

## **Uncertainty about causes and effects of global warming in U.S. news coverage before and after Bali<sup>1</sup>**

Mai Kuha

Ball State University, Muncie, IN, USA  
mkuha@bsu.edu

**Abstract.** A particularly troubling issue in US news discourse is that global warming, and human activity as a cause for it, continued to be presented as controversial even after a scientific consensus emerged and was reflected in other countries' media coverage. Previous research by journalists, sociologists, and geographers has consisted mostly of content analysis; this paper complements it by focusing on specific linguistic elements that indicate the degree of certainty expressed in references to the causes and effects of global warming. An analysis of news articles on global warming published in US newspapers between 2005 and 2008 suggests that the degree of certainty in statements about global warming increased after the UN Climate Change Conference in December of 2007 in Bali, but that US news discourse still lags behind the UK.

### **Research on media coverage of global warming**

**Volume of coverage.** In the US, media coverage of climate change increased each year from 1987 to 1990 (Wilkins 1993:75-76) and diminished after 1990 (Mazur 1998). Boykoff (2007b) determined that the amount of coverage after 1995 "has ebbed and flowed" in response to particular events (480). More generally, attention to global warming seems to be cyclical (McComas & Shanahan 1999); for one thing, "journalists are more likely to discuss climate during unusually warm periods" (Shanahan & Good 2000). In 2003-06, the amount of coverage increased dramatically in the US and UK prestige press (Boykoff 2007a:475), but the US consistently lagged behind the UK (473). The State of the News Media 2008 report ([www.stateofthenewsmedia.org](http://www.stateofthenewsmedia.org)) of the Project for Excellence in Journalism shows that global warming was among the top 10 stories in US network evening news in 2007, but not in newspapers.

**Sources.** Framing in news stories tends to vary, depending on whether the sources are scientists or politicians (Trumbo 1996). Antilla (2005) reports that "climate contrarians"<sup>2</sup> were often "primary definers" in some news outlets, and that these sources had "known fossil fuel industry ties" (350). In the UK, "environmental pressure groups have gained greater legitimacy in the media" in the late 1980s (Anderson 1993:65), and have a considerable voice in coverage of sustainable development, although the national government and NGO representatives are the two types of

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<sup>2</sup> term from Boykoff (2007b:482)

sources most often used (Lewis 2000:261). In the US, Trumbo (1996) found a decrease in the use of scientists as news sources during the decade he analyzed (1985-95).

**Framing and what to report.** Carvalho (2007) argues that “ideology works as a powerful selection device in deciding what is scientific news” (223). Environmental issues in the US are often framed in economic (Lewis 2000) and political terms (Jones 2007); climate change, in particular, is often framed in terms of “debate, controversy, or uncertainty” (Antilla 2005:350). In the 1990s, the conservative movement made a systematic effort to establish that global warming is not problematic (McCright and Dunlap 2000). For a chronicle of the presence of environmental conflict in U.S. media before the 1960s, see Neuzil & Kovarik (1996).

**What is missing?** Journalists have not reported on the connections between global warming and local events that have cost money (Gelbspan 2004:xii); they have not asked about funding for climate change research (52).

**Uncertainty.** Zehr (2000) found scientific uncertainty to be salient in US news coverage from 1986 to 1995; he suggests that the construction of a public that is misinformed may lead to inaction. Until 2005, the US media continued to represent global warming as controversial (Dispensa & Brulle 2003), failing to show “how profoundly out of step the United States is relative to the rest of the world” (Gelbspan 2004:72). Lagging behind news discourse in other countries, US media have finally shifted to a tone more in line with the scientific consensus (Howland 2006) since 2005 (Boykoff 2007a:474). Several reasons for this untimely misrepresentation of global warming as controversial have been discussed in previous research.

