NCAR

Weather and Society Watch

A Publication of NCAR's Societal Impacts Program (SIP) **Volume 1, Number 3, April 20, 2007**

Moving Toward Symbiosis between Physical and Social Sciences

by Raymond Ban*

"Quality exists only to the extent that the product meets the perceived needs of the customer" and "An educated consumer is our best customer" are well known phrases. Neither axiom says anything about the physical sciences though, right? Note the key words—quality, needs, consumer, and most importantly, customer. All of these words relate much more directly to the *social* rather than the physical sciences, don't they? But after 35 years as a professional physical scientist in the industry segment of the weather enterprise, I find myself returning to these maxims over and over again. So let's dig a bit deeper into this apparent paradox and see what we learn along the way.

Over the course of my career, I've observed that we in the atmospheric science community think that we're really good at knowing what's best for the customer, or, as I call it, "assuming truth." I'm not sure why, but somewhere along the way we become entrenched in the notion that we know more about what the customer needs or wants than he or she does. In general, we don't spend a great deal of time learning what really makes our customers tick and trying to understand their decision-making processes. We seem to focus more on creating products and services that serve the science instead of really delivering value to customers. Now, I recognize that these observations aren't true for all parts of the community and admit that my observations might be a bit harsh. But others in the community have identified this as an issue as well.

I was privileged to chair the National Research Council (NRC) committee that constructed the 2006 "Completing the Forecast" report.[1] This report deals with characterizing and communicating uncertainty in weather and climate forecasts. During the committee's five official meetings, participants consistently brought up the need to incorporate the user's voice into product development.

Somewhere along the way we become entrenched in the notion that we know more about what the customer needs or wants than he or she does.

In fact, Finding 2 of the report states: *'Understanding user needs and effectively communicating the value of uncertainty information for addressing those needs are perhaps the largest and most important tasks for the Enterprise. Yet, forecast information is often provided without full under-standing of user needs or how to develop products that best support user decisions. Parts of the Enterprise (e.g., within the private sector and academia) have developed a sophisticated understanding of user needs. In addition, there is a wealth of knowledge in the social and behavioral sciences that could be more effectively incorporated into the product research and development. Currently this variety of resources is not being fully tapped by NOAA and user perspectives are not incorporated from the outset of the product development process.'*
(p.3 Committee on Estimating and Communicating Uncertainty in Weather and Climate Forecasts 2006).

(See Symbiosis on page 11)

A layer of ice coats the trees, flowers and sidewalks of the Alamo during the 2007 AMS Annual Meeting in San Antonio, Texas in January.
(Photo by Ashley Coles)

In This Issue

Testing User Understanding of Forecast Uncertainty Information in the Experimental Economics Laboratory

by Mark S. Roulston* and Todd R. Kaplan**

Meteorologists are well aware that weather forecasts are uncertain, with some of that uncertainty deriving from the atmosphere's chaotic nature. Motivated by this awareness, the meteorological community has developed "ensemble forecasting," in which researchers conduct multiple simulations of the atmosphere to determine the sensitivity of the forecast to uncertainty in the initial condition. These multiple simulations also test model accuracy.

Ensemble forecasting is now an established tool at medium-range horizons of 3 to 14 days, and is also becoming increasingly useful for short-range forecasts up to 2 days ahead. Meteorologists also understand that ensemble forecasting yields the type of information about forecast uncertainty that can, in theory, enhance the economic value of forecasts by improving the decision making of forecast users (AMS, 2002; NRC 2006). It is not clear, however, how much of this enhanced value will be realized because we do not know how well forecast users are able to understand forecast uncertainty information or forecasts in a probabilistic format. This is particularly true for users of free-at-the-point-of-use channels for disseminating weather forecasts, such as TV and the Internet.

The value of a weather forecast derives from its ability to influence decisions that are made in the face of uncertainty. The question of how people make decisions under uncertainty is one of the principal research themes in the field of experimental economics (Kagel and Roth, 1995). The methods developed by experimental economists to study individual choice are useful tools for objectively determining how well users understand weather forecasts. In a preliminary study, we applied laboratory-based experimental economic methods to this question. The results suggested that people can interpret forecast uncertainty information and use it to make better decisions (Roulston et al., 2006). We have not, however, used such methods to test specific formats for presenting probabilistic weather information.

As part of a project to design formats for including uncertainty information as part of the 5-day forecasts we post on our public Web site, the U.K. Met Office funded a series of experiments at the Financial and Economics Experimental Laboratory at Exeter University (FEELE). These experiments were designed to test whether undergraduates are capable of understanding forecast uncertainty information that is included in a Web-based location-specific forecast. The format tested was the most popular of five formats presented to users of the U.K. Met Office's Web site as part of an online questionnaire.

Ensemble forecasting yields the type of information about forecast uncertainty that can, in theory, enhance the economic value of forecasts by improving the decision making of forecast users.

During the experiments, we presented 153 participants—all undergraduates studying a range of majors at the University of Exeter—with a sequence of 20 "lotteries" in which they could choose to receive £0.50 ($0.99) if one of two criteria was satisfied.

The participants were divided into two groups: Group A (77 participants) received a "deterministic" forecast while group B (76 participants) received the same forecast with additional uncertainty information. Figure 1 depicts an example of the forecast formats used (see p. 11).

