James R. Carter

Weather Map Presentations in Mass Media in the United States

INTRODUCTION

The United States thrives with a profusion of weather maps. It can be argued that the greatest number of maps produced day to day in the US are the weather maps in their many forms. And, certainly, the greatest number of maps seen by the public in the US are the weather maps. In terms of mass media, weather maps are common in newspapers, are created in minds via radio and are most diverse on television. A great number of weather maps can be found on the World Wide Web, but the Web is world-wide in its reach and one can argue that it is not mass media. Therefore, maps on the Web are not considered in this discussion of mass media maps.

COLOURFUL MAPS IN NEWSPAPERS

Newspapers in the US with a few exceptions will have a weather map of the coterminous 48 states of the United States, excluding Alaska and Hawaii. The model for these weather maps is *U.S.A. Today*, a daily newspaper designed to cover the entire country with no local allegiance. The paper is published only Monday through Friday. It is a bright and colourful paper on the outside pages of each section. Interior pages are almost exclusively black and white. Their weather page printed on an outside page has set the standard for the use of colour in newspaper weather maps. The highlight of the presentation is a large map of the US and neighbouring areas in Canada and Mexico. This map extends across the entire width of the page. The map employs a graded series of colours going from reds to yellows to greens to blues to represent the day's high temperature. Further details are shown for individual cities such as Chicago 67/45sh, meaning the high temperature today will be 67° F, the low overnight will be 45° F and showers. The only subdivisions of weather type are: cloudy, partly cloudy, rain, sun, showers, snow, snow flurries, and thunderstorms. Two smaller maps will be employed to show that day' s and the next day's precipitation forecast. There is likely to be another map on the page focusing on some particular aspect of weather; for example: a map showing predicted departures from normal for summer. The rest of the page is filled out with detailed statements of predicted weather conditions in the cities designated as top travel destinations.

It has now become common for many city newspapers to have a colour weather map on a daily basis. The colour map is likely to be printed on the last page of the first section to take advantage of the use of colour on only one side of a single full sheet. In most cases these coloured maps are purchased through a service such as AccuWeather, Inc. Because AccuWeather sells its services to hundreds of papers, the same map will appear in many newspapers each day. The total layout on the page may vary but the same map is common to many papers.

The AccuWeather maps are likely to show colours to represent the predicted high temperature for the day. Printed in black will be fronts, L and H for centers of low and high pressure, symbols to indicate showers, T-storms, rain, flurries, snow, or ice. In one example on a map 9 cm wide, in addition to all of the above there were the names of 15 cities with predicted high and low temperatures and in three places the words COOL, WARM, and NICE. In total, the map is quite well balanced. In this section on weather there may be one or more additional maps of the local state or region in colour. In general, these are not very detailed.

There are many variations of these colour weather maps in newspapers, depending on who provides the weather material for the paper. It is interesting to note that many of the larger circulation newspapers associated with some of the larger cites will have a weather map but it will not be in colour. For example: in a non-systematic sample, it was observed that two newspapers in the Midwest servicing cities of about 100,000 persons feature the coloured weather maps of AccuWeather every day. The *Indianapolis Star* which is the major paper for a metropolitan population of more than a million persons uses a coloured map provided by Weather Central, Inc. The *Chicago Tribune* serving the metropolitan area of eight million persons uses a black and white weather map provided by Weather Central, Inc. The *Chicago Sun-Times*, the competing daily paper, also carries black and white weather coverage. Monmonier[1] gives treatment to many of these items in his comprehensive work on journalistic cartography.

