

IS STRANGE WEATHER IN THE AIR? A STUDY OF U.S. NATIONAL NETWORK NEWS COVERAGE OF EXTREME WEATHER EVENTS

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Abstract. This paper asks whether extreme weather events are becoming more discernible. It uses the Vanderbilt University Television News Archives to determine if annual coverage given to heat waves, droughts, hurricanes and floods has increased on the network news between 1968 and 1996. An index of extreme weather events shows a clear trend toward increased coverage, especially since 1988. However, the different types of extreme events do not receive equal coverage: for example, annual peaks for droughts contain about twice as many stories as the peaks for heat waves. The data further reveal that there is no association between coverage of climate change and the overall coverage of extreme events. While extreme events have attracted more stories in the U.S., there has been no increase in the coverage devoted to extreme events in foreign countries. The possible effects of shifts in TV coverage on the public salience and understanding of climate change are discussed.

1. Introduction

Scientists using climatic models to simulate an enhanced greenhouse effect anticipate that the frequency and intensity of storms, droughts, floods, and other extreme weather events will increase as the planet gets warmer. These predictions lead to at least two key questions. First, are extreme weather events becoming more frequent or severe? Second, is strange weather becoming more discernible to ordinary persons, policymakers, and so on? Where the first question revolves around the monitoring of long-term real-world events, the second deals with perceptions that need not be strictly tied to such events.

To ask if extreme weather events are becoming more frequent or intense is to pose a seemingly straightforward question that the public culture takes as readily resolvable. In other words, evidence showing that the public misperceives global warming (confusing it with ozone depletion) suggests that the public lacks the scientific background required to grasp the problems involved in the long-term monitoring of extreme events (Kempton et al., 1995; Shamos, 1995; cf. Nicholls, 1995). Yet uncertainty prevails here. According to the Intergovernmental Panel on Climate Change, 'Overall, there is no evidence that extreme weather events, or climate variability, has increased, in a global sense, through the 20th century, although data and analyses are poor and not comprehensive' (Houghton et al., 1996, p. 173). As well, regional scale data reveal contradictory findings. Careful



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examination of the problems involved in monitoring long-term trends suggests that the issue of whether extreme events are increasing can only be profitably addressed for subsets of extreme events for specific regions in the *future* (Nicholls, 1995).

In lieu of long-term homogeneous climatic observations, many activists who are convinced that it is reckless to wait until the data are in have looked for indirect or proxy measures of changes in extreme events. Thus Greenpeace and others have focused on the large increases in weather-related insurance losses in the 1990s (Insurance Bureau of Canada, 1997; Leggett, 1993; Pearce, 1995). Significantly, the insurance industry is the first large corporate sector to publicly express concern about the possible consequences of climate change.*

But insurance losses are too contaminated by other factors to afford clear inferences about extreme weather. Thus, in the U.S., where floods have been particularly prominent, much of the problem is due to population movements into flood planes, based on the belief that engineered systems of dams would thwart future catastrophes. Instead, the dams may have had the opposite effect and thereby afford alternative explanations for the impacts. Increased population density has also increased the possibility of catastrophic losses in hurricane zones.

Concurrent with increased insurance losses, a number of commentators point to a seemingly widespread sense of unsettled or strange weather (cf. Ross, 1991). Certainly the idea of bizarre weather has become a media staple. Inflated rhetoric has brought too many storms-of-the-century and a more than one 'once-in-10,000-year event' (e.g., Grescoe, 1997). Hurricanes have metamorphosed into super hurricanes, and 1993 was dubbed the year of 'killer weather' (Petranek, 1993). A number of social scientists have, starting with the watershed year of 1988 when people may have 'felt' a difference in the weather, also claimed that extreme weather is emerging as an issue on the public agenda (Bernard, 1993; Cogan, 1992; Ungar, 1992). Thus Cogan (1992, pp. 21, 47–48) contends that chaotic European weather between 1987 and 1991 accounts for the high levels of public concern about climate change found there.

For the most part, a concern with the notion of strange weather takes us from our first question to our second. That is, we are more likely to be dealing with perceptions of change than with mirror-images of real-world events. Overall, media research finds little relationship between a 'universe of events' estimated with extra-media data and the amount of media coverage (Dunwoody and Peters, 1992). Although extremely violent storms with disastrous loss of life and property seem to announce themselves to the media, they are most likely to be covered if they occur in the U.S. or in countries with a similar culture (Singer and Endreny, 1993). In the case of drought, to take a different example, the definition of what is newsworthy is problematic and elastic.

* According to the Insurance Bureau of Canada (1997, p. 16), before 1987 no natural disaster caused insured losses of more than \$U.S. 1 billion. During the past decade, there have been 18 such disasters.

Since perceptions of events are influenced by, among other factors, prior ideas and sensitivities, information processing algorithms, and the structure of collective memory, it is apparent that they can be misguided. In this context it is notable that Rebetz (1996) finds that neither of two common complaints about climate change in Switzerland – the lack of snow in winter and the lack of sunshine in summer – is supported by climatological data. Indeed, Rebetz (1996, p. 498) summarizes research revealing that human perception of long-term climate tendencies is very limited when compared to the perception of short-lived extreme events. Although no national U.S. surveys are available, a study based on small, nonrandom samples finds that most respondents believe that the effects of global climate change can already be seen in local weather (Kempton et al., 1995, pp. 80–83). Informants report that winters are warmer and the weather is more variable and unpredictable.