Our preliminary analysis from the Exeter experiments indicates that participants given uncertainty information were significantly more likely to choose the most probable outcome, suggesting that they were correctly interpreting the information contained in the uncertainty graphic. This result is reflected in the average earnings for each group: Group B (which received the uncertainty information) earned an average of £8.48 ($16.75) per person, and Group A earned £7.25 ($14.32). Participants receiving the uncertainty information, on average, opted for the most likely outcome in 17.04 of the 20 lotteries. Those without the uncertainty information chose the most likely outcome in an average of only 13.70 lotteries. Undergraduates studying the more non-quantitative subjects (such as humanities) and those studying more quantitative disciplines (such as economics and physical sciences) both gained from having the uncertainty information. Correctly interpreting the information was not significantly dependent on gender.

We are conducting a more complete analysis of the results, and plan to extend the study to groups other than students to test the robustness of the results.

(See Testing User on page 11)

References

AMS Council, 2002: Enhancing weather information with probability forecasts. *Bulletin of the American Meteorological Society,* **83,** 450–452.

Kagel, J.H., and A.E. Roth (eds.), 1995: *Handbook of Experimental Economics*. Princeton, NJ: Princeton University Press, 721.

National Research Council, 2006: *Completing the Forecast: Characterizing and Communicating Uncertainty for Better Decisions Using Weather and Climate Forecasts,* Washington, DC: National Academies Press, 124.

Roulston, M.S., G.E. Bolton, A.N. Kleit, and A.L. Sears-Collins, 2006: A laboratory study of the benefits of including uncertainty information in weather forecasts. *Weather and Forecasting,* **21**, 116–122.

What Are Societal Impacts?

Reexamining a Common Phrase

by Stu Ostro*

The term is hot these days. It's part of the name of the Societal Impacts Program at NCAR. There's an AMS Board on Societal Impacts, on which I sit. We often see the topic written about. But what do those words really mean?

Webster's New World College Dictionary (the dictionary of choice of the Associated Press, *The New York Times,* and *The Wall Street Journal*) lists eight variations of the definition of "**society**." But the one that seems to best fit when applied broadly to weather and climate, as opposed to, say, an organization like the American Meteorological Society, is

"All people, collectively, regarded as constituting a community of related, interdependent individuals."

And, for "**impact**":

"The power of an event, idea, etc. to produce changes, move the feelings, etc."

So what in the world of weather and climate produces societal impacts?

I would argue: *everything*.

The obvious includes tropical cyclones such as Hurricane Katrina, which produced a catastrophe in southeast Louisiana and southern Mississippi but also had ripple effects on people's lives and the economy that went far beyond the localized area; Hurricane Andrew, which permanently affected the psyche of southern Dade County (as it was known back then) in Florida; and the 1970 Bangladesh cyclone, whose death toll was estimated to be as high as an incomprehensible 300,000+ people.

On an even larger scale are such things as the Dust Bowl and global climate change.

But what about a clear, warm afternoon at the beach? Isn't that a societal impact, when thousands of people are moved to join together and bask in the sunshine?

Or a spectacular mountain wave cloud or an LP supercell or a glowing orange/pink sunset as the underside of an altocumulus deck is illuminated? Mere clouds can inspire awe in anyone viewing them, and that would seem to satisfy the definition.

Or simply a rainy weekend that forces folks to change their plans from outdoors to indoors?

Medical science is perhaps the only other discipline that's in the same league as the atmospheric sciences when it comes to having a *direct effect* on *everyone's* lives.

Maybe the name of the AMS should be changed to the 'American Meteorological Impacts on Society' Society.

Don't worry, I know, the name won't actually be changed, and even if it were to be, my wording is way too cumbersome.

And I understand how important the purely physical sciences are. But the point is this:

The science satisfies our quest for knowledge, but the profession exists to serve humanity.

*Stu (sostro@weather.com) is the senior director of weather communications for The Weather Channel.

Lenticularis clouds appear over Boulder, Colo. at sunset. (Photo by Emily Laidlaw)

Correction

We regret an error that was published in the January 2007 print edition. In Ilan Kelman's "Review of Marshall Frech's *The Water's Edge,*" a phrase reading "Recent catastrophes include Hurricane Katrina in 2005, which killed nearly 2,000 people and a December 2006 tsunami in the Philippines in which more than 200,000 people lost their lives" should have read "Recent catastrophes, each of which killed over 1,000 people, include Hurricane Katrina in 2005 and a December 2006 typhoon in the Philippines."

Additionally, the third paragraph of the article should have read "Their powerful explanations—"I love this water"—capture some of the fundamentals of our increasing vulnerability to floods: moving into floodplains, river and coastal engineering, faith in technology such as dams to protect us, and long-term policies that favor the transfer of risk from the wealthy elite to individual homeowners."

Weather and Society Watch will gladly run any correction of errors our readers find. Please contact laidlaw@ucar.edu if you require a correction.

Weather-Related Disaster Diplomacy

by Ilan Kelman*

A house on Upolu, Samoa that was damaged by Cyclone Heta in January 2004. (Photo by Ilan Kelman)

"Hurricane Katrina Reconciles Cuba-U.S. Differences" blazed one newspaper headline. Another shouted, "North Korea Pledges 'a Nuclear Free Future' After International Drought Aid Saves Millions". In reality, however, disasters have rarely yielded durable conflict resolution. Instead—in most cases—the memory of assistance and humanitarianism fades away while politics-as-usual dominates.

Yet interest continues to grow in the notion of "disaster diplomacy" (see http://www.disasterdiplomacy.org), which explores how and why disaster-related activities do or do not induce international cooperation among countries or communities in conflict and produces scientific results on which disaster and conflict-related policies and practices can be based. Disaster-related activities refer to both pre-disaster efforts, including prevention and mitigation, and post-disaster actions, including response and recovery.

