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The Christchurch earthquake's hidden secrets

An invited comment
by Erol Kalkan

The catastrophic Christchurch earthquake is a strong reminder to engineers and scientists of the hazards pose by fault lines, both mapped and unknown, near major cities. In February 2011, the relatively moderate earthquake that struck the cities of Christchurch and Lyttleton in the Canterbury region of New Zealand's South Island surprised many with its destructive power. The magnitude 6.2 temblor killed 181 people,118 of whom were killed in the collapse of a single building in the city center. The quake damaged or destroyed more than 100,000 buildings.

It was the deadliest quake to strike the nation in 80 years—since the 1931 earthquake that struck the Napier and Hastings area of the North Island. The Christchurch quake was part of the aftershock sequence following the September 2010 magnitude 7.1 earthquake near Darfield, 40 kilometers west of the city. The Darfield earthquake was in a sparsely populated area, causing no loss of life. By contrast, the Christchurch earthquake was generated on a fault in close proximity to the city.

(Please see Christchurch, page twelve)

Take it to the (carbon) limit

Carbon emissions drop little in slow economy

The global recession may have hurt employment in 2009, but it didn't slow the release of carbon dioxide from fossil fuel burning very much. According to a report from the University of East Anglia published in *Nature Geoscience* on November 21, 2011, carbon dioxide emissions continued to grow and were only 1.3 percent lower than the 2008 record figures—less than half the drop predicted a year ago.

The average growth rate was 1.6 parts per million in 2009, which is below the 2000-2008 average of 1.9 ppm per year. But it was considerably higher than experts had expected during the global recession. Professor Pierre Friedlingstein, lead author of the research, said, "The 2009 drop in CO_2 emissions is less than half that anticipated a year ago. This is because the drop in world gross domestic product was less than anticipated and the carbon intensity of world GDP, which is the amount of CO_2 released per unit of GDP, improved by only 0.7 per cent in 2009—well below its long-term average of 1.7 percent per year." Friedlingstein said that when 2010's emissions are calculated, it may well be the highest emissions ever.

At the end of 2009, the atmospheric concentration of carbon dioxide had reached 387 ppm, the highest in the last two million years, according to the **Global Carbon Project** (see related story, **page five**).

The Copenhagen and Cancun targets for global temperature change were to stay below a global average temperature increase of two degrees Celsius. A report in *Nature Climate Change* finds that this requires limiting greenhouse gas emissions to 44 billion tons of carbon dioxide equivalent by 2020, a goal which is slipping out of reach. The world is currently on pace to emit 48 billion tons of carbon dioxide equivalent.

However, all is not lost. "Our study revealed there are many emissions scenarios that are economically and technologically feasible pathways to a two degree target, but that for countries to get closer to this target they need to honor the higher end of their pledges," said Malte Meinshausen from the University of Melbourne's School of Earth Sciences.

But the world must do more this decade, he said. "Our study confirms that only by moving to the more ambitious end of the pledges … the world would be getting closer to being on track to the 44 [billion ton], two degree milestone," he said. "If the international community is serious about avoiding dangerous climate change, countries seem ill-advised by continuing to increase emissions, which they have done so in the last ten years, which ultimately will lead to disastrous consequences later on."

They Said It ...

"Pretty much everything here is a good way to get sick. It'll definitely thin the herd."—**Salvatore Cipolla, 23, from Long Island, on the crowded conditions at Occupy Wall Street, quoted in the November 10, 2011** New York Times.

"Investments in climate change mitigation at the local, state and national levels, married with analyses of the climate change health costs to inform this strategic planning, will save billions of dollars in health costs and save lives."—**Kim Knowlton, senior scientist for the Natural Resources Defense Council, quoted in a Columbia University Mailman School of Public Health** news release.

"If we don't do that, we could be going into a situation of war—war for food, war for space."—**Nteranya Sanginga, director-general designate of the International Institute of Tropical Agriculture, on the need for agricultural research in Central Africa, quoted in** IRIN.

"This is Asia's largest-ever distribution of mosquito nets. It will cover over 4,000 villages in 20 provinces in Cambodia." he goal is to ensure that every person at risk of contracting malaria has a mosquito net by the end of the year."—**Steven Bjorge, malaria team leader at The World Health Organization Cambodia, quoted by** IRIN.

PPD-8 seeks a national emergency management policy

Keywords: 'National,' not just federal

The potential effect of the implementation of Presidential Policy Directive 8: National Preparedness (PPD-8) "could significantly influence the daily operations and priorities of homeland security officials, emergency managers, and first responder at the federal, state, and local government level," according to a report from the Congressional Research Service."Further, PPD-8 policies may impact federal assistance and grant allocation decisions, guide the federal and nonfederal efforts to build homeland security and emergency management capabilities, and establish a national baseline for hazard preparedness. In future years, PPD-8 policies may also influence the Administration's budget requests and priorities," the report, *Presidential Policy Directive 8 and the National Preparedness System: Background and Issues for Congress*, says.