This paper aims to take advantage of a signal opportunity to determine if the sense of strange weather is accompanied by shifts in the amount of media coverage devoted to extreme weather events. There are limited opportunities in the social sciences for gathering long-term homogeneous observations – or for doing so at a reasonable cost. However, the Vanderbilt University's Television News Archives began recording and abstracting the evening news broadcasts on the three major U.S. television networks in 1968. The present study uses these Archives to determine if extreme weather events have become more prominent on the airwaves. The aim is not merely to ascertain whether the quantity of coverage given to heat waves, droughts, hurricanes and floods has increased over time, but to compare coverage of U.S. and international events and to examine linkages between this coverage and the issue of climate change. The paper then develops more speculative inferences about the possible agenda setting effects of the observed patterns of coverage.

2. The Data

Abstracts of newscasts for the three major U.S. television networks (ABC, CBS, NBC) are available from 1968 onwards through the Vanderbilt University home page on the World Wide Web. The abstracts contain one- to three-sentence summaries of the stories. They always give the location of the story, which makes it feasible to distinguish between U.S. and foreign weather events. There are several reasons why these flagship network newscasts are a good source for ascertaining whether coverage of extreme weather events has increased over time. Unlike local newscasts, the national ones do not ordinarily provide weather forecasts or coverage. Only the extreme weather impacts or disasters that interest us here are deemed newsworthy for the network news. Network newscasts are eminently comparable over time, as the 23-minute newshole has remained constant. In addition, the evening news still reaches a far wider audience than any other news format. Indeed, public officials reportedly watch the network news 'to find out what the rest of the nation is finding out' (Robinson and Clancey, 1983, p. 49). Most of

these stories also contain visuals, which are central to the recall of news events (Graber, 1990).

Annual searches from 1968 until 1996 were conducted for each of the following weather impacts: heat waves, droughts, floods, and hurricanes. Searches were also conducted for global warming and forest fires. The Vanderbilt Archives allow for searches by keywords, part words, phrases and word combinations. Thus for each type of impact, several searches employing a range of keywords or phrases were undertaken. Under hurricanes, for example, separate searches were also conducted for each of the following: wind storm; cyclone; typhoon; and monsoon. The data for each type of weather impact were collated by date and checked for irrelevant selections (the boxer, 'Hurricane' Rubin Carter, as one example). Initial frequency counts of stories by network revealed no systematic differences. Hence the results reported here are based on annual frequency counts of stories for all three networks.

3. Results

To make sense of the coverage of the different types of weather impacts over the 30-year research period, scientific findings and political developments are employed to divide the period into three intervals: 1968–1979; 1980–1988; and 1989–1996. The initial interval before 1980 is designated the *control* period, since there are neither temperature changes nor sufficient activities by issue sponsors (concerned scientists, social movement activists) to render climate change particularly relevant in the public arena. In the second or *germinating* interval, atmospheric changes are thrust onto the public agenda by various claims-makers and become newsworthy and resonate with other issues on the public agenda. Nuclear winter emerges as an issue in 1982; the discovery of the ozone hole is announced in 1985; and 1988 brings the 'greenhouse summer'. As well, annual time-series of combined land-surface air and sea surface temperature anomalies for the globe since 1861 reveal a clear and consistent upward swing through the 1980s (Houghton et al., 1996, p. 143). Several of those years were hot enough to capture the attention of the public.

The final interval is termed the *established* period. As a result of the summer of 1988, which serves as a transition between the germinating and established intervals, global warming is now an issue recognized by the media, politicians, and most of the public. In this period, sponsorship of the issue by various environmental groups and scientists increases. An increasing number of congressional hearings and international meetings are also devoted to the problem, culminating in the Rio Earth Summit and the Framework Convention on Climate Change. During the established period, then, global warming (and then later climate change) is available both to sensitize the media to extreme weather impacts and to serve as a possible peg for weather-related stories.

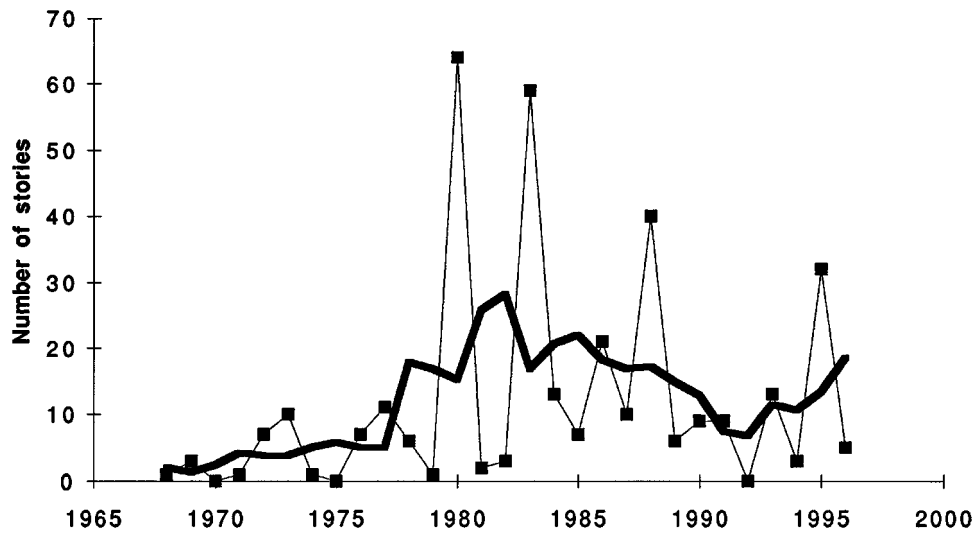


Figure 1. Annual coverage of heat waves on the network news.

