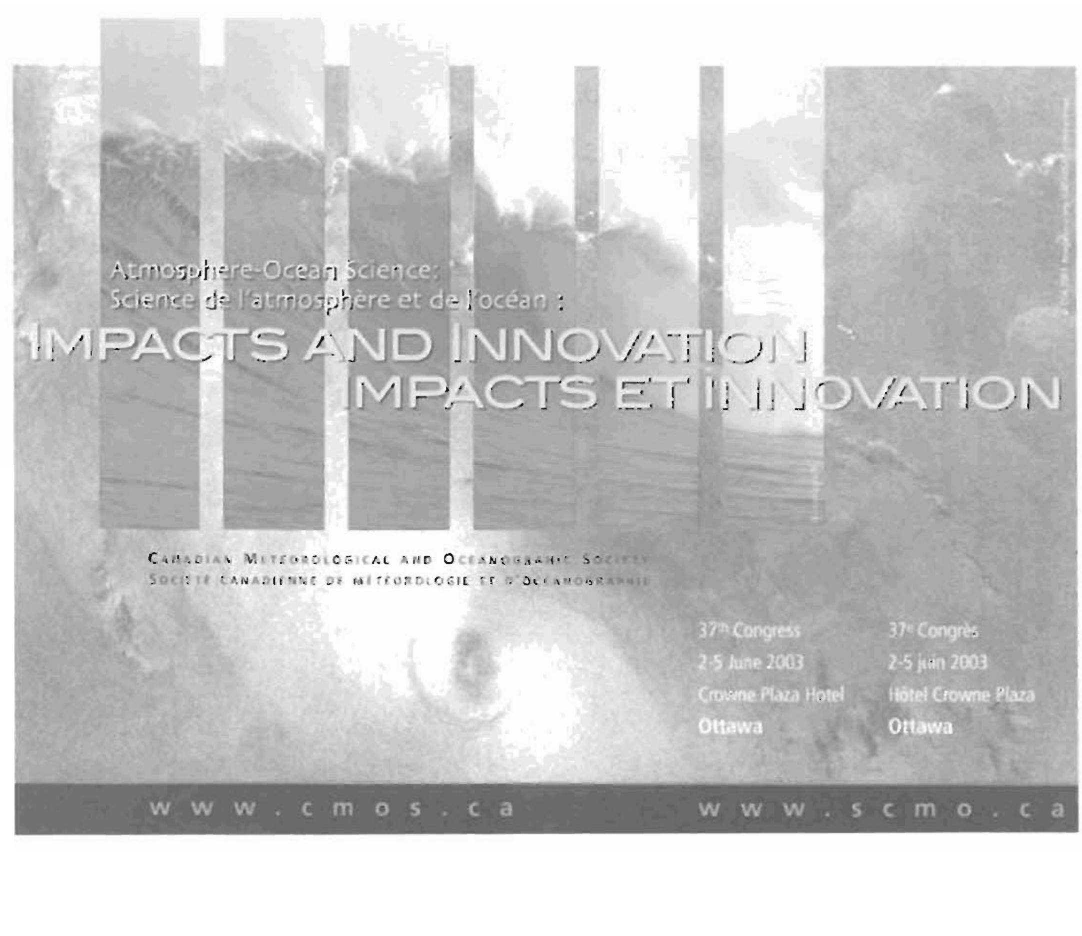
The Board rejected options 1 and 4 and asked for elaboration on options 2 and 3, both of which involved closer association with UVic.

Following extensive consultation with interested parties at UVic and Environment Canada, the phase 2 report recommended that "the formation of a climate institute at UVic is timely and appropriate and should be pursued with vigour by CICS in partnership with the other proponents". In addition, it recommended that CICS should offer to become the 'shell' of such an institute. The Board accepted these two key recommendations and set in motion a process to draft an action plan and submit it to the membership for approval. This would be a plan to transform CICS from an independent, non-profit corporation to a UVic collaborative research centre. The mandate would be "to foster collaborative research within UVic and with outside players on all aspects of climate, climate change and their interactions with human activities". It was proposed that this transformation be done in stages, which first would see CICS be under the umbrella of UVic's Centre for Global Studies and then within a year or less become an approved independent centre at the University. To facilitate this process, UVic asked Prof. Steve Lonergan of the Department of Geography to assist CICS's Executive Director and staff with the planning process on an interim basis. This process will identify all the steps required for the transformation and, with membership approval, initiate actions to complete the transformation. Members and clients of CICS can expect to hear more about these exciting developments in the months ahead.

*Ian Rutherford, Research Manager*

* Reproduced with the authorization of the Editor, "The Climate Network", Vol.8, No.4, Winter 2003, page 3.

## CMOS Accredited Consultants
## Experts-Conseils accrédités de la SCMO


Atmosphere-Ocean Science:
Science de l'atmosphère et de l'océan :
IMPACTS AND INNOVATION
IMPACTS ET INNOVATION
Canadian Meteorological and Oceanographic Society
Société canadienne de météorologie et d'océanographie
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