RADIO FOR MENTAL MAPS OF THE WEATHER

Historically, and still today, radio stations give weather forecasts based on statistical statements, such as „the high temperature tomorrow will be 68° F with a 30% chance of rain". We normally do not associate radio with maps. But, with the existence of dedicated electronic linkages, radio stations are able to have direct connections to weather radar presentations and broadcasters are able to describe the patterns of the weather. My local public radio station has two television display monitors in the studio which permits them to monitor approaching storms. A common radio statement might be „a line of thunderstorms is now moving across the Mississippi River near Quincy, Illinois, and is advancing in a Northeast direction at 40 miles per hour". Three or four times per hour an updated statement may be issued. The result of such repeated broadcasts is that radio creates effective mental maps of the weather for those of us who know the local geography. And radio can deliver these mental maps to an audience unable to access up-to-date visual products, such as drivers of vehicles.

THE NATURE OF TV WEATHER PRESENTATIONS IN THE USA

Television weather maps exist in a unique map viewing environment compared to other forms of graphics on television[2]. While maps included in most news programs appear on to the screen

with no forewarning of what will be seen at what scale, weather programs with their many maps are presented at standard times in predictable settings. In general, the maps have the same basic appearance from day to day and are presented at known times by familiar individuals. Viewers can select the presentation they find most meaningful, appealing and convenient. For many, the choice of program to watch is based on the maps and the way the presenter works with those maps. The presenters are an important part of weathercasting and many of these persons have become quite famous based on their frequent exposure on television.

In a discussion of television weather in the US, recognition must be given to the recent installation of the NEXRAD Doppler radar across the country by the federal government. While radar has long been a common component in weather forecasting and television presentations, NEXRAD Doppler radar gives returns that are transformed into many new forms of maps. Viewers of television will see many maps built from the Doppler data. The US government is in the process of completing a network of Doppler radar units that will provide coverage for almost the entire country. The NEXRAD system employs technology called WRS-88[3].

The NEXRAD Doppler radar is much more sensitive than the radar systems that have been used in the US for forty years. These Doppler units can be configured in one of three ways, to make them more sensitive to the weather being monitored. Doppler units record signal strength in 16 levels, compared to only six levels in the older units. With this more sensitive sensor they are able to prepare such map products as:

- colour enhanced loops of radar echoes,
- accumulated precipitation for a period of time or the duration of the storm event,
- the amount of liquid water contained in clouds,
- circulations within thunderstorms that might lead to tornadoes,
- and the exact location of cold fronts and other meteorological boundaries.

Private firms capture the raw radar data and process it into a great variety of map and graphic forms. A good discussion of this technology and the resulting products is found at the Web site of AccuWeather, Inc. [4] - probably the largest of the firms that prepare so many maps for presentation on television and in newspapers.

LOCAL WEATHER PRESENTATIONS

Weather exists in three different environments on American television: local broadcasts, national presentations, and full-time weather presentations[5]. Cities small and large have their own television stations. Most local stations have their own news staff and news programs. News is generally broken into three major themes: general news covering politics and human events, weather reports and forecasts and sports reporting, usually presented in this sequence. Local stations normally have two or three news presentations each day, each lasting 30 minutes. There may be an early morning program, perhaps a noon presentation, and certainly an early evening

program at about 6:00 PM and then a late night program at 10:00 or 11:00 PM. The weather segment will be three to five minutes in length with maps on display for about 50% of that time. The weathercaster will step through a sequence of maps showing the local area and the larger region. There may be one or more national maps showing the coterminous US and neighbouring areas in Canada.

The collection of maps will consist of probably: the current synoptic chart of the nation or region with the colourful fronts and Lows and Highs, an animated loop of cloud images on a regional map base, an animated loop of radar echoes on a regional map base, a map of high temperatures for the nation today, a forecast map of precipitation for the next day, and a map of forecast temperatures for the next day. There may be one or more local maps with numbers showing current temperatures and/or quantities of precipitation received in the past 24 hours.

The quality of these maps will vary depending on the station and the person preparing the presentation. In the US two professional organisations have a program to certify television weathercasters[6]. To become certified the person must have some formal training and submit a portfolio to a certification board. Thus, the certified weathercasters have proven themselves to their peers and in general their presentations are quite good as are their maps and graphics. However, in small markets where salaries are lower, or in off times, the quality of the presenters is not consistent. Some of the persons making the presentations do not understand meteorology, nor do they know geography nor have much comfort with maps.