PPD-8 is a very general policy guide issued by President Barack Obama on March 30, 2011 to set policies to "prevent, protect against, mitigate the effects of, respond to, and recover from those threats that pose the greatest risk to the security of the nation." Terrorism is the first threat on the list, but also included are natural disasters, pandemics, and man-made hazards.

But the devil, as we're so often reminded, is in the details. The goal of the PPD-8 policies is to set national preparedness policy, as opposed to simply setting a federal policy. That is, the emerging national policy will attempt to address and coordinate federal, state, local, tribal, and other government entities to deal with national preparedness.

This policy development process is not very far along, really, at least as outlined in the CRS report. The next major deadline is March 30, 2012. At that time, the schedule calls for release of a "national preparedness report," a sort of status report on the progress made toward the goals. Then on June 30, "national planning frameworks covering prevention, protection, and mitigation are due. Frameworks for response and recovery were completed in January 2008 and September 20111, respectively. Then in September 2011, detailed interagency operations plans should be done.

An interested aspect of this planning is going to be how much it will be influenced by the economic downturn and political budget crises that continue to arise like whack-a-moles. The CRS report says that Congress "may wish to assess, along with the administration, the total budgetary implications of the 'preparedness enterprise' developed by PPD-8. "For example, the establishment of multiple new National Planning Frameworks may bestow additional, and currently unfunded, responsibilities on federal agencies to prepare for and coordinate capabilities in the different mission areas. More holistically, if the standard for preparedness is based in part on the meta-scenario described in the draft National Preparedness Goal, Congress may wish to evaluate whether existing appropriated resources are sufficient to meet the challenge of the consequences described in the catastrophic scenario," the CRS report says.

2011 Atlantic hurricane season sees 19 named storms

Worst U.S. Northeast flooding in 80 years

The 2011 Atlantic hurricane season produced 19 tropical storms, of which seven became hurricanes, three of them major ones. The 19 tropical storms are the third-highest number since records began in 1851, outpaced only by 1887, 1995 and 2010, according to the U.S. National Oceanic and Atmospheric Administration.

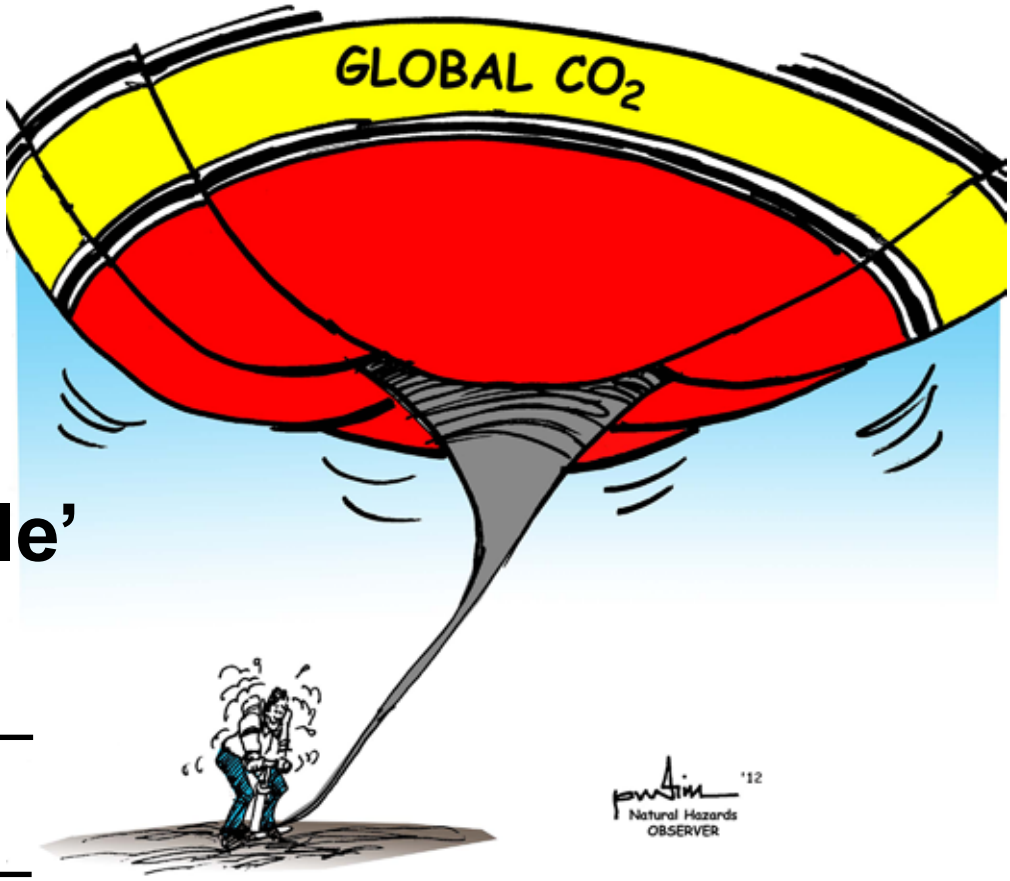
But while tropical storm numbers were high, the number of hurricanes and major hurricanes "is only slightly above the average of six and two, respectively," NOAA says