All disaster diplomacy evidence so far suggests that disaster-related activities can catalyze diplomacy but are unlikely to *create* diplomacy. In the short-term (on the order of weeks and months), disaster-related activities can affect diplomacy, as long as a foundation already exists for the reconciliation. That foundation could be formed, for example, by secret negotiations between enemy states or by formal or informal cultural and trade links. Over the long-term, though, non-disaster factors have a more significant impact on diplomacy than disaster-related activities. Leadership changes, mutual distrust, belief that an historical conflict or grievance should take precedence over present-day humanitarian needs, or priorities other than conflict resolution and diplomatic dividends are examples of non-disaster factors.

Throughout all disaster diplomacy work, weather-related activities have been prominent and indicate a variety of outcomes, from disaster-based diplomacy successfully catalyzing longer-term peace to disaster-related activities having no impact on conflict resolution. Three types of case studies have been covered that provide examples of the links between diplomacy and weather:

- A specific geographic region or country, such as North Korea's roller-coaster international relations following floods, droughts, and famines that started in 1995
- A specific disaster event or type of disaster, such as the successful management of the 1991–1993 drought in southern Africa, which occurred in the context of rapid and significant political and developmental changes across the region; the drought diplomacy efforts prevented the drought emergency from becoming a drought disaster
- Disaster-related procedures and policies—for example international cooperation in identifying disaster casualties after a major cyclone—that could apply to any geographic region or disaster event or type

The main lesson is that one size doesn't fit all in disaster diplomacy. More background and depth are needed for any case study in order to understand how disaster-related activities could be applied to foster peace—and when that application could backfire.

Therefore, in studying disaster diplomacy, we also investigate the theory and trends that emerge from compiling and comparing these case studies, seeking to explain how governments and others choose different approaches in devising disaster-related activities to support or inhibit diplomatic processes. In categorizing disaster diplomacy case studies, we have analyzed the influence of the proximity of the countries involved in disaster diplomacy, their aid in relationships and interactions, and several other factors.

No proof has yet been found for new and lasting diplomacy based only on disaster-related activities.

A prominent example of weather-related disaster diplomacy between Cuba and the United States was first described by NCAR's Mickey Glantz in 2000 (see http://www.disasterdiplomacy.org/cubausa.html). Glantz focused on pre-disaster activities, highlighting the scientific and technical cooperation that sometimes takes place between the two countries. Although that co-operation is particularly for hurricane modeling and monitoring, other aspects of weather science are included as well. Glantz noted that this cooperation had little influence on the diplomacy between the two countries—and was perhaps successful because the science occurred below the

(See Disaster Diplomacy on page 9)

Perhaps Our Science Is Really Only as Good as Society's *Willingness* to Use It

A response to Weather and Society Watch's January editorial

by Ashley Coles*

In the January 2007 issue of *Weather and Society Watch*, William Hooke questions the ability of science to improve and protect societies around the world when many people remain incapable of using scientific advances as rapidly as they appear. He wonders, along with the International Council for Science (ICSU), ". . . why, despite advances in scientific understanding of the natural and social causes for disasters, disaster losses continue to mount" (Hooke 2007).

As Hooke points out, scientists do shoulder a great responsibility—to ensure that scientific advances actually benefit the public. Given that scientific research goals include benefits to humanity and that taxpayer dollars contribute enormously to that research, where does the science go wrong? Why do disasters continue to ravage communities around the world when we seem to know so much about how to predict or prevent them?

Perhaps our science is only as good as society's *willingness*—instead of *ability,* as Hooke suggests—to use it. Having the knowledge does not always mean using it well. In the United States, for example, our fear of tyrannical government has led to power restrictions at all levels of governance. Wolensky and Wolensky (1990) have dubbed ours a "custodial" style of governance, in which officials must refrain from imposing any structural or nonstructural hazard mitigations that might impinge on private or business interests. These mitigation strategies might include taxes, building codes, levees, laws, or any other effort to help protect life and property.

However, such strategies will never be fully implemented without support from the people these measures are intended to protect. And yet, once the disaster strikes, it becomes the government's responsibility to clean up the mess and compensate affected communities. This system leaves little room for using newly acquired science, and much of our tax revenue ends up paying for post-disaster relief instead of long-term vulnerability reduction.

In addition, vulnerability reduction tends to favor those who are least vulnerable to begin with. Again, it comes down to having the power to effect—or inhibit—change.

Vulnerability reduction tends to favor those who are least vulnerable to begin with.

Countless vulnerability assessments conducted around the world have shown that socioeconomic status is a key factor in determining how well people cope with and recover from a disaster. Other studies have shown that social structure and practices establish and reinforce inequalities that enhance vulnerability. Yet little is done to reduce these effects. Why?

Because those with the power and money to create these changes often do not wish to surrender any of that power and money.

Relative socioeconomic status, then, affects the distribution of new scientific knowledge and technology—and that leaves an enormous percentage of the world's population to deal with these theoretically solvable issues with little or no aid. The lack of *ability* to use the science therefore applies to only a part of humanity—those without the power to effect change—while the lack of *willingness* to use it applies to the rest of us.

So how do we win the approval and confidence of the public? I agree with Hooke's observation that much of the problem has historically been the deployment of a "guess-and-supply" model of service provision, with experts channeling money and research into trying to figure out how to sell the products they already make, rather than learning what the public truly needs or wants.