On the other hand, in some places the local weather personalities are very skilled and their presentations are first rate. In general, these more skilled presenters are to be found in the larger cities where there are large viewing audiences. The classic weathercaster, at least for me in Illinois, is Tom Skilling of WGN in Chicago. WGN is called a „super station" and through the reach of cable television systems is seen in about 50 million homes across the country For years I watched Skilling work through his many maps although I lived more than a thousand kilometers from Chicago and well outside the Midwest region.

Skilling shares the constraint on time that is so common to local and national weather presenters. The weathercaster prepares for a 200 second presentation and then some late breaking event forces the producer to shorten the time for weather to perhaps 120 seconds. The presenter is forced to either leave something out or hurry through all of the maps and graphics[7]. Many times I have seen Skilling put up complicated maps that stay on the screen for one or two seconds -- too short to be read by anyone.

Part of the reason that Skilling sometimes has to zip through maps is that he puts a great amount into each presentation. There are many things that make his presentations somewhat unique, not to say others do not do some of these same things. For one, he tries to explain the regional and hemispheric forces that are producing a particular weather event. He tries to represent the projected patterns from at least two different computer models when they show some variation and he frequently shows maps of the upper atmosphere. And, he offers explana-

tions for particular situations. Years ago he employed a perspective map with an animated grid flexing up and down to illustrate the nature of a dome of high pressure. With changes in technology he lost the ability to do that sequence[8]. But, he illustrates other things using maps, such as what it means spatially when the forecast calls for a 30 percent chance of precipitation.

The greatest variety of maps will be seen across the many local presentations. Skilling was one of the first to use animated sequences with fronts gliding across the map. Now such animated sequences are quite common among local forecasters. Skilling also features an animated sequence of isotherms across the United States over a 72hour period. More recently, he has been using maps showing streamlines of airflow. These maps have bright yellow lines spiralling out from high pressure systems and converging into lows. Similar maps with streamlines are now being seen in the presentations of other local weathercasters.

It is interesting to note that two to five years ago many of the more advanced, local weathercasters, including Skilling, would show a 3D map of cloud cover over North America in a perspective view. They would pan around the 3D model and then zoom in on the local area. Skilling[9] noted that he had to be careful how he started these fly-overs because many viewers were lost if they could not see key geographic features, such as the Gulf of Mexico. In building this paper I realise that I have seldom seen such 3D presentations for more than a year. Why this seemingly appealing animated map presentation is seldom employed is a good question, because many weathercasters have the capability to show such maps. In recent interviews, a number of weathercasters expressed the opinion that such fly-overs are gimmicks and they did not want to use them.

THE WEATHER COMPONENT OF THE NATIONAL NETWORKS

The US now has five networks that are national in scope. The three traditional networks are ABC, CBS, and NBC. Recently, Fox entered the competition. CNN has been on the scene for more than a decade. It provides national coverage but integrates that with their world coverage. All of the four regular networks include a weather component in their mix of news in their morning programs, but do not have a weather component in the evening news. The weather person may be well trained but is one of the personalities hosting the morning show. While the weather presentation is national in coverage, it is likely to have little depth. Viewers will probably see a map with fronts and broad swatches of symbols showing areas of precipitation or sunshine. Another map will portray high temperatures for the day. A third map will show the forecast for tomorrow with a map similar to the map showing today's conditions. Many of these maps are very generalised and employ large icons to portray the sun or large raindrops. Recently, they have begun to animate the maps and viewers might see the zone of precipitation slowly change form as it glides off to the east.