- Journalists’ emphasis on ‘balance’ led them to give equal attention to climate contrarians (Boykoff & Boykoff 2004, Antilla 2005, Howland 2006). The notion of balance interacted also with the tendency to personalize news: together, they led to “the scenario of the dueling scientists” (Boykoff & Boykoff 2007).
- The conservative countermovement (Howland 2006) had an effect. Big coal and oil companies have been involved (Gelbspan 2004:72) and their advertising is an important source of revenue for newspapers (McManus 2000:316). Dispensa & Brulle (2003) give examples of newspapers coming under pressure from advertising agencies (84-85).
- Scientists’ understated language can be misinterpreted (Howland 2006), particularly because journalists often do not read scientific papers (Gelbspan 2004).

More charitably, Mazur & Lee (1993) argue that it is reasonable that journalists exercise caution, because “early warnings sounded by scientist-activists are invariably controversial and often appear overstated in retrospect” (713).

**Impact on readers.** Some findings suggest that the content of news stories may not matter as much as we might initially assume. For one thing, readers generally

remember up to a third of basic information received from media (Bell 1994a:37-38, summarizing three large-scale studies). Mazur & Lee (1993) note that “public response to media coverage is largely independent of the detailed content of that coverage” (683); they argue that the **amount** of coverage has a larger impact. “The most widely accepted effect of news media on opinion is ‘agenda-setting’, the placing of certain issues or problems foremost in the minds of people, including policy-makers” (Mazur 1998:458). On the other hand, some research suggests that the content of news coverage can be influential. Corbett and Durfee (2004) found that participants who read a news story about global warming which included context had a higher level of certainty about it. More generally, beyond news discourse, a large body of linguistic research demonstrates the potential effect of word choice on readers; see, for example, the classic work by Loftus (1975).

It is not immediately obvious how to reconcile these experimental results with media scholars’ arguments about the content of news not having much effect on media consumers. I would speculate that the empirical work in linguistics demonstrates that readers are influenced by the content and form of the message when they are paying attention to what they read, and that the work by media scholars shows how little impact the content and form of the message can have when readers are not paying attention. That is, when a media consumer’s exposure to news is limited to scanning the headlines and the occasional lead in a newspaper, it seems reasonable that the newspaper would have only an “agenda-setting” effect. However, when that reader finds a news story of particular interest and reads it in its entirety, specific content and form would surely have an effect.

## Procedures

Given the history of US newspapers giving global warming less attention and, until recently, allowing “climate contrarians” an inappropriately loud voice, I wanted to investigate this question: when US media coverage does take the view that human activity has a role in global warming, what level of certainty is expressed in propositions<sup>3</sup> about its causes or effects?

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<sup>3</sup> In linguistics, a **proposition** can be defined as

- “the sense of a declarative sentence, with all ambiguity, vagueness and deixis resolved ... In linguistics, the interest is primarily in the way in which different linguistic forms can be shown to express the same proposition (e.g. *The cat ate the meat, the meat was eaten by the cat, and so on*)” (Crystal 2003:377)
- “that part of the meaning of a clause or sentence that is constant, despite changes in such things as voice or illocutionary force of the clause” (<http://www.sil.org/linguistics/GlossaryOfLinguisticTerms/WhatIsAProposition.htm>)

Certain linguistic features, particularly reporting verbs, signal the degree of commitment that a speaker or writer makes to the truth of a statement. For example, while these two sentences both report roughly the same information, the first one expresses more certainty than the second one does:

*Hundreds more people in the United States will die each year from air pollution as temperatures increase from carbon dioxide, according to a Stanford University study.*

*Researchers believe that hundreds more people in the United States could die each year from air pollution as temperatures increase from carbon dioxide.*

**The texts.** I used Access World News to retrieve articles published in US newspapers during four three-week periods:

- October 30 - November 19, 2005 (for comparison with the following three periods of interest)
- October 30 - November 19, 2006 (following the publication of the Stern review on October 30)
- November 17 - December 7, 2007 (following the release of IPCC's AR 4 synthesis report on November 17)
- December 14, 2007 - January 3, 2008 (following the UN Climate Change Conference, 12/3 – 12/14/07, in Bali)