(See Willingness on page 8)

Thick ice coats a tree in San Antonio, Texas during a rare winter storm. (Photo by Ashley Coles)

From the Director

A Perspective on Better Integrating Atmospheric and Social Science

by Jeffrey K. Lazo*

For this issue, I had planned to write about the World Meteorological Organization conference on Secure and Sustainable Living: Social and Economic Benefits of Weather, Climate, and Water Services (held in Madrid, March 19–22; see http://www.wmo.ch/Madrid07). But, ironically, bad weather on the East Coast caused more than 1,400 flight cancellations, including mine, and I never made it to Madrid. Ah . . . the societal impacts of weather . . .

But a different topic came to mind when a colleague made a comment that gave me ample fodder for thought. While discussing an integrated atmospheric-societal impacts research program, this colleague said, in essence, "You guys [meaning social scientists] need to find the funding for research on societal impacts of weather and weather forecasting . . . but since the weather community generally is only willing to fund physical sciences, you need to find funding from social science sources."

As a social scientist, my visceral response was that social scientists must compete intensely for comparatively limited pots of money that must cover an enormous range of social issues and a diversity of social sciences. From this perceived state of the research funding world, my argument is that if the meteorology community needs and wants more societal impacts work, then the meteorology community must take a lead in finding money to generate involvement from social scientists.

Yes, a number of very important and socially relevant issues are related to hydrometeorological phenomena,

---

Table 1. FY 2003 Federal Obligations for Research in Atmospheric and Social Sciences, by Agency (dollars in thousands)

Cabinet-level agencies	Atmospheric sciences	Social sciences	Ratio*
Department of Agriculture	16,373	138,738	0.12
Department of Commerce (*includes NOAA/NWS*)†	161,158	10,825	14.89
Department of Defense	46,066	38,853	1.19
Department of Education	0	162,261	0.00
Department of Energy	119,065	0	n.a.‡
Department of Health and Human Services	0	302,494	0.00
Department of Housing and Urban Development	0	10,761	0.00
Department of the Interior	813	4,499	0.18
Department of Justice	0	45,418	0.00
Department of Labor	0	36,254	0.00
Department of State	0	2,265	0.00
Department of Transportation	32,274	11,399	2.83
Other agencies			
Agency for International Development	0	74,258	0.00
Appalachian Regional Commission	0	732	0.00
Environmental Protection Agency	66,697	4,498	14.83
Federal Communications Commission	0	2,948	0.00
Federal Trade Commission	0	2,280	0.00
National Aeronautics and Space Administration	613,037	587	1044.36
National Science Foundation	203,834	124,948	1.63
Smithsonian Institution	85	15,033	0.01
Social Security Administration	0	36,782	0.00
All agencies	**1,259,402**	**1,025,833**	**1.23**

*Of atmospheric to social sciences
†In the Department of Commerce, ALL of the social science funding shown here is allocated to the U.S. Census Bureau; none is allocated to NOAA or NWS.
‡ Not applicable.

Source: http://www.nsf.gov/statistics/nsf06313/tables.htm, accessed April 6, 2007.
Source for Atmospheric Sciences: TABLE 23. Federal obligations for research in environmental and physical sciences, by agency and detailed field: FY 2003
Source for Social Sciences: TABLE 25. Federal obligations for research in mathematics and computer sciences and in social sciences, by agency and detailed field: FY 2003.

including hurricanes, flooding, droughts, climate change, tornadoes, and heat waves, among others. Many of these are already topics of interest to social scientists—especially the natural hazards community—and some funding does exist for social science related to these phenomena. But social scientists are also focused on other very important and socially relevant issues such as poverty, crime, education, discrimination, immigration, and international relations. In these arenas, we must compete heavily for the limited social science research funding.

Although the data on funding sources are difficult to sort out, it appears, for instance, that NSF funding in FY 2003 for atmospheric sciences (not counting NSF funding for geological, ocean-ography, or environmental sciences) was about $204 million. On the other hand, FY 2003 NSF funding for ALL social science research was about $125 million.

Looking at research and development spending by the Federal government, agency by agency as shown in Table 1, one notices that agencies that do allocate research funds for social science research generally have little or no connection to atmospheric research. Looking at spending for the social sciences in agencies that do conduct atmospheric R&D, atmospheric science research outspends social science research by about 5 to 1.

A few examples of efforts to integrate physical and social science do exist. For example, the Human and Social Dynamics (HSD) priority area of NSF's Directorate for Social Behavioral & Economic Sciences (SBE) requires interdisciplinary research (HSD is not focused in any particular sense on atmospheric issues).

There are some atmospheric research efforts such as THORPEX (http://www.wmo.ch/thorpex/) and CASA (http://casa.ece.uprm.edu/) that explicitly include social sciences (although how much funding is really available for social science research in these programs remains to be seen). And I would be remiss in not mentioning that NOAA/USWRP does currently fund a significant portion of NCAR's SIP. Given this, I cannot think of any competitive long term funding for social science research directly integrated with atmospheric research efforts – if any readers are aware of such funding you are asked to let us know and that information will appear in the next issue of *Weather and Society Watch*.

On an interesting side note, someone pointed out to me that while much of the funding for atmospheric sciences is allocated for primary research, what the meteorological community really seems to want from social scientists is the development of applications. This in part reveals a misunderstanding of what the social sciences can bring to the weather enterprise. Academic social scientists are as interested in primary research questions and publishing in peer reviewed journals as atmospheric scientists are—in essence this is the type of research NSF is mandated to support. If applications are truly all that the meteorological community needs, then much of this work does not require social sciences but, instead, requires consultants and private sector firms for product development.

