



Environment
Canada

Environnement
Canada

Meteorological Service of Canada



Canada

providing service to Canadians since 1871

MSC

INTRODUCTION

from the Assistant Deputy Minister

The Meteorological Service of Canada (MSC) has been providing service to Canadians since 1871.

Canada's weather service was created to provide weather warnings to mariners on the Great Lakes and St. Lawrence River. In 1908 Canada's water survey activities were officially recognized.

Today, the MSC has approximately 1600 staff working to ensure Canadians receive accurate and accessible daily weather, water and ice information.

Serving the second-largest country in the world, the MSC must cover a vast domain. The MSC stretches from the high Arctic, at air quality research stations, to weather offices and water stations across the country, to buoys in both oceans, and even to space, where observations from Canada's RADARSAT, the world's first operational radar satellite, provides data for ice forecasts.

The MSC is a unique and essential service of the federal government, contributing to the health, safety, security and economic prosperity of all Canadians.

As the Assistant Deputy Minister of the Meteorological Service of Canada, I am pleased to present this brochure, which describes who we are and what we do.

Marc Denis Everell



Top: MSC's Supercomputer

MISSION STATEMENT

The mission of the Meteorological Service of Canada is to anticipate and respond to the evolving needs and expectations of Canadians and their institutions for meteorological, hydrological and related information and prediction services thereby helping Canadians adapt to their environment in ways which safeguard their health and safety, optimize economic activity and enhance environmental quality.



WHO WE ARE AND WHAT WE DO FOR CANADIANS

The Meteorological Service of Canada:

- provides weather forecasts and warnings of extreme weather events and hazardous air quality
- monitors atmospheric conditions and the quantity of water in Canadian lakes and rivers
- forecasts ice and wave conditions on navigable oceans and inland waters
- monitors and predicts the state of the climate
- leads the development of atmospheric science and related environmental prediction in Canada
- is Canada's official source for public weather warnings and the principal scientific authority for standards, information and advice on the past, present and future states of the atmosphere, hydrosphere (lakes, rivers and oceans) and cryosphere (snow and ice).

Our People

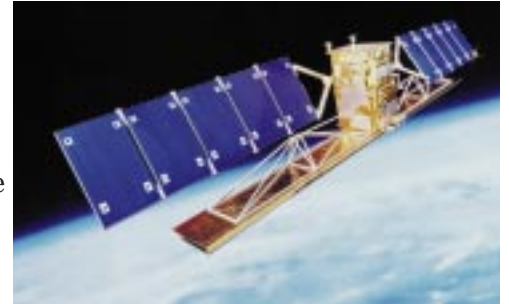
MSC staff are highly trained, specialized scientific and technical workers, many of whom work in round-the-clock shifts, on land and at sea, throughout Canada including the High Arctic, to monitor and predict severe weather events and measure water levels of major lakes and rivers. Our dedicated staff are the primary reason for our reputation as a world class weather prediction service and our internationally recognized excellence in atmospheric science research.

Some Facts about the MSC

The MSC is one of the most automated weather and hydrometric services in the world, with a \$375 million technological infrastructure. This infrastructure ranges from traditional (thermometers and rain gauges) to state-of-the art technology (supercomputers, Doppler radar, satellite receivers), and must operate 24 hours a day, 365 days a year.

- A large component of MSC's national headquarters is located in Downsview, Ontario, along with a research laboratory
- There are 14 regional weather centres across the country, along with other offices providing specialized client services or conducting research

- The Canadian Ice Service office in Ottawa conducts ice surveillance and forecasting for the Arctic, the Eastern Canadian seaboard, the St. Lawrence and the Great Lakes
- The Canadian Meteorological Centre (CMC), located in Montreal, is the hub of the national tele-



↑ RADARSAT-1 courtesy of Canadian Space Agency

- communications, weather modeling, and emergency response services. The CMC also houses MSC's supercomputer, one of the fastest scientific computers in the world. The supercomputer runs the numerical models for daily weather forecasting, as well as supporting hundreds of researchers, particularly those working in climate change research and prediction. Each day CMC's computers handle about 3 trillion bytes of data.
- More than one hundred years of climate data (7 billion observations) are stored in MSC archives, for use by researchers, the media and clients such as insurance and law firms.

- The MSC is also home to Canada's Hurricane Centre, which is part of Halifax's Maritimes Weather Centre
- The Water Survey of Canada, along with its partners, measures river flow and records the levels of lakes and rivers at more than 3100 locations in Canada.