Climate change narratives focus on warmer temperatures. Hence extreme hot spells are probably the most accessible and believable sign of climate change in the public arena. Figure 1 shows annual frequencies of stories dealing with heat waves on the national newscasts. The trend analysis is based on a five-year running average, truncated to two years at the end points. The trend analysis reveals that heat waves garnered most attention during the germinating interval when climate change had yet to come out in public. Thus the three peaks in coverage all occur between 1980 and 1988. Interestingly, the transition year of 1988 receives substantially less coverage than found in the two earlier peak-years. Subsequent to 1988, coverage declines for several years. Even 1995, when most of the stories are devoted to the 'killer' heat wave in Chicago, attracts only half the number of stories found in those earlier peak-years. Overall, then, the data are consistent with the perception that the 1980s were a scorching decade with the first potential warnings of a hotter climate to come.

Droughts, like heat waves, are readily associated with a warming climate. Coverage of droughts, however, is more variable, and Figure 2 does not reveal any clear trends over time. Rather, there are two peaks in coverage, one in the control period and one in 1988. The prominence of the 1988 drought is especially apparent. It garnered more than three times as many stories as did heat waves in that year. More generally, annual peaks for droughts contain about twice as many stories as the annual peaks for heat waves. Whereas stories about heat waves frequently concern the deaths of people, drought stories deal with crop and animal losses and the attendant economic effects. The latter are more conducive to running stories as increases in consumer prices continue to be felt well after the drought itself becomes unnewsworthy.

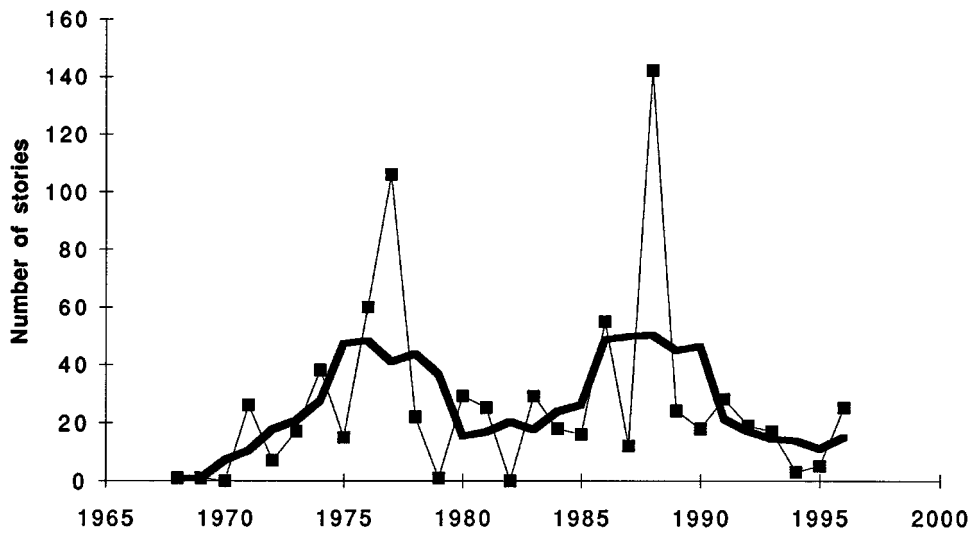


Figure 2. Annual coverage of droughts on the network news.

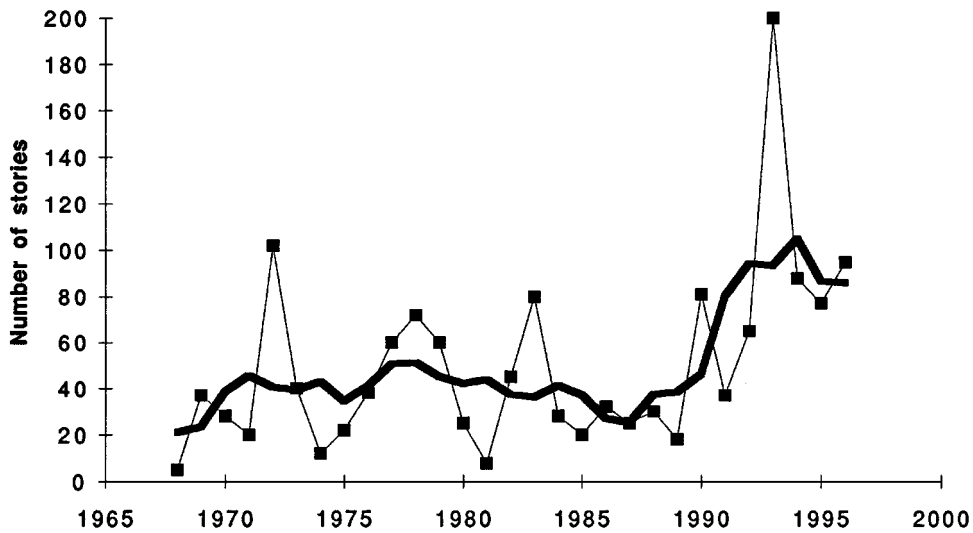


Figure 3. Annual coverage of floods on the network news.