So what do "we" need from the weather community? First, the weather community needs to make stronger connections with the social science communities already doing work related to weather phenomena, particularly the natural hazards community. The AMS Policy Program and other activities within AMS—including the Societal Impacts Board and the Annual Partnership Topic on Hurricane Disasters: Building America's Resilience to Hurricane Disasters—are starting to do this with little or no funding.

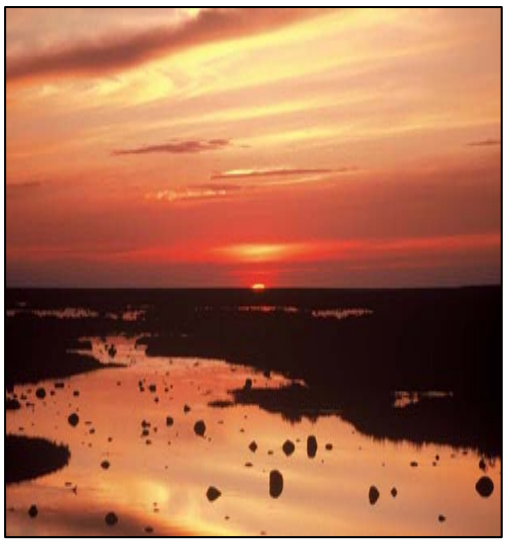
Second, the weather community, including the private sector, which ultimately relies heavily on the public sector, needs to make a strong and vocal case for funding for social science research on the weather forecasting system, including outlining the societal priorities for the scientific research. Although this may mean taking some of the money currently allocated for physical science research and allocating it to social science research, the investment can easily outweigh the costs because the social science research will ultimately help make the science relevant. This, in turn, will strengthen the demand for science and help justify the expenditures on pure and applied hydrometeorological research.

Finally, the weather community needs to stop talking *about* social scientists in terms of "you guys need to study this" and start talking *with* social scientists along the lines of "*we* need to solve this . . ." Otherwise calls for integrated hydrometeorological-societal impacts research will simply continue be lip service to a societally important effort.

*Jeff (lazo@ucar.edu) is the director of NCAR's SIP.

Symbiosis *(continued from page 11)*

[1] Committee on Estimating and Communicating Uncertainty in Weather and Climate Forecasts, Board on Atmospheric Sciences and Climate, Division on Earth and Life Studies, 2006. *Completing the Forecast: Characterizing and Communicating Uncertainty for Better Decisions Using Weather and Climate Forecasts.* Washington, DC: The National Academies Press.



The sun sets on a particularly brilliant evening over northern Manitoba (Photo by Ilan Kelman)

Weather Impacts Information: More Accessible Than You Think!

by Emily Laidlaw*

Have you ever wondered where to start as you began a project or tried to gather background information on a particular topic? Most of us have. But if your topic has anything to do with extreme weather events or organizations that respond to those events, you don't have to be stumped about where to begin. A versatile weather impacts database is more accessible than you think.

The Societal Aspects of Weather (SOCASP) Web site (http://www.sip.ucar.edu/socasp/) is SIP's database of Internet resources on weather impacts and organizations that respond to those impacts. SOCASP differs from the Extreme Weather Sourcebook in that it does not contain data sets. Instead, it presents a well-organized, easily accessible collection of weather impacts resources. For example, do you need a comprehensive list of organizations that collect hurricane data? Would it be helpful to find the Web sites for organizations that provide property and crop insurance and those that collect statistics on insured property and crops? Are you looking for a bibliography of weather-related publications? Whether you're a scientist, a policy maker, a student, a member of the media, or just curious about the weather, SOCASP has something to offer.

Over the next year, we'll be updating SOCASP—which was generously transferred to us by Roger Pielke, Jr. and his colleagues at the Center for Science and Technology Policy Research in August 2006—to add newer and more relevant resources, and your feedback on the site will be an invaluable part of that process. For example, which resources do you find useful? Which resources are irrelevant? What resources would you like to see added? Can you suggest design features that might make the site more useful? We want—and need—your opinions on these and other topics! Please send your thoughts to Emily Laidlaw at laidlaw@ucar.edu or visit the SOCASP feedback page at http://www.sip.ucar.edu/socasp/contact.jsp.

*Emily (laidlaw@ucar.edu) is an associate scientist with NCAR's SIP. To access our full collection of community information resources, please visit http://www.sip.ucar.edu/resources.jsp.

Willingness *(continued from page 5)*

Fortunately, many agencies are starting to shift in the latter direction. But regardless of whether hazard mitigators unilaterally implement a new technology or seek the public's approval first, uncertainty about how people will respond to the new knowledge abounds. Also, each new scientific product carries with it a brand new set of dangers that have yet to be experienced or even imagined, except through trial and error.

According to Perrow (1999), as society becomes more technologically advanced and complex, risks continue to escalate, even though many of the advances are actually designed to promote safety and control. Much of the work of the late Gilbert White displays this concept exceptionally well. For example, as we gain control over the flow of rivers through various structural advancements, people feel more confident about their safety and that of their homes, even if they're located in a floodplain (White, 1974).

Does this mean we should feel hopeless and pessimistic about the effectiveness of our research? Of course not! If we really listen to what people say, as Hooke suggests, we may observe an increase in society's willingness to accept new science. But this also means that some of us may have to forego certain luxuries, giving others the opportunity to avoid or deal with hazards on a level playing field. We must also attempt to reduce system complexity so that we don't create new risks that we'll need to solve later on.