CNN takes their charge more seriously and throughout the 24hour broadcast day they often present an informative sequence of weather maps interpreted by a trained weathercaster. Even in the US, CNN will include some basic weather maps of Europe and the world. The weather map coverage for the US has a unique CNN look. The maps are attractive and well designed. CNN now uses animation to have fronts and weather systems slowly migrate as the systems are predicted to evolve. The rates at which they carry out the animation is much slower than that used by the local weathercasters who employ animation. CNN weather presentations will vary in length from a quick look covering perhaps 20 seconds to in-depth presentations of up to three minutes.

FULL TIME WEATHER CHANNELS: MAPS, MAPS AND MORE MAPS

In 1982 when The Weather Channel, or TWC, was started I could not believe that anyone would want to look at weather maps 24 hours per day, everyday. But, not only has The Weather Channel demonstrated that such a business is possible, in some markets there are now competing channels with 24 hours of weather coverage. By 1991 it was reported that „The Channel's meteorologists were being seen in 85 percent of American homes with cable TV and in 54.7 percent of all households with television."[10] Viewership has continued to grow. The cable systems carry The Weather Channel because viewers demand it. Obviously, someone saw a market I did not see.

In 1994 the Local Weather Service, or LWS, was brought on-line in selected markets to capture some of the viewers of The Weather Channel. In Indianapolis, TWC is found on channel 38 and LWS is located on 39 on one cable system. A number of factors led to this competition but LWS argues it gives the people more local coverage. Thedwell[11] commented that „we give 90% local and 10% national versus The Weather Channel which is the opposite". While in reality those proportions are exaggerated, the focus of the weather maps on LWS is distinctly the local region.

The programming on the continuous weather channels consists of a number of maps in sequence interspersed by commercial advertisements. Viewers can tune in at any time and be within a few minutes of coverage of the local weather. Both systems have a segment where radar images are shown with no human present to make the interpretations. The advertisements are often related to weather, travel, or outdoor activities such as gardening. It is not unusual to see the name of the advertiser along the top of a map.

The Weather Channel, or TWC, is nation-wide and is the standard by which any competitor will be compared. TWC has evolved over the years but has kept the same basic format. They employ a base map of the US with extensions into Canada and Mexico. The landmasses are shown in brown and the water bodies are dark blue. The standard maps have bright fronts and symbols showing rain, snow, ice and fog for the current situation, for predicted conditions a few

hours hence and for forecast conditions for the next 24 hours. They then show a map with a loop of radar imagery, as well as a map with a loop of cloud cover. They then zoom in on these maps when they discuss conditions in particular regions. In the basic mix of maps they will also have a map of precipitation forecast for the next 24 hours, the predicted high temperatures and the predicted low temperatures.

There are a number of other maps commonly shown on TWC. One is the loop of satellite imagery of water vapour. This map is unique in that the background is black, coastlines and political boundaries are orange, and the amount of water vapour content is shown in grey shades grading from black to white. This is the only map observed of all weather maps that does not employ different background colours separating land from water. A more conventional map of dew point temperatures with numbers for selected cities is often shown. A different tint is used over the land areas to show where dew points are above some selected value. When storms abound, TWC will show a loop of maps of lightning strikes, as well as maps showing occurrences of hail and tornadoes. When some area has had heavy precipitation they are likely to show a quantitative estimate of precipitation over the past few hours based on an interpretation from the NEXRAD Doppler radar signals. And, there are the many maps relating to specific activities, such as travel. There is a school day forecast map advising parents how to dress their children as they go off to school, employing such icons as sweaters, coats, and umbrellas. In the appropriate seasons there will be maps of a pain index, allergies, and the incidence of influenza. In the fall they will have maps of the date of peak colours of the trees. In winter they will have maps of snow conditions for skiing. In spring they have maps of the last dates of killing frosts and what crops can be planted in different areas. The list goes on and on.