Previous research on media coverage of global warming has generally considered the prestige press (often the *New York Times*, the *Wall Street Journal*, the *Los Angeles Times*, and the *Washington Post* in the US, and the *Independent* and *The Times* in the UK). The reason for the selection of these newspapers, when stated, is that they have a large circulation and are influential. However, it seems to me that the collective influence of local papers is also important. My search included all the sources archived in the Access World News database at the time of data collection: 1,486 newspapers from the US and 185 from the UK.

I searched for articles that contained either “global warming” or “climate change” in the headline or in the lead. I then discarded those that were irrelevant, retaining those that did, in fact, have global warming as their topic, or that made statements about the causes or effects of climate change, until I had twelve news stories and three editorials from all four periods. They contained a total of 517 propositions about the causes or effects of climate change. For comparison, I also analyzed twelve news stories from UK newspapers for the period following Bali (December 2007 - January 2008), selected using the same procedure. These stories contained a total of 46 propositions about the causes or effects of climate change. The samples from both countries contained some stories that ran in a number of newspapers.

**Analysis.** For each proposition about the causes or effects of climate change, I identified the reporting verb (or any other relevant linguistic feature) that the writer used to signal the degree of certainty of the proposition. On the basis of types of verbs distinguished in Hooper (1975), Hyland (1999), Karttunen (1971), Thomas & Hawes (1994), and Thompson & Ye (1991), I classified the propositions into the following categories, listed from the greatest level of certainty to the least. The categories are reminiscent of Givón's (1982) evidentiality scale.

- **Assertions, presuppositions, and factives.** The highest degree of commitment to the truth of a proposition occurred when reporters presented statements as true without appealing to an authority or using disclaimers.

*[T]he spring runoff will come about one month earlier in the year.* (San Francisco Chronicle, CA, November 17, 2005)

Also at this level of certainty I placed propositions that are **presupposed**, that is, information that must be accepted by the reader in order for a sentence to be understood. For example, the following sentence presupposes *human-caused global warming is a reality*.

*President Bush has moved incrementally toward accepting **the reality of human-caused global warming**.* (The Christian Science Monitor, Boston, MA, January 3, 2008; emphasis added)

A third type of proposition at this level is that introduced by a factive verb, most often *show* or *demonstrate*. Factive verbs “carry along the speaker's presupposition that the complement sentence represents a true proposition” (Karttunen 1971). We can tell this is the case, because if the writer added a statement of disagreement to this type of proposition, the result would not be felicitous:

*Research has shown that increased risk of wildfire in mountain forests is linked to climate warming.* (The Bakersfield Californian, CA, December 7, 2007)

*?? Research has shown that increased risk of wildfire in mountain forests is linked to climate warming, **but I disagree**.* (Non-occurring example)

- **Non-factives that signal some certainty.** This level includes propositions introduced by non-factive verbs similar to those that Hyland (1999) identified as presenting the author of the source of information as either positive or critical about its veracity. *Predict* and *warn* were among the most frequent.

*The study predicts that a 2-foot rise in ocean levels would leave 70 percent of the area under water.* (The Press of Atlantic City, NJ, November 17, 2005)

- **Non-factives, neutral.** At this level I placed propositions introduced by non-factive verbs similar to those that “do not imply any interpretation of the reported information”, according to Thomas & Hawes (1994). *Say* was the most frequently occurring, followed by *report*.

- **Non-factives that signal less certainty.** This level includes propositions introduced by non-factive verbs similar to those that Hyland (1999) identified as presenting the author of the source of information as tentative, as well as Hooper’s (1975) “weak assertives”. *Believe* and *suggest* were prominent. I also included propositions modified by the modal verbs *could*, *may*, and *might*.