Given these concerns, I agree with Hooke that communications, social science, policy, and politics offer the ultimate venues for vetting these issues so that we can reap the benefits of hazards research. To effectively protect against hazards, we must understand people's perceptions, as well as their discussions of risk and risk managers, and current and potential mitigation strategies. This crucial knowledge will give us insight into the types and levels of sacrifice that publics, researchers, and politicians are willing to make to ensure widespread safety from hazards.

*Ashley (coles@email.arizona.edu) is a graduate student in the Department of Geography and Regional Development at the University of Arizona. For more information on Ashley's research, visit http://www.ltrr.arizona.edu/~coles.

References

Hooke, W.H., 2007. Our science is only as good as society's ability to use it. *Weather and Society Watch,* **1**(2): 1, 8.

Perrow, C., 1999. *Normal Accidents: Living with High-Risk Technologies*. Princeton, NJ: Princeton University Press.

White, G.F., 1974. Natural hazards research: Concepts, methods, and policy implications. In *Natural Hazards: Local, National, Global*, edited by G.F. White. New York: Oxford University Press.

Wolensky, R.P., and K.C. Wolensky, 1990. Local government's problem with disaster management: A literature review and structural analysis. *Policy Studies Review,* **9**(4): 703–725.

diplomatic and political radar. Glantz also used a severe drought in 1998 in Cuba (the worst to hit the country under Fidel Castro's leadership) to illustrate the level of animosity between the two countries. Cuba asked for international assistance but refused any aid from the United States, arguing that the American trade embargo contributed to Cuba's need for assistance as much as the drought. Meanwhile, the U.S. government was in no rush to assist, considering that the disaster might destabilize Castro's regime. Yet the drought was one influence among many that led to a 2000 trade agreement between the two countries.

In November 2001, Hurricane Michelle became the worst hurricane to hit Cuba during Castro's reign. The U.S. government offered aid. Castro declined, asking to pay for the American supplies instead. The United States was averse to this arrangement. Diplomatic wrangling also took place over whether Cuban ships or U.S. ships should transport the goods. Although an agreement was eventually reached, it was based on the 2000 trade agreement meaning that Hurricane Michelle did not create new U.S.-Cuba cooperation but did affect previous initiatives.

Then in July 2005, Hurricane Dennis hit Cuba. The U.S. government offered aid. Cuba said thank you but declined, opting instead for Venezuelan assistance. An opportunity for Cuba–U.S. rapprochement appeared and Cuba snubbed it. In August–September 2005, Hurricane Katrina hit the United States. Cuba offered assistance, especially doctors and medical supplies. For several days, the U.S. State Department did not acknowledge the offer. Then, the offer was acknowledged but not accepted. An opportunity for U.S.–Cuba rapprochement appeared and the United States snubbed it by not accepting Cuba's offer of assistance. Finally, in October 2005, Hurricane Wilma hit Cuba. The U.S. government offered aid. Cuba said yes, and then attached conditions and the aid offer was withdrawn. Yet U.S. supplies reached Cuba in response to Wilma, but again as part of the 2000 trade agreement, again illustrating that disaster-related activities can build on already-existing connections, but rarely create new rapprochement.

Why have Cuba and the U.S. found it so difficult to come closer together? The answer is the basic politics of power in that the enmity further bolsters the power base of Castro and of many anti-Castro politicians in the United States. The diplomatic dancing around weather-related activities—punctuated by non-weather events such as 9/11 and the Elían González affair—reflects the fact that neither government wants long-term reconciliation because that would harm their political interests. For hurricane disasters, that means that either country accepting post-hurricane aid from its (perceived) enemy could be interpreted as a loss of face and victory for the other side. Thus, political self-interest can supersede humanitarian imperatives.

Absence of evidence, however, is not evidence of absence. A successful example of new Cuba–U.S. diplomacy based solely on disaster-related activities may yet emerge as we research history or observe future events. However unsuccessful disaster diplomacy appears to be for Cuba and the United States presently, anything can happen with the mixture of people, politics, and weather. The same applies to all other case studies around the world. No proof has yet been found for new and lasting diplomacy based only on disaster-related activities. Yet it could happen. And then maybe headlines such as "Peace From the Ruins" and "Disaster Mitigation Averts War" might become reality.

*Ilan (ilan@ucar.edu) is a postdoctoral fellow through NCAR's Advanced Study Program, working with the Center for Capacity Building. For more information on Ilan's research, please visit http://www.ilankelman.org.

Cloud cover creates a vivid sunset near Boulder, Colo. (Photo by Emily Laidlaw)

Conferences & Announcements

7th Annual Meeting of the European Meteorological Society (EMS) & 8th European Conference on Applications of Meteorology (ECAM)

Date: October 1-5, 2007
Location: Madrid
Abstract Deadline: May 25, 2007

EMS will address a wide spectrum of scientific and application topics in atmospheric sciences, while ECAM will focus on the application of meteorology for society, providing a platform where the meteorological community can exchange their ideas, results, needs, and demands, as well as present and future aims. For more information on registration, accommodation, travel routes, visa requirements, social events and exhibition opportunities, please visit http://meetings.copernicus.org/ems2007

(See Conferences on page 10)

Conferences *(continued from page 9)*

Australasian Natural Hazards Management Conference 2007: From Warnings to Response and Recovery

Date: July 2-3, 2007, with optional workshops on July 1 & 4
Location: Brisbane
Who Should Attend: Emergency managers, planners, risk assessors, asset and utility managers, natural hazards researchers and scientists

The conference will provide a forum to discuss the integration of hazard information with effective risk management, focusing on a variety of topics including applying hazard information to best practice planning; developing effective warning systems; improved response and recovery from events; and creating resilient communities by integrating science into practice. For more information, please visit http://www.hazards-education.org/ahm07.