In the event of severe weather in some part of the country, the TWC staff focuses on that event. Recently, they have begun to send weathercasters to the site for on-the-scene reports. It is dramatic footage to see one of the faces we know so well on the beach at midnight as trees are being bent over with the fierce winds of a hurricane. Meanwhile, back in the TWC studio the weathercasters are talking us through the storm activities. They are likely to zoom in on radar loops in the immediate area of concern. They may integrate loops of cloud cover in their explanations. It has become quite common to have the weathercaster annotate the maps with a light pen to highlight some feature. Watching the evolution of some potentially damaging weather event on television under the interpretation of familiar weather personalities is similar to watching a sporting event on television. In both cases viewers observe the interplay of short-lived phenomena that will produce winners and losers. In the case of the weather event we see the action played out on maps. Such map presentations on TWC can be exciting and they hold the attention of sizeable audiences. When Hurricane Fran moved into North Carolina in September 1996, at the time of peak interest some 2 million households tuned into The Weather Channel in a 15 minute period[12].

Every few minutes TWC switches to an automated sequence with statistical data on current conditions, a text statement of the forecast conditions, and a large scale map with a loop of radar echoes. In the background is music. These automated sequences are generated for hundreds of National Weather Service zones[13]. The local maps with the automated radar loops are so detailed that during times of severe weather I watch TWC for storm cells moving close enough to my house to threaten my electrical system. Based on my interpretation of the radar maps many times I have shut down my computer and unplugged it to avoid power surges from lightning strikes. In all cases a thunderstorm moved over my house within minutes. That tells me the radar is aligned to the map base and gives me reason to turn to this channel the next time severe weather is near.

Because TWC is on the air continuously, the maps they prepare for one presentation can be used over and over again as long as they are valid. Thus, some of the interpretative maps and forecast maps may be used throughout the day and in total they may be put on the air 20 or more times. The maps with loops of imagery have to be updated frequently as new imagery becomes available.

In recent years TWC has begun to show interpretative sequences explaining the occurrence of the evolution of some meteorological phenomena. They often start with a base map and add components one on top of another as additional factors are accounted for. Interpretative sequences have been shown for such things as

- an early warm breakout on the eastern seaboard;
- a strong Nor'Easter pounding the coast of New England;
- drought in the western states; heavy snowfall in the south-eastern states;
- an outbreak of tornadoes in the central US;
- heavy and continuous rains that led to flooding;
- and a hurricane that was predicted to hit a Hawaiian Island but dissipated early.

During hurricane season they give particular attention to the climatology of hurricanes and tropical depressions and we see many maps showing historic tracks of these storms. Once a hurricane or tropical depression has been identified and named, TWC makes it a point of interest and considerable attention is given to the weather system. As the weather system approaches land a great amount of attention is given to the event at the expense of regular programming. They also show maps indicating the probability of the storm coming ashore at any point.

THE APPEAL OF WEATHER IN THE USA

The fact that The Weather Channel is so successful tells us much about the role of the weather forecasting and presentation industry in the United States. As weather is presented it has great

appeal. Many industries are based on getting these maps to the public in a timely and colourful fashion. There are many reasons why the United States has so many weather map presentations.

• The US is physically a large country with more than a quarter billion residents, most of whom speak and read the same language. This gives a large potential audience for any presentation.

• Most of the US is located in the Middle Latitudes and therefore it is subject to considerable diversity in weather events. The coterminous US extends over 4,000 km from the Pacific to the Atlantic and therefore we frequently witness the evolution of major weather events from beginning to end.

• The United States experiences many kinds of severe weather events with great public concern. We lead the world in terms of the number and frequency of tornadoes. Many of our population centers are in the possible paths of hurricanes. These storms generate great excitement and much public attention in the mass media.

• Much of the population resides in the eastern half of the country so that good predictions can be made for the largest population based on the extensive data collection systems in the western part of the nation. And, those persons in the east get to watch weather systems evolve as they progress to the east.