Historical records from 7700 sites permit the estimation of streamflow at ungauged locations. Our hydrometric network is being modernized to better assist in flood prediction and prevention.

Observation and Data Networks

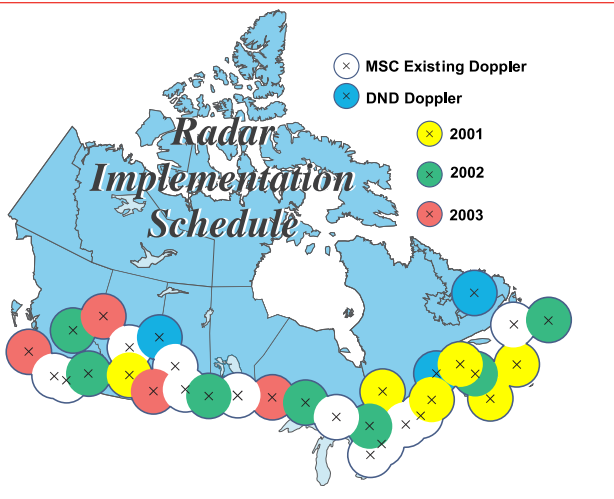
Data are critical to the environmental prediction process. Weather, air quality, ice, snow and water observations are gathered and shared in Canada with over 179 countries around the world.

We have an array of networks across the country collecting this information - from the earth's surface, in the water, from the upper atmosphere and from space. Thousands of volunteer severe weather watchers, ham radio operators and shipboard observers help in detecting severe weather and monitoring Canada's climate.

Two examples of observing and data networks are:

■ **The Canadian Lightning Detection Network (CLDN)**

The implementation of the 81 sensor CLDN was completed in August 1998. Lightning data is now used by MSC meteorologists to forecast and detect thunderstorms across Canada, to assist forestry services in fighting forest fires caused by lightning, and to help utilities in power outage planning.



■ **Weather Radar**

MSC's radar network of conventional and Doppler radars covers 95% of Canada's population. Doppler radar is a key tool in improving the detection and prediction of environmental hazards such as severe weather and floods. The map illustrates our multi-year project to convert all weather radars to Doppler. This National Radar project is MSC's number one priority for capital investment. When finished, 31 Doppler radars will be in operation.

Serving Canadians

Weather services are among the most frequently used

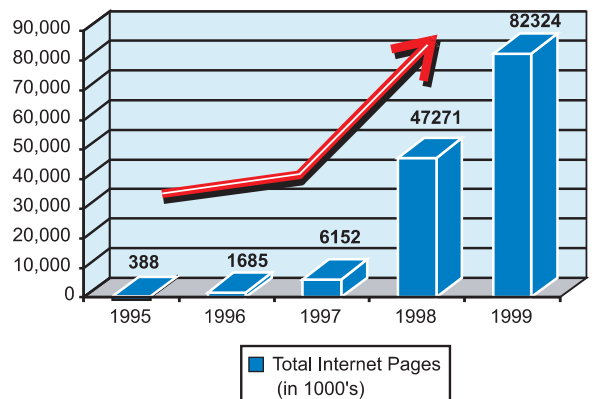
federal government services. Polls show that virtually all Canadians surveyed (94%) listen to at least one weather forecast daily.

Annually, we issue approximately 14,000 severe weather warnings and 3,500 ice hazard warnings, and provide about 500,000 public weather forecasts, 200,000 marine weather forecasts and 400,000 aviation forecasts.

Our information can be accessed via Environment Canada dissemination systems, such as:

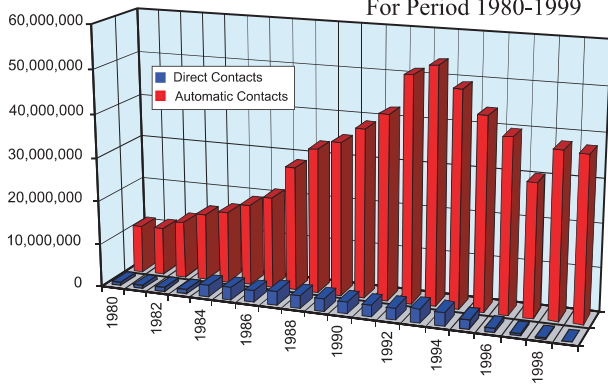
- *Weatheradio*: a service continually broadcasting weather information using VHF frequencies and
- *Weathercopy*: a digital Weatheradio service
- *The Internet* (<http://weather.ec.gc.ca>): our weather pages get over 80 million page views per year (200,000 daily) and account for the majority of Environment Canada's Green Lane web traffic. The chart demonstrates the exponential growth in Internet usage for weather information.
- *Telephone*: free recorded messages provide basic public forecasts, or, by calling a 1-900 user-pay phone service, callers can speak directly to a meteorologist 24 hours per day. Although over 40 million calls per year are received, this number has declined since the mid-1990's, as shown in the chart on page 5, likely due to increases in internet usage.
- *Emerging Technologies*: We continue to explore innovative ways to deliver our information to Canadians. The explosion of new technology, such as wireless telephones, laptop computers and palm

Growth in Internet Contacts





Contact Statistics
For Period 1980-1999



organizers provides new opportunities to ensure the public can get weather warnings and information in time to take action to protect themselves and their property. Future delivery methods may include crawler messages (WeatherAlert) that scroll along the T.V. screen to warn viewers of approaching severe weather, and other concepts such as WeatherAlarm (technology to interrupt automated radio broadcasts during weather warning situations) and Internet, cellular telephone and digital radio delivery mechanisms.

Electronic and Print Media

However, our primary means of reaching Canadians is via the mass media. The media are a crucial link to ensure that Canadians receive weather information and especially warnings in a timely manner. Since weather information is a popular item for most media audiences, both the MSC and the media benefit from their provision of this valuable public service.

ALLIANCES

The MSC cannot deliver its products and services alone. In addition to the media, we work extensively with other public and private partners. Among them:

Department of National Defence

The Canadian Forces rely on specialized meteorological and hydrological information provided by MSC, both on bases in Canada and during their operational missions. Examples of

support during 2000 include setting up a web site in February with flooding and climate summaries for Mozambique, provision of forecasts to a Task Group rescuing survivors of a sinking freighter north of Bermuda in March, and weather support to the 408 Squadron stationed in Bosnia.

Provinces

Water level and streamflow data are collected at hydrometric gauging stations across Canada, under formal cost-share agreements signed with each of the provinces and territories. These agreements with provincial governments for water monitoring have long been held as models of federal-provincial co-operation and ensure Canadians receive effective, coordinated information about water.

We also work with the provinces in areas such as air quality monitoring and forest fire management.

Universities

The MSC participates in a multitude of cooperative projects with universities and research agencies in Canada and around the world to conduct research related to atmospheric and environmental sciences and to develop policies on issues such as climate change.

Canadian Coast Guard

The MSC works in partnership with the Canadian Coast Guard (CCG) to ensure the safety of mariners and the efficiency of Canada's marine transportation system. The CCG's Marine Communications system broadcasts our weather and ice information to mariners at sea by radio. Our Canadian Ice Service provides the CCG with specialized weather and ice information to support the activities of the icebreaker fleet as well as Search and Rescue operations.



↑ Canadian Coast Guard Icebreaker

NAV CANADA

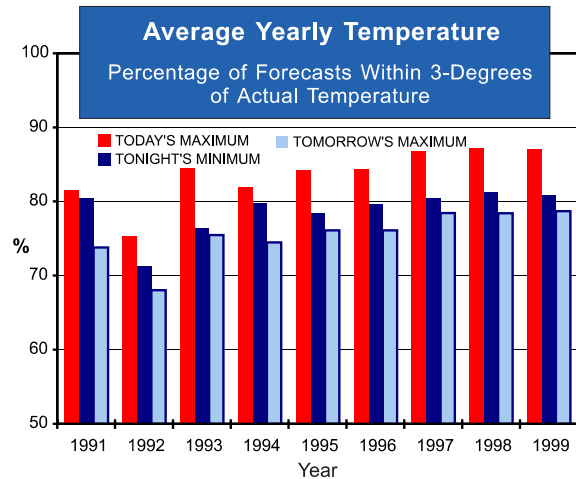
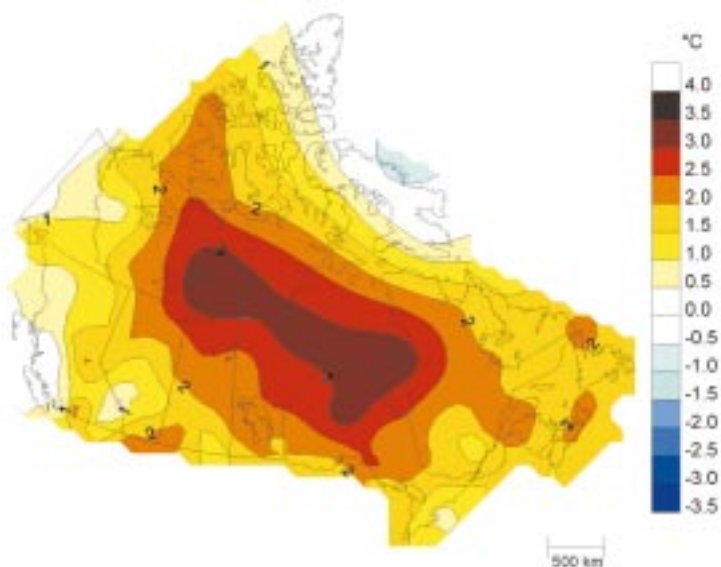
Accurate and timely weather information is vital to the safety and efficiency of air transportation in Canada. MSC has been providing weather services to the aviation industry since the 1930's. Today, we provide these services under contract to NAV