3rd National Surface Transportation Weather Symposium

Date: June 19-21, 2007 (Subject to change; Please check Web site for more information.)
Location: Washington, D.C.
Organizer: Office of the Federal Coordinator for Meteorology (OFCM)

The conference will focus on the theme of **"**Improving Commerce and Reducing Deaths/Injuries through Innovative, Weather-Related R&D and Applications for the Surface Transportation System." For more information, please visit http://www.ofcm.gov/wist/wist.htm.

Regional Plan Association's 17th Annual Regional Assembly: A Bright and Green Future

Date: May 4, 2007
Location: Waldorf Astoria Hotel, New York, NY

The Assembly will focus on climate change, energy and growth in the tri-state metropolitan region. Planned keynote speakers include New York City Mayor Michael Bloomberg and New Jersey Governor Jon Corzine. A downloadable program and registration form is available at www.rpa.org.

Dissertation Initiative for the Advancement of Climate Change Research (DISCCRS): Interdisciplinary, Early-Career Symposium on Climate Change and Impacts

Date: Sept. 10-17, 2007
Location: Hawai'i Island
Who Should Apply: Applicants who have completed their Ph.D. requirements between April 1, 2004 and March 31, 2007 in any discipline related to climate change and impacts.
Application Deadline: April 30, 2007

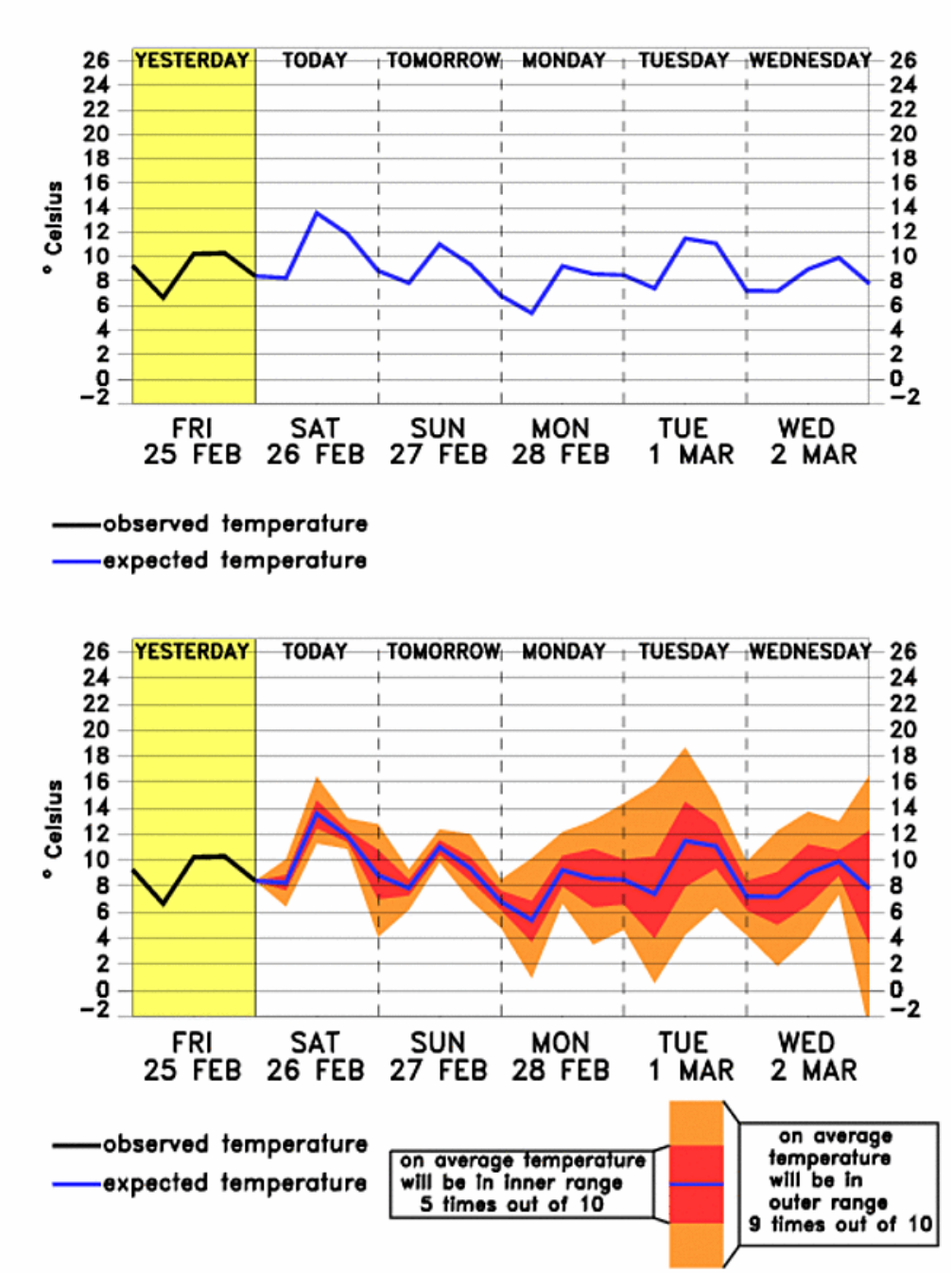
Airfare, room and board for the symposium will be fully paid for 36 selected candidates. Social scientists are especially encouraged to apply. Symposium participants will provide oral and poster presentations in plenary format, hone interdisciplinary communication and team skills, and discuss emerging research and societal and professional issues. For more information, please visit http://www.disccrs.org/disccrsposter2007.pdf or contact disccrs@whitman.edu.