• The US population is highly mobile and many persons have visited or have lived in distant places, and/or have friends and relatives in distant places. Likewise, many persons travel and want to know what to expect in terms of weather at their destinations. For these reasons many persons have an interest in what is happening in distant places as well as what is happening locally.

• The US is very sensitive to freedom of the press and therefore there is great competition between the various forms of news media, whether that be newspapers, magazines, radio, or television.

• There are many options for the delivery of television in the US and therefore there is great competition for viewers. I have at least four different services I can purchase to deliver television to my home. Providing access to good weather coverage is important to sell any one television service.

• The federal government plays the major role in the collection of weather data, modelling, and forecasting, but by agreement it relies on the public media to disseminate the weather information to the public[14].

CONCLUSIONS

The US has grown up with television and weather presentation on television has been an important part of the development of the television industry[15]. The quality of television weathercasting has done much to create the audience that watches weather presentations. And, as presented television weather is good entertainment for many as well as being informative and educa-

tional. For many, watching a violent storm migrate across a neighbouring area may be as exciting as watching two teams run a ball up and down a playing field. If and when the violent weather is approaching your home, it is even more exciting. And, seen on a variety of colourful and dynamic maps in the comfort of one's home adds to the excitement.

Years ago I sought to develop a definition of GIS, the Geographic Information System. My basic definition was „an integrated system to capture, store, manage, analyse, and display information relative to concerns of a geographic nature"[16]. As I converged on that definition I came to realise that the weather forecasting industry including the presentation systems in the United States is an excellent example of a GIS. In fact, this industry with its many maps is a model for what we would like all mapping systems to be. If only we had such large audiences ready to view all of our maps.

Figures next page (p. 99)

Top left Map of an official Weather Watch for Tornadoes and Severe Storms. The white circle was drawn to show where tornadoes were occurring at this moment. The Weather Channel,

Top right Map showing the points of origin of Tropical Storms or Hurricanes in the Caribbean Sea, Gulf of Mexico and Atlantic Ocean over the past 111 years in the month of June. The Weather Channel.

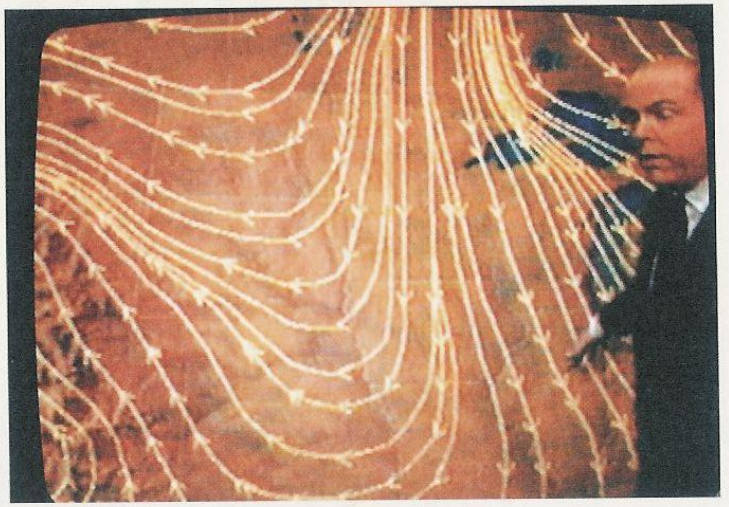
Bottom left Map from a supercomputer model showing forecast positions of a cold front for the next 72 hours over the coterminous US. Tom Skilling, WGN-TV, Chicago, Illinois, USA.

Bottom right Streamlines of surface airflow over the central US. Tom Skilling, WGN-TV, Chicago, Illinois, USA.


WEATHER WATCHES
TORNADO SVR T-STORM
Through Early Morning


Tropical Storms or Hurricanes
of Origin
June
1886-1996 (60 STORMS)


Supercomputer Model Projection
LATEST
COOL
Surge!
Chicago
FORECAST
The Next 72 hours!



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