CANADA, which has been the private operator of Canada's air navigation system since 1996.

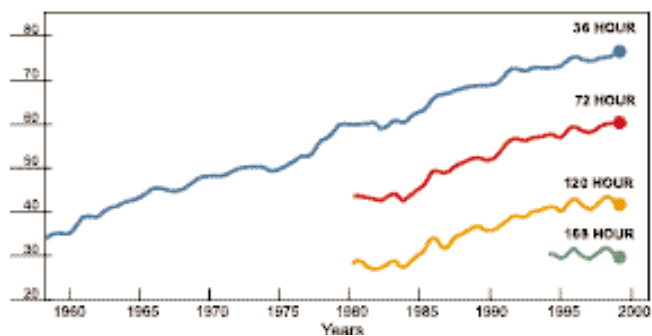
The performance measurement system we developed to evaluate aviation forecasts as part of the contract has been recognized as the most rigorous of its kind in the world, and has generated international interest.

PERFORMANCE MEASUREMENT

Temperature Departures from Normal Annual (Jan-Dec) 1999



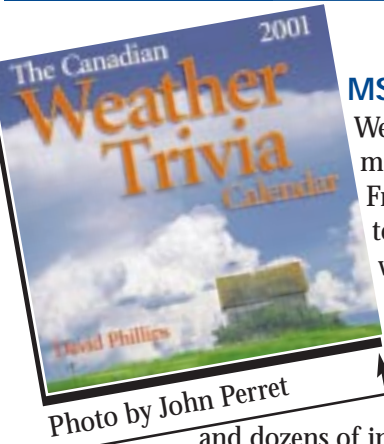
Quality of Large Scale Weather Pattern Forecast Over North America



We regularly evaluate our performance by conducting a variety of technical verifications of weather warning and forecast accuracy. Performance is also measured via public surveys, focus groups and through feedback methods such as 1-800 numbers and Internet contact mechanisms. In addition to regular public surveys, we consult key clients, such as the media, and sub-sectors of the public, such as the Deaf and those living in the North, to ensure we are meeting all of our clients' needs.



MSC MAKING A DIFFERENCE



MSC in the Media

Weather stories are of great media and public interest. From 1996 to 1998, Canada's top news stories related to weather (the Saguenay Flood in Quebec, Manitoba's Red River Flood and the Eastern Canada Ice Storm). MSC scientists provide expertise and dozens of interviews to the media each year on issues such as climate change and weather extremes, and climate phenomena such as El Niño and La Niña. Environment Canada's Top 10 Weather Stories of the year, an annual ranking compiled by MSC climatologist David Phillips, attracts high media coverage.

Photo by John Perret

Scientific Leadership

- Our scientists have won domestic and international awards, and play an important role in research on atmospheric science issues, climate change, weather extremes, and public weather programs
- The Brewer Spectrophotometer, created by MSC scientists, is internationally recognized as the

world's most accurate ozone-measuring instrument and is now used in 35 countries

- In 1992, with the start of the UV Advisory Program, Canada was the first country to develop a nation-wide ultraviolet index. This program helps Canadians avoid harmful solar exposure

Climate Change Science

- Canadian global climate models (GCMs), developed over the past decade, are considered to be among the best in the world. The models predict how the climate and ocean circulation might react to certain greenhouse gases and other pollutants. Other models simulate past, present and future climates. Canada was one of the first countries in the world to develop computerized global climate models.
- Climate data, model results and analyses are in demand among Canadian and international researchers. The media, public and educators display great interest in the our *Climate Trends and Variations Bulletin* (see page 6) and our web sites on El Niño and La Niña.