...and that man-made carbon (CO2) emissions might be contributing to the change... (The Herald News, Joliet, IL, November 19, 2006)

We should not expect reporting verbs or other linguistic devices to have the same force every time they are used. Rather, we must take context into account (Thompson & Ye 1991:372). Boosting and attenuating devices “may subtly modify one another” (Holmes 1984:363), and, in the case of spoken language, intonation can have an impact on the degree of certainty conveyed (Holmes 1982:14-15). Also, while Karttunen pointed out back in 1971 that the properties of factive verbs (such as *learn*) are well known, Hazlett (forthcoming) gives examples of uses of factive verbs that do **not** presuppose the truth of the complement. Therefore, I considered each proposition in the context of the sentence, adjusting the degree of certainty expressed in a few cases—for example, when a modal verb or an adverb modified one of the factive verbs mentioned above.

Table 1 shows the number of propositions about the causes or effects of climate change in the news stories, relative to the length of the articles. With the exception of the pre-Bali 2007 sample, we see the proportion of global warming coverage spent on discussing its causes and effects decreasing over time in the US, and approaching the corresponding figure for UK newspapers. This seems to fit Howland’s (2006) encouraging finding that coverage now focuses more on possible **solutions**.

	Number of propositions about the causes or effects of climate change	Total word count in the articles	Words per proposition about causes or effects
US			
2005, Oct. – Nov.	126	6,598	52
2006, Oct. – Nov.	100	9,167	92
2007, Nov. – Dec.	88	7,222	82
Dec. 2007 - 2008	91	9,424	104
UK			
Dec. 2007 - 2008	46	5,420	118

Table 1. News stories: proportion of propositions about causes and effects of global warming per period.

Another preliminary point to consider is what proportion of these propositions take the view that global warming is not man-made. Table 2 shows a surprising upsurge of such propositions in the 2007 news story sample. In the sample of stories published a few weeks later, after Bali, there was only one skeptical statement. In the small sample of three editorials per time period, one of the three in 2005 rejected human activity as a cause of global warming; after Bali, when such statements decreased sharply in news

stories, all three editorials were by “climate contrarians”. There were no such statements in the UK sample.

The 11% of skeptical statements in the 2007 news stories are all from the same two stories. That is, these findings do **not** suggest that most news stories include a note from the other side of the old debate for balance, but that news coverage in the US generally reflects acceptance of the scientific consensus on global warming (though sometimes with great uncertainty, as we will see), and that there are a few loud voices that take a strong stand against it. Both the content and the rhetorical devices in the climate contrarians’ statements seemed quite different, particularly in the editorials, so it didn’t seem helpful to lump them together with the rest of the texts. Therefore, I’ve limited the following analysis to propositions that side with the scientific consensus.

			Percentage of propositions that view warming as not anthropogenic
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US			
	News stories		
		2005, Oct. – Nov.	0%
		2006, Oct. – Nov.	0%
		2007, Nov. – Dec.	11%
		Dec. 2007 - 2008	1%
	Editorials		
		2005, Oct. – Nov.	44%
		2006, Oct. – Nov.	4%
		2007, Nov. – Dec.	3%
		Dec. 2007 - 2008	81%
UK	News stories	Dec. 2007 - 2008	0%

Table 2. Percentage of propositions presenting climate contrarians’ views.

## Results

**Degree of certainty.** Table 3 and Figure 1 show that the neutral non-factive verbs, which do not commit the journalist to the truth of the proposition expressed, are the most frequently used in all four periods. A journalist can remain neutral about the truth of a statement by using a verb such as *say* to attribute it to an authority. However, the reporter’s primary motivation in using such verbs could be simply to give due credit for the information presented, so the high frequency of use of these verbs is not surprising or even troubling, necessarily.