Television news coverage of floods (Figure 3) reveals no trends until the early 1990s. The Mississippi flood of 1993 attracts an exceptional number of stories, virtually doubling the coverage found in earlier peak-years. Flood coverage in subsequent years hovers around the peaks found in those earlier years, rendering them prominent in the mid-1990s. Conspicuous coverage of floods continues in 1997 (data not shown), with about 100 stories found by the end of April.

Figure 4 presents the results for hurricanes and other wind storms. The results reveal an upward trend in television coverage of hurricanes in the established

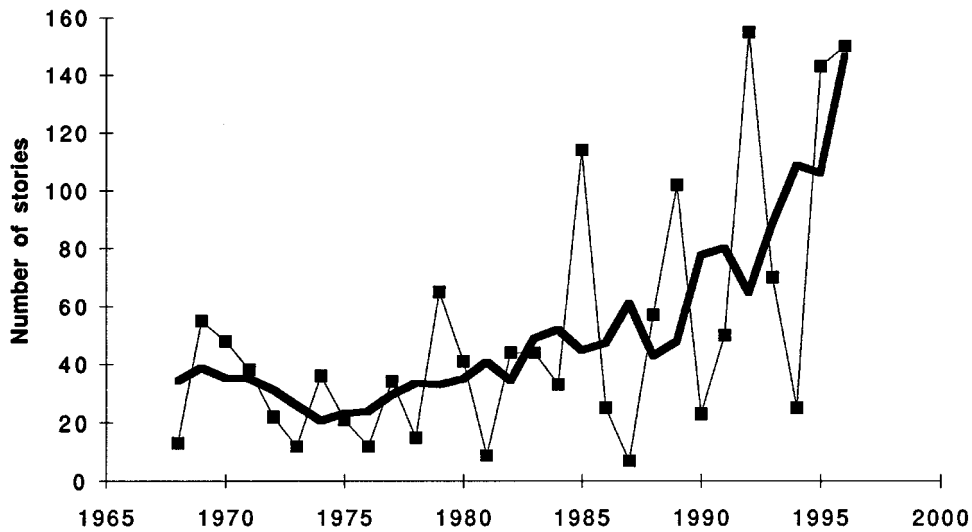


Figure 4. Annual coverage of hurricanes on the network news.

period. More specifically, there are no clear differences between the control and the germinating intervals, excepting the single peak in 1985. However, in the established interval, there are four years of peak coverage, three of which exceed the levels of coverage obtained in any of the previous peak-years. This coverage corresponds with large insurance losses due to several particularly destructive hurricanes, especially Hurricane Andrew.

Forest fires are not a direct weather impact, but are weather-related. As well, efforts to create fearful images of a hotter planet often employ visuals of desiccated soil and vegetation that render wildfires likely. Coverage of forest fires, however, does not reveal any clear trend (Figure 5). The most obvious result is the 1988 peak, which mostly reflects interest in the fire in Yellowstone National Park. Altogether, the data on forest fires, heat waves and droughts congeal in 1988 and underscore the importance of that year in putting climate change on the map. As compared to 1988, brush fires in California in the 1990s attract modest coverage.

4. Extreme Weather Event Index for TV

In recent studies, Karl et al. (1995, 1996) develop an index that measures selected changes in U.S. climate thought to be sensitive to increased emissions of greenhouse gases. The elements of the index were selected to have direct relevance to the public and policymakers. These were: unequal increases in maximum and minimum temperature, increases in cold season precipitation, severe summertime drought and the proportion of total precipitation derived from extreme one-day precipitation events, and decreases in day-to-day temperature variations.

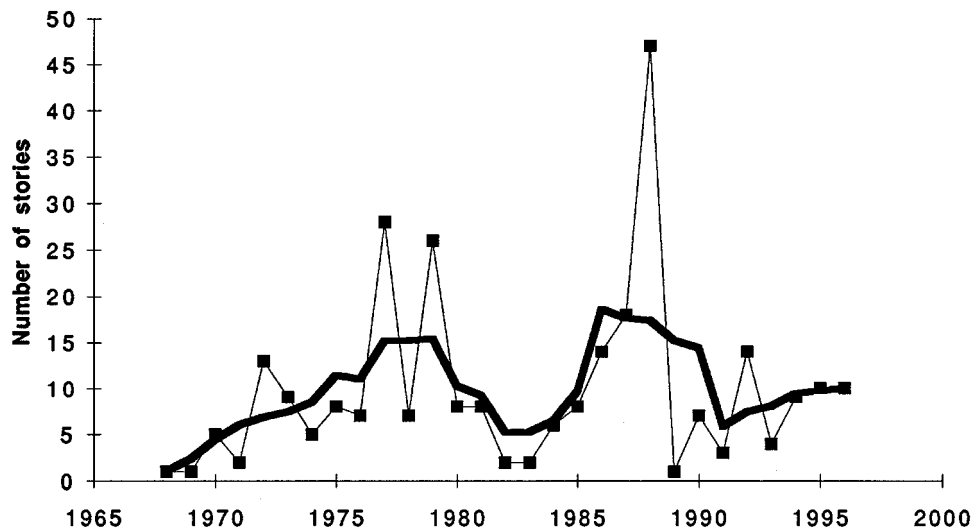


Figure 5. Annual coverage of forest fires on the network news.