Announcing GREENHOUSE 2007; Program committee now calling for abstracts

Date: October 2-5, 2007
Location: Sydney Hilton
Abstract Deadline: June 15, 2007
GREENHOUSE 2007 will present an opportunity for scientists and representatives from industry and all levels of government to hear the latest findings in climate science and discuss the implications for Australia and the region. The conference will focus on projections for the future; the use of probabilities for risk management; the impact climate change will have on human activity; and changing perceptions of climate change.
For additional information or to register, please visit www.greenhouse2007.com.

Testing User Understanding (continued from page 2)

Figure 1. An Example of the Forecast Formats Presented to Experiment Participants



Notes: Group A was given the format in the top panel; group B received the format in the lower panel, which includes uncertainty information. Both groups were then given the choice of receiving £0.50 ($0.99) if either (a) the temperature at midday on Sunday is above 10ºC or (b) the temperature at midday on Tuesday is above 10ºC. A participant with the uncertainty information given in the lower panel can work out that option (a) is more likely to occur than option (b). A participant without the uncertainty information must make an assumption about forecast uncertainty to decide which option is more likely.

*Met Office, FitzRoy Road, Exeter, Devon, EX1 3PB, United Kingdom; mark.roulston@metoffice.gov.uk

**School of Business and Economics, University of Exeter, Streatham Court, Rennes Drive, Exeter, EX4 4PU, United Kingdom; t.r.kaplan@exeter.ac.uk

Symbiosis (continued from page 1)

Although this finding specifically identifies NOAA (the agency that sponsored the report), it clearly applies more broadly across the enterprise, not just to uncertainty but to all product dimensions—and this is where NCAR's SIP can significantly benefit the Weather Enterprise. Although it will be quite a challenge, SIP can take a leadership role in moving our community from a physical-science-centric perspective to one that enfranchises societal needs at the very onset of product development. Clearly, this will require changing legacy attitudes and processes that have grown deep roots in many parts of our community.

Change is rarely comfortable. And the significant cultural change needed in this case won't be easy and certainly won't take place overnight. But the good news is that the process has started. SIP is gaining momentum. The Weather Enterprise must ensure that this momentum continues to build and, as a member of the SIP Advisory Board, I'll certainly do all I can to keep the ball rolling in the right direction.

*Raymond (rban@weather.com) is the executive vice president for meteorology science and strategy at The Weather Channel.

(For reference, see Symbiosis on page 7)

Your Feedback

We want your feedback on what you'd like to see more—or less—of in *Weather and Society Watch*! For instance, would you like to see announcements purely related to weather events or would you also like to know about climate events, such as the ones we have included on page 10 of this edition? Would you like to see more articles on bridging the gap between weather and climate research? Whatever your view, we can only make *Weather and Society Watch* your newsletter if we know *your* thoughts! Please send your thoughts on these and other topics to laidlaw@ucar.edu.

About *Weather and Society Watch*

Weather and Society Watch is published quarterly by the Societal Impacts Program (SIP) at the National Center for Atmospheric Research (NCAR). The University Corporation for Atmospheric Research (UCAR) operates NCAR with support from the National Science Foundation and other sponsors.

The purpose of *Weather and Society Watch* is to provide a forum for those interested in the societal impacts of weather and weather forecasting to discuss and debate relevant issues, ask questions, and stimulate perspective. The newsletter is intended to serve as a vehicle for building a stronger, more informed societal impacts community.

Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of NSF or other sponsors. Contributions to *Weather and Society Watch* are subject to technical editing at the discretion of SIP staff.

Weather and Society Watch is available on the World Wide Web at: http://www.sip.ucar.edu/news/. Archives of WeatherZine, a previous weather impacts newsletter upon which *Weather and Society Watch* was modeled, are available on the Web at http://sciencepolicy.colorado.edu/zine/archives/.

Contact Us

For additional information or to submit ideas for a news item, please contact:

SIP Director: Jeff Lazo (lazo@ucar.edu)
SIP Associate Scientist: Emily Laidlaw (laidlaw@ucar.edu)

To send mail about Weather and Society Watch, please write to:

Jeff Lazo
Societal Impacts Program
National Center for Atmospheric Research
P.O. Box 3000
Boulder, CO 80307

About SIP

All aspects of the U.S. public sector, along with the nation's economy, are directly and indirectly affected by weather. Although the economic impacts of weather and weather information on U.S. economic agents have been loosely documented over the years, no definitive assessments have been performed, and information generated from the previous studies is difficult to locate and synthesize.

SIP, initiated in 2004 and funded by NOAA's U.S. Weather Research Program (USWRP) and NCAR, aims to improve the societal gains from weather forecasting. SIP researchers work to infuse social science and economic research, methods and capabilities into the planning, execution and analysis of weather information, applications, and research directions. SIP serves as a focal point for developing and supporting a closer relationship between researchers, operational forecasters, relevant end users, and social scientists concerned with the impacts of weather and weather information on society. Program activities include primary research, outreach and education, and development and support for the weather impacts community.

For more general information on SIP, contact Jeff Lazo at lazo@ucar.edu or http://www.sip.ucar.edu.