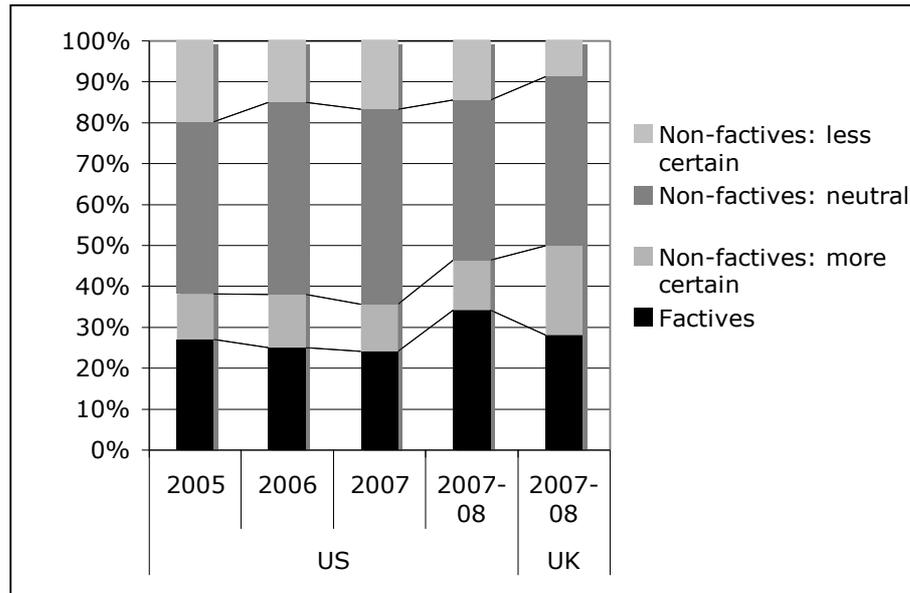


Figure 1. Degree of certainty in propositions about causes and effects of global warming in the sample of news stories.

	Level of certainty			
	Assertions, factives	Non-factive		
		More certain	Neutral	Less certain
US				
2005	27%	11%	42%	20%
2006	25%	13%	47%	15%
2007	24%	12%	47%	17%
07 - 08	34%	12%	39%	14%
UK, 2007-08				
		28%	22%	41%
				9%

Table 3. Degree of certainty in propositions about causes and effects of global warming in the sample of news stories.

In terms of change over time, we see that, in the 2005 sample, all of 20% of propositions were at the level that signals the least certainty. The samples from 2006 and 2007 show some fluctuation without clear direction. If anything, 2007 coverage before Bali seems to return to more conservatism, with a slight increase in less certain non-factives, the category of least certainty. Together with the statements from climate contrarians I just mentioned, this suggests resistance.

After Bali, we see a shift. The percentage of propositions expressing the highest level of certainty (assertions and factives) jumps to 34%, considerably more than in any of the previous samples, and the percentage of propositions at the neutral non-factive level and at the less certain non-factive level drop to the lowest point. The change is noteworthy, considering that the time elapsed between the pre-Bali 2007 sample and the post-Bali sample is short, and that the 2006 and 2007 samples also followed important events. The conference in Bali, possibly as part of a broader increase in public awareness, seems to have succeeded in getting media attention of a kind that the previous reports and events did not.

A comparison with the UK sample shows that, while there are more propositions at the highest level of certainty in the US newspapers, the combined percentage of propositions at the two highest levels of certainty is still higher in UK coverage. When we remember that the UK news story sample included no propositions from climate contrarians, the overall picture is that US coverage still lags behind the UK<sup>4</sup>.

**A snapshot of post-Bali coverage.** Here are some examples that illustrate the most frequently occurring proposition types that media consumers in the US might have encountered in the three weeks following Bali.