Both weighted and unweighted forms of the index showed a trend towards elevated values since 1976.

Whereas Karl et al. were concerned with measuring a greenhouse signal with *presumed* public relevance, the present study deals with extreme events that have high visibility in the public realm. To determine whether overall television coverage of these events has increased, the data from heat waves, droughts, floods and hurricanes were combined to form an index of extreme weather events. The results of this analysis (Figure 6, top time-series) reveal a clear trend toward increased coverage of extreme events. While there are only slight differences between the control and the germinating periods, starting with the transition year of 1988 and continuing through the established period, there is an unmistakable upward trend in coverage.

Overall, Figure 6 displays rapid year-by-year fluctuations in the level of coverage. Until 1988, noticeable peaks in coverage occur at best every five or six years. But between 1992 and 1996, peak coverage is found in four of the five years. Given that the number of stories in these years exceed all previous years, with the exception of 1988, the results support the claim that a sense of strange weather has been in the air since at least 1992. Although the data were not fully available at the time this was being written, 1997 will certainly maintain the upward shift in the floor of coverage.

5. Network Coverage and Global Warming

This section goes beyond describing changing trends over time and asks whether any links can be established between coverage of global warming and the overall

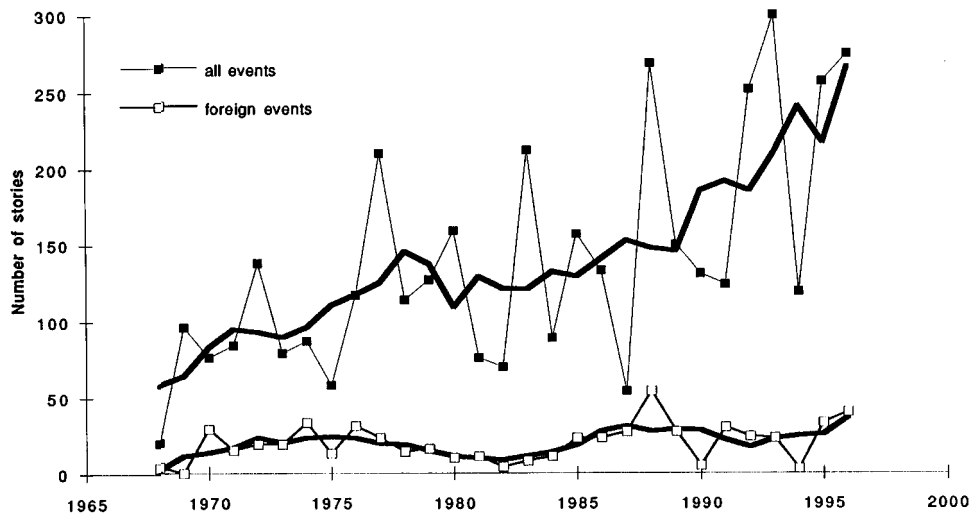


Figure 6. Index of extreme weather coverage on the network news by all events and foreign events.

coverage of extreme events, and in the distribution of national and international coverage of such events. Since an increase in coverage of extreme events is found during the established interval, it affords some face validity to the notion that media attention to the weather is partially driven by increased sponsorship activities and an attendant sense of urgency about climate change. A further examination of this link is important not only to understand the determinants of media coverage, but to show the extent to which the two phenomena are linked in public discourse.

The issue attention cycle implies that global warming, like any other social problem, will not receive uniformly high coverage after it becomes an established issue (Mazur and Lee, 1993). Rather, coverage tends to fluctuate. If this social problem is sensitizing the media to extreme weather impacts, it is expected that annual coverage of global warming will be associated with total annual coverage of extreme weather events. Essentially, years with high levels of extreme weather should render global warming more relevant. This could result, first, in more coverage of global warming in general. Effectively, scientific and environmental claims and conferences occur with sufficient frequency that plausible stories are always in the offing. Second, one can more confidently predict that peaks in extreme events should lead to increases in weather-related stories pegged to global warming (Wilkins and Patterson, 1990).

Figure 7 presents the annual number of stories devoted to global warming (this is the keyword primarily used in the Vanderbilt Archives) and the number of these that are weather-pegged. When the frequency of annual stories devoted to global warming is compared with the extreme weather index found in Figure 6, it is clear that there is no relationship between the two variables. Thus if 1993 was the year nature went mad, it elicited negligible coverage of global warming. As for the

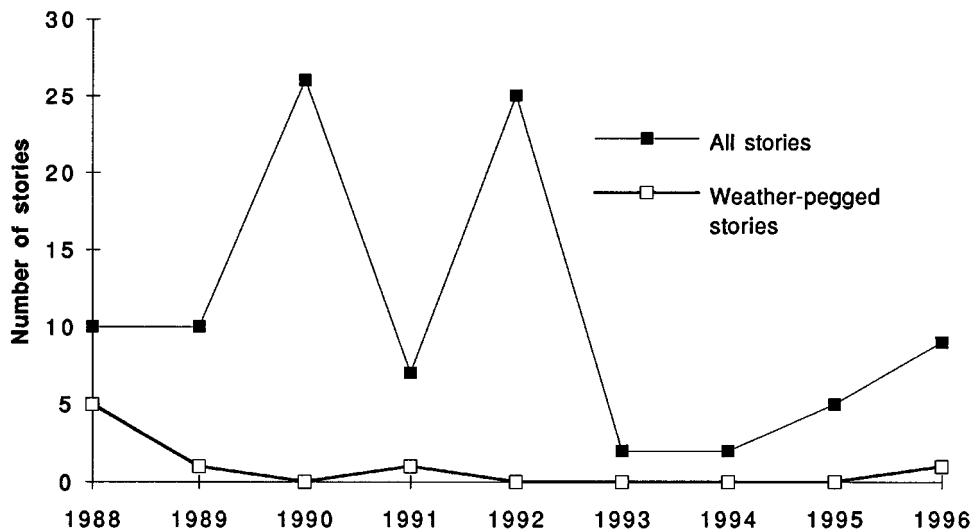


Figure 7. Annual coverage of global warming on the network news by all stories and weather-pegged stories, 1988 to 1996.