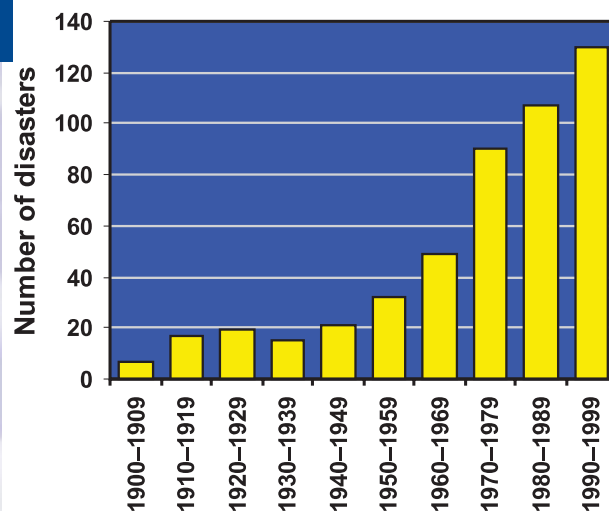
Social and Economic Impacts of Weather

MSC services contribute to important sectors of the economy, such as agriculture, transportation, fishing, energy, construction and travel and tourism.

Weather-related disasters in Canada

Estimated losses over 10 years

- \$3 Billion in insurable losses
- \$5-8 Billion in economic losses
 - ▶ Ice Storm '98 - \$2.5 Billion
 - ▶ Saguenay Flood - \$1.2 Billion
 - ▶ Red River Floods - \$400 Million
 - ▶ Calgary Hailstorms - \$400 Million
 - ▶ Edmonton Tornado - \$300 Million
 - ▶ B.C. Blizzard - \$200 Million
- 70 - 100 lives lost
- Over 58000 people displaced



One area of increasing attention and concern is the effect of weather on public safety and the economy. The last two decades have seen large increases in human and financial losses due to weather-related disasters such as floods, droughts, tornadoes and the devastating January 1998 Ice Storm (see page 7). Our work in this area includes developing techniques and expertise to better predict these events, providing advice and information when they occur, and conducting research into causes and future probabilities.

Contributing to Cleaner Air

Poor air quality is estimated to cause approximately 5000 premature deaths per year in Canada. In addition to conducting research on air quality issues, we also work with provincial and municipal partners to deliver better air quality information to the public. In 1997 we launched a pilot smog prediction program in Saint John, New Brunswick, in partnership with the New Brunswick Department of Environment. This daily air quality forecast program will be expanded to other areas over the next few years.

Public polling conducted after the introduction of the daily smog forecasts indicates that residents are more aware of their local air quality problems and seem to have a better understanding of the health hazards and how to reduce smog, thanks to MSC's information.

Emergency Response

■ In addition to the warnings of severe weather which are issued regularly to protect Canadians, we play an important role in coordinating emergency response to events such as nuclear accidents and volcanic eruptions. The CMC is one of eight centres in the world providing predictions of the path of radioactive material and volcanic ash within Canadian and other international territories. In the past two years, CMC has responded to twelve such episodes - six times each for volcanic and nuclear events.



- MSC also plays a vital role in providing meteorological support for Search and Rescue operations and forest fire management
- Following a serious fire in September 1999 in the U.S. National Weather Service's supercomputer infrastructure, we provided emergency assistance through model outputs and specialized forecast products until mid-January 2000

THE FUTURE

Canadians depend on MSC's information every single day. Meteorological and hydrological information is vital to public safety and security on land, at sea and in the sky. We in the MSC will continue our long tradition of providing services to Canadians by maintaining a continuous watch on weather, water and ice conditions, and issuing predictions and warnings to protect lives and property and reduce risks. We look forward to meeting the needs of Canadians in the 21st century.



For more information, please visit the Meteorological Service of Canada's web site on Environment Canada's Green Lane at:
<http://www.msc-smc.ec.gc.ca>