*"Whether or not it's happening is not the point. It's obviously happening,"*  
said Pat Michaels (Allegheny Times, Coraopolis, PA, Dec. 14, 2007).  
Neutral non-factive level: 39%

*The biggest polluters are the United States, China, India and Brazil*  
(Alameda Times-Star, CA, January 3, 2008). Assertions/factives: 34%

*Research suggests that diminished sea ice and warmer water may decrease  
the plankton that dies and feeds creatures on the bottom* (The Daily  
Astorian, Astoria, OR, January 3, 2008). Less certain non-factives: 14%

**Editorials.** It is not meaningful to analyze the samples from 2005 and from after Bali, since statements from climate contrarians were dominant in them. Table 4 shows the figures for 2006 and for 2007 (before Bali). We can see a far greater degree of certainty expressed in editorials than in news stories.

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<sup>4</sup> Differences in national policies and in levels of awareness about environmental issues are just one possible reason for differences in the choice of reporting verbs; cultural differences in levels of directness may be a factor as well.

	Assertions, factives	Level of certainty		
		Non-factive		
		More certain	Neutral	Less certain
US				
2006	73%	9%	14%	5%
2007	73%	5%	5%	16%

Table 4. Degree of certainty in propositions about causes and effects of global warming in the sample of editorials.

**Variation in the amount of coverage.** Going beyond this sample of news articles, I searched Access World News for stories containing either “global warming” or “climate change” in the three weeks following Bali, in the US, UK, and other English-speaking countries. This search pulled up some articles that were actually not about global warming (for example, one story described a comedy show related to global warming, without saying anything more about the climate phenomenon itself), but these numbers probably tell us something about the amount of attention the topic gets. When we take into account the number of newspapers included in Access World News, we see that global warming still does not get nearly as much attention in the US as it does in the UK. As Table 5 shows, in the three weeks following Bali UK newspapers averaged more than three stories on global warming per day, while US newspapers managed less than two.

Something unexpected got my attention in the course of doing this analysis: regional variation in the U.S. The states listed in Table 5 are just a sample to illustrate the dramatic range in the amount of coverage. (See the appendix for a complete list.) As the table shows, newspapers in North Dakota seem to be **ahead** of the British, producing more than seven stories per week on global warming. I was surprised to see that California is below the national average. What’s disturbing is that a number of states, such as Alabama and Arkansas, had so little to report about global warming, even after Bali. I do not see a clear regional pattern in the degree of certainty expressed in propositions about global warming, although there does seem to be a slight tendency for states with less news coverage to express less certainty as well.

It is not clear what might explain these differences. Southern states overall tend to have less coverage, but some don’t fit the pattern: West Virginia and Florida are above the national average. It would be interesting to find out whether the pattern has to do with what the basis of each region’s economy is, or who the owner of a particular newspaper is. In a larger study, it would be a good idea to take into account the approximate size of each newspaper to determine what portion of the “news hole” was devoted to global warming, and also to take samples at different times, since media attention to any topic fluctuates.

	Number of newspapers	Number of stories	Average number of stories per paper per day
India	11	1,703	7.4
UK	185	13,689	3.5
Australia	168	11,256	3.2
New Zealand	2	123	2.9
Canada	127	5,199	1.9
South Africa	9	2	0.0
US	1,486	50,086	1.6
North Dakota	2	318	7.6
Vermont	7	918	6.2
Utah	7	824	5.6
Colorado	18	1,192	3.2
West Virginia	9	545	2.9
Missouri	17	998	2.8
Florida	59	3,032	2.4
New Jersey	33	1,590	2.3
Wyoming	3	105	1.7
Texas	55	1,788	1.5
California	196	5,549	1.3
Georgia	34	739	1.0
Michigan	53	1,130	1.0
Massachusetts	132	2,740	1.0
Alabama	21	399	0.9
Maryland	38	667	0.8
Arkansas	12	100	0.4

Table 5. Number of stories containing either “global warming” or “climate change” (anywhere in the text) published between December 14, 2007 and January 3, 2008 in newspapers archived in Access World News.