second hypothesis, weather-pegged stories on climate change are strikingly rare. Rather than being weather-related, peaks in global warming coverage are constituted mostly by stories about the politics of the Bush administration and the Rio Earth Summit.

The one seeming exception to this is 1988, when half of the stories are weather-related. One possibility here, which has been found in other research on collective memory, is that events become dissociated from their source (Irwin-Zarecka, 1994). If global warming and extreme weather emerged in tandem as issues in 1988, their subsequent dissociation is not particularly unexpected. Beyond the general tendency to dissociate events and sources, global warming is a troublesome issue to link to real-world events. Most scientific spokespersons, in the effort to do 'good science', acknowledge that no particular storm or drought can be specifically attributed to the enhanced greenhouse effect. But if scientists have gone to great lengths to avoid such linkages, spokespersons for environmental groups have been less reluctant to draw linkages, especially to increased insurance losses. At the same time, the media have drawn strong links between the 1997/98 El Niño and a variety of weather impacts across the globe.

In this context, a distinction can be drawn between a weak and a strong disassociation effect. With a weak effect, reporters and editors may be attuned to extreme weather as a result of the greenhouse effect, but do not employ the latter as a peg because they regard the necessary qualifications as discursive liabilities. Weather stories, which pass as hard news, may thus serve as a surrogate for more tenuous and controversial accounts pegged to global warming. With a strong effect, extreme weather evolves into an independent issue divorced from other considerations.

These alternatives can be tested by examining coverage of extreme weather events in foreign countries. Overall, concern about climate change is likely to be strengthened by the realization that extreme impacts are global rather than just national phenomena. Increased international coverage would both corroborate and generalize the sense of strange weather. By implication, a weak dissociation effect is consistent with increased coverage of foreign weather events as a surrogate for or sign of climate change. A strong dissociation effect implies that network coverage will be governed by organizational routines that devalue foreign events, especially when they do not involve immediate American economic or political interests or are not associated with a large number of deaths (Adams, 1986).

The results in Figure 6 (bottom time-series) are consistent with a strong dissociation effect. Thus there is no clear trend indicating increased coverage of foreign extreme weather impacts. Beside the absence of an absolute increase in foreign stories, there is a relative decrease in these stories since the total number of stories on extreme weather is on the rise. At the same time, the results in the established period may exaggerate 'foreign' coverage. Specifically, a major component of the foreign results in the 1990s comes from hurricane stories in the Bahamas and other islands on the Eastern seaboard. It is the proximity of these events to the U.S. and the attendant chance that the mainland will be affected that elicits attention.

6. Real-World Impacts and TV Coverage

While we previously noted that evidence on extreme weather events is too limited to draw any conclusions about their overall frequency or intensity, it is possible to use Nichols' (1995) strategy of monitoring specific types of regional impacts to examine possible links between TV coverage and real-world events. Extra-media sources such as *Weatherwise* indicate that seemingly newsworthy heat waves have occurred in Eurasia in the 1990s. Heat waves, of course, are closely associated with climate change, and Europe and Japan have important cultural and economic links with the U.S. Prior research indicates that these types of links are significant determinants of U.S. media coverage of foreign events (Singer and Endreny, 1993).

On the basis of annual summaries in *Weatherwise*, perhaps the best candidate for international attention was the Eurasian heat wave of 1994. This hot spell brought oppressive temperatures that lasted for most of the summer. Its effects stretched from Spain (where there were water shortages and a spate of wildfires) through Northern Europe, to Tehran and into Japan and Korea (Compte, 1995). Japan saw dying livestock, water-rationing, and industrial closures due to water shortages. Tokyo set a July record with 20 'tropical nights', minimums of 25 °C (77 °F) or higher. The *New York Times*, which often sets the agenda for other media, did seven stories on this heat wave. However, it was ignored by the U.S. networks. Similarly, little or no coverage was devoted to other striking European impacts

(such as Britain's 'Great Storm' of 1987) that appear to have galvanized concern with climate change there (Cogan, 1992).

Given the inward-looking tendencies of most of the U.S. media, it is probably more informative to examine possible mirror-image effects by focusing on coverage of national extreme weather events. One of the few areas where Nichols' (1995) criteria for monitoring specific types of regional impacts are met is with hurricanes. Researchers report that the 1970s, 1980s and early 1990s were a time of infrequent hurricanes (Stevens, 1997). The years 1991 through 1994 were extremely quiet, and even the unusually intense 1995 season was not enough to reduce this downward trend (Karl et al., 1997). Since Figure 4 shows, in contrast, that television coverage of hurricanes generally rises during these quiet years, it seems apparent that coverage is not reflecting the frequency of real-world events. Together, the foreign and national results for specific impacts indicate that trends in television coverage are not substantially – or reliably – related to real-world impacts.