## **Conclusions and questions**

Taken together, the results of this study and of previous work suggest that the level of certainty expressed about the causes and effects of climate change increased in US news reporting after the UN Climate Change Conference in Bali. However, US newspapers still lag behind the UK, in terms of the amount of coverage, the presence of climate contrarians, the percentage of propositions that express certainty at the two highest levels, and probably also the proportion of coverage devoted to clarifying the causes and effects of global warming, which may indicate less attention given to possible solutions and next steps. Overall, we have seen signs of slow improvement, but, in 2008, a tone in media coverage that is still more tentative than the climate crisis warrants.

Because of the standards that apply to editorials in newspapers, it was still possible for readers in Colorado Springs to open *The Gazette* in January of 2008 and find statements such as the following in a piece titled “Our Opinion”:

*Global warming alarmism peaked in 2007 with calls for vast increases in government control to stifle industrial growth, eliminate fossil fuels and impose new carbon taxes. (...) All this received much media coverage and support from politicians and government bureaucrats, who stand to gain control if we heed their warnings. The problem is, there's no scientific consensus for doomsday claims, let alone that drastic remedies are needed.*

Sadly, given the state of literacy in the US, I am not certain that all readers are able to distinguish this from factual news reporting. Even if they do make the distinction, such messages might still have an influence. As we have also seen, an area of particular concern is that readers in different areas of the US may have dramatically different levels of exposure to coverage about global warming. This matters because of cognitive reasons: in order for attitude change to take place, it is important to receive repeated messages and to feel that the information presented belongs in the mainstream.

Assuming that the reasons for the gap remaining between US media coverage and that of the UK are the same as those proposed by previous researchers, the factor we may be able to influence most directly is the language of scientific information made available to the public. As scientists, we could consider whether we have struck an appropriate balance, so that the way we communicate with journalists is direct and forceful enough, while remaining objective. If the role of journalists seeking balance in reporting is still an issue, a dialogue with journalism departments at universities might be beneficial. However, if the role of the conservative movement and big oil companies turns out to be the heaviest factor, bringing about change in news discourse could be challenging.

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<sup>5</sup> The author seems to be Finnish; “Antilla” is unknown as a name in Finland, but “Anttila” is very common.

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## Appendix

Complete list of states: number of hits in Access World News for “global warming” or “climate change” anywhere in the text, Dec. 14, 2007 – Jan. 3, 2008.

	Number of newspapers	Number of hits	Average number of stories per newspaper
Alabama	21	399	19
Alaska	5	491	98
Arizona	8	423	53
Arkansas	12	100	8
California	196	5,549	28
Colorado	18	1,192	66
Connecticut	47	1,670	36
Delaware	1	99	99
District of Columbia	8	955	119
Florida	59	3,032	51
Georgia	34	739	22
Hawaii	1	85	85
Idaho	6	501	84
Illinois	104	2,402	23
Indiana	25	834	33
Iowa	14	652	47
Kansas	15	866	58
Kentucky	16	491	31
Louisiana	10	249	25
Maine	5	205	41
Maryland	38	667	18
Massachusetts	132	2,740	21
Michigan	53	1,130	21
Minnesota	18	675	38
Mississippi	10	368	37
Missouri	17	998	59
Montana	5	140	28
Nebraska	5	141	28
Nevada	5	285	57
New Hampshire	5	344	69
New Jersey	33	1,590	48
New Mexico	15	507	34
New York	83	3,027	36
North Carolina	54	1,249	23
North Dakota	2	318	159
Ohio	33	951	29
Oklahoma	13	453	35
Oregon	13	1,036	80
Pennsylvania	125	2,704	22

Rhode Island	6	166	28
South Carolina	25	597	24
South Dakota	3	102	34
Tennessee	12	478	40
Texas	55	1,788	33
Utah	7	824	118
Vermont	7	918	131
Virginia	38	1,031	27
Washington	17	1,683	99
West Virginia	9	545	61
Wisconsin	21	684	33
Wyoming	3	105	35