7. Possible Effects of TV Coverage of Extreme Events

Finally, we ask if increased TV coverage of extreme weather events is likely to affect the public or political salience of climate change? Since there is no comparable data set that can be used to measure public or political perceptions over the 30 year research period, efforts to address these perceptions are based on inferences drawn from extant theorizing and research pertaining to media effects. While this approach can be deemed speculative, it is guided by the cumulative results of the best and most relevant prior work in the area.

Broadly, people can become cognizant of strange weather from their own experience, from discussions or contacts with others, and from media reports (presumably, politicians and policymakers have better access to scientific reports and expert opinions). In most instances, personal experience and information gleaned from others are limited to fairly local events. Even if local phenomena are sufficient to generate a sense of unsettled or bizarre weather, they have inherent limitations that make it difficult to sustain this perception. At a local level, out-of-sorts weather is (all but) invariably a temporary phenomenon. As with regression toward the mean, the weather customarily returns to a more or less 'normal' state: storms end, seasons change, and a spell of normal (and especially pleasant) weather tends to attenuate the sense of strangeness.

If the news were counterfactually made to disappear, most people would not know of – much less recall searing images depicting – the Mississippi flood, Hurricane Andrew, Yellowstone burning, and the great ice storm of 1998. When transient local conditions are augmented by fairly persistent media reports of more distant disasters, this can serve to generalize and corroborate local perceptions. Calculations derived from Figure 6 reveal that the 1990s bring an average of 208 TV stories per year. Persons watching the news on one network could thus be exposed

to almost 70 stories a year, or more than one a week. According to White (1985), people are mainly able to perceive the very abnormal weather events and natural disasters that TV favors. Both the availability of visuals and the 'naming' of events are significant factors for their retention in the collective memory. Overall, then, it is likely to take a mix of local and distant impacts, which together provide a broad compass for the inevitable discussions of the weather, to sustain a sense of unsettled weather.

In this context, the dominant social science perspective on media effects is subsumed by what is termed agenda-setting processes. Over twenty-five years of research on these processes suggests that the amount of media coverage of an issue can be an important determinant of public and political awareness of it (McCombs and Shaw, 1993). Specifically, the media functions best to tell the public *what* to think about (a salience effect), rather than to tell them *how* to think about it (a persuasion effect). But while the media can affect the events that figure prominently on the public and the policy agendas, these effects are not automatic. Rather, they are mediated by a host of contingent factors that can either enhance or impede the agenda-setting process. Pertinent issues that researchers have examined include the characteristics of the issue, the nature of media coverage, and audience factors.

In considering the nature of media coverage, there is evidence to suggest that television can have more instantaneous and potent effects than other media. According to Iyengar and Kinder (1987, p. 126):

Television news is not only distinctive in its focus . . . but also in its presentation. Television news is news without ambiguity, equivocation, or uncertainty. It is, or poses as, authoritative news. Most Americans, most of the time, seem to find its authoritative pose irresistible.

Graber (1990, p. 153) speaks of the parade of 'opinion-shaping visuals' that allow audiences to form more accurate mental pictures of parts of the world. That is, television excels at creating quick visual illustrations but is deficient in conveying complex ideas.

Significantly, the most detailed and systematic study of agenda-setting processes as they apply to climate change seems to validate the unique impact of TV. Trumbo (1995) compares the attention paid to global warming between 1985 and 1992 by elite newspapers and news magazines, network television news, the science press, opinion pollsters, the public, and Congress. He develops a number of research questions and hypotheses dealing with the constellation of relationships among the media, the public, pollsters and policymakers. Overall, his results do not support the hypothesis that media attention to the issue leads to increased public concern. Rather, he finds a strong relationship between policy and media attention, with the two being linked by feedback loops.

Despite the lack of a general media effect on public concern, Trumbo reports and analyzes in some detail the 'strong relationship found between television attention and the ECI [Extreme Concern Index]' (pp. 38–39). He contends:

It has been held that more prolonged print attention to an issue is boosted, or spotlighted, by short bursts of television attention that then serve to most strongly impact public opinion. That process is demonstrated in this study (p. 44).

He suggests that the unique and interesting effects of television may be due to three factors. First, national poll samples are more similar to the television audience than to the print audience. Second, alarmists may watch more TV or simply attend more closely to alarming content. Third, there is the superior ability of television news to set the agenda. An additional consideration is that the complexity and uncertainty surrounding climate change are more likely to be concealed in the brief but authoritative sound bites characteristic of TV news. Given the research showing that the public often misunderstands climate change (Kempton et al., 1995), it follows that the more detailed analyses found in elite newspapers and magazines are probably incomprehensible and hence, often disregarded.

Whereas Trumbo examines the agenda setting effects of stories about global warming, the present study looks at TV coverage of extreme weather events. Given the strong salience effects he finds from a relatively small number of TV stories on global warming, there are cogent reasons for believing that the much larger number of stories about extreme weather will have even stronger effects on the public and policy agendas. Stories about global warming deal mostly with 'hypothetical' threats that are expected to unfold in the future. Extreme weather events, in contrast, occur in real-time. The latter have an immediacy that the former cannot match. Scientific claims and reports on conferences do not afford the drama – and the stunning pictorials – attendant on floods, hurricanes and the like. Global warming seldom lends itself to a sustained running story, while extreme weather impacts pit human ingenuity against nature's worst. The latter are often infused with drama, as potential victims, reporters and their audience wait to see where the hurricane strikes, whether the improvised dikes will hold, and so on.

A further consideration here, derived from the literature on the success or failure of social problems in public arenas, is the extent to which claims and issues 'resonate' with the dominant cultural themes prevailing at a particular point in time (Hilgartner and Bosk, 1988). Since the ending of the Cold War erased the major source of fear in American society, the sites of social anxiety seem to have shifted toward a variety of disasters (Ungar, 1998). Starting with the revived fascination with the Titanic and extending through new diseases (Ebola, mad cow disease) as well as earthquakes and volcanoes, disasters have been commercialized and mythologized in books, movies, CD-ROMS, displays and artifacts for sale (Colt, 1997).

Atmospheric issues mesh nicely with this disaster boom. The theory that a comet striking earth precipitated climate changes that extinguished the dinosaurs has probably garnered more public interest than any other scientific idea (Alvarez, 1997). It also lent credence to the theory of nuclear winter. Ozone depletion transforms routine exposure to sunlight into a potentially dangerous activity. Spectacular

weather events have resulted in record insurance losses and created metaphors of a 'waterworld' and the like. In short, it seems plausible that the numerous bursts of television attention devoted to extreme weather impacts have served, in a cultural context where disasters resonate, to spotlight the issue of strange weather.

8. Conclusions

While the television data presented here are relatively straightforward and clear, the analysis of public perceptions is limited to inferences based on reasonably established theory and prior media findings. Since our grasp of agenda-setting process is contingent, we cannot be *certain* that the increased coverage found here has had agenda-setting effects. Although there is no reason to suspect that Trumbo's spotlight effect does not apply to the present results, there is still a further difficulty. Specifically, even if television coverage has contributed to an atmosphere of strange weather, this does not necessarily convert into an awareness of climate change. Events can be framed in different ways, and the findings presented above clearly show that television news is not 'priming' people to evaluate weather events in terms of this concept. Thus we do not know whether there is a latent sense of anxiety about climate change, or if the public, like the network news, has dissociated the two. The media hype surrounding the 1997/98 El Niño renders the question of public perceptions even more uncertain.

A number of social scientists have argued that it will take alarming weather signs to engender public pressure for action on climate change (Bernard, 1993; Ungar, 1995). If we are to understand the possible role of extreme events in mobilizing concern and action, it is essential to go beyond media trends and directly research the public. One possibility is to compare perceptions and concerns by those who have been victimized by extreme weather events with those who have not. Particularly instructive results might be obtained by studying the Saguenay region of Quebec, since some persons reportedly have had to evacuate their homes up to five times since 1979 (Grescoe, 1997). Comparisons with populations that vary along the dimensions of impact and distance should provide a good indication of how elements of the public decipher such impacts. In addition, more attention ought to be paid to the European public.

In this context, one aspect of the public's understanding of climate change in particular needs to be investigated. The reader will have noticed that this study excluded TV stories on winter storms (during several years in the 1990s, there were more than 100 stories on such storms). This was done because several sources of evidence suggested that public discourse only countenances increases in the upper tail of a climate distribution (cf. Kempton et al., 1995, pp. 80–81). Specifically, the author first noticed a number of cartoons that used extreme cold or snow storms to mock scientists' claims. Then a number of articles from elite newspapers and magazines did the same thing. For example, when Time magazine entitled a story,

‘Brrr! What Global Warming?’, the title accurately indexed the derisive contents. Finally, there were editorials. According to one example from Canada’s ‘national newspaper’:

We shrugged when they blamed last summer’s heat wave in Central Canada on global warming; that has been true of every spell of hot weather for a decade or more. We chuckled when they attributed southern Alberta’s summer floods to the same source. We sighed when Environment Minister Sheila Copps said warming had a hand in a rash of forest fires. But when they started linking this winter’s *cold* spell to global warming, we got hot under the collar. Is there any kind of weather that is not caused by global warming? (Globe and Mail, 1996).

These examples suggest that the media (excepting the New York Times) have not followed the shift in scientific concern from global warming to climate change. By sticking to the notion of ‘warming’, the media may well have left the public uninformed about the range of possible climate variations and the accumulating evidence of rapid and relatively irreversible historical shifts in climate. Of course, if the media and the public discount one tail of climate distributions – or worse, regard outcomes in that tail as belying scientific claims – it is far more difficult for extreme events to galvanize concern.

One possibility here is to follow the lead of Berk and Schulman (1995) and employ quasi-experimental designs to uncover not only what the public understands but the extent to which it can learn, assimilate and use new information. In examining the public’s ‘willingness to pay’ in order to prevent various hypothetical climate scenarios from transpiring, Berk and Schulman were undoubtedly asking people to make decisions that they have not previously thought about. Yet their respondents were able to digest complex information and make relatively informed decisions. Their results indicate that the public does not grasp the effects of variation in climate support the claims made here. These public misunderstandings can also be regarded as an educational challenge. That is, researchers could provide examples of (the most) valid responses to particular scenarios and then determine if people can subsequently use the new information in a logical fashion. The upshot is not to simply degrade the capacity of the public in scientific fields, but to go beyond the sound bite rationality found in most public arenas and offer people the tools and the stimulation needed to achieve a level of scientific literacy.

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