Assessing these figures, Ricardo Alvarez, a private consultant and research associate at Florida Atlantic University, says that in terms of damages, the 2011 Atlantic hurricane season "clearly ranks way above avaerage based on a death toll that included at least eleven in New Jersey and six Vermont, more than $7.0 billion in damages and the worst flooding seen in the U.S. Northeast in more than 80 years." The damage occurred from Hurricane Irene, which hit the expensive, highly developed real estate around New York and New Jersey, along with causing much damage along the East Coast.

Alvarez notes, however, that worldwide tropical cyclone activity was 17 percent below average. Alvarez writes, "While two consecutive years of below-average tropical cyclone activity on a global basis do not signify a trend one cannot, but ask if this might not be a signal from Nature telling us that the threshold for cyclogenesis has shifted to a higher level, in response to global warming? In my opinion the multi-decadal cycle of increased cyclogenesis in the Atlantic is masking this possible shift in the threshold for tropical cyclone generation in this basin, while elsewhere in the world we continue to see fewer storms. Certainly food for thought and an important area for research exists relative to tropical cyclone activity on a global basis, and how this is being affected by global warming or others aspects of global climate change."

"Although the 2011 hurricane season has ended, our need to prepare for disasters hasn't," said Craig Fugate, administrator of the Federal Emergency Management Agency in a NOAA release. "Being prepared for all kinds of hazards—from hurricanes to blizzards to tornadoes—is a year-round activity."

Rising carbon creating 'unstoppable' effects



But 'climate sensitivity' may be less than earlier believed

The biggest story the mainstream news media is ignoring this cycle is the revival of the rise of carbon dioxide emissions in the atmosphere, even in the face of falling economic prospects. The growth rate of carbon emissions in 2010 was 2.36 parts per million, "one of the largest growth rates in the past decade," according to a report from the Global Carbon Project released in early December 2011 (see related story, page two).

The average increases for the decade 2000-2009 was 1.9 ppm per year. For 1990-1999, it was 1.5 ppm annually, and for 19880-1989 it was 1.6 ppm per year. The concentration of carbon dioxide in the atmosphere is now 389.6 ppm, 39 percent higher than at the beginning of the Industrial Revolution. CO2 concentrations were about 278 ppm in 1750. Current atmospheric carbon concentration are the highest they've been in the last 800,000 years.

Most of the increase in carbon emissions results from the burning of fossil fuels, especially coal. Fossil fuel emission were the highest in human history in 2010, 49 percent above the Kyoto reference year, 1990. Research by other scientists indicates that even in "best case scenarios," rising carbon dioxide emissions will cause "unstoppable effects" to the climate for the next 1,000 years, including a collapse of the West Antarctic ice sheet by the year 3000, and an eventual rise in sea level of a minimum of four meters.

The National Oceanic and Atmospheric Administration's report State of the Climate in 2010 paints a picture that is broadly consistent with this news. The decrease in snow cover from December to May in the northern hemisphere was the largest in more than 40 years. Greenland's glaciers lost more mass in 2010 than in any other year on record. Global average land surface air temperatures were second warmest on record. The Arctic warmed at about twice the rate of lower elevations. Arctic sea ice was the third lowest extent on record.

But the news on the climate front is not all bad. "Climate sensitivity" is a climatologist's tool to measure how much temperature change can be expected from a doubling of carbon dioxide in the atmosphere. Previous studies have indicated that climate sensitivity is three degrees Kelvin for a doubling of CO2. But a November 2011 paper in Sciencexpress indicates that the impact may be lower, 2.3 degrees K, and within a narrower uncertainty range.

The paper, by Andreas Schmittner of Oregon State University and colleagues, implies a "lower probability of imminent extreme climate change than previously thought." If correct, it could provide a little more time to reduce emissions and reduce the overall impact.

But not everyone is convinced it is correct. The group of scientists at RealClimate.org write that this new estimate of climate sensitivity is well within the range calculated in the reports of the Intergovernmental Panel on Climate Change. In addition, the lower estimate would provide only about 11 years of breathing space to deal with emissions.

Recent research indicates that even with lower climate sensitivity, emissions reductions must begin to occur within two decades is warming relative to pre-industrial temperatures is to be kept below 2 degrees Celsius.

Ecosystem valuation

Invisible losses

Asia lost 25 percent of the area covered by mangroves between 1980 and 2005. North and Central America lost 23 percent of its mangroves over the same period, Africa 14 percent. Around the world, the area covered by mangroves has declined 19 percent, from 18.8 million hectares (46.4 million acres) in 1980 to 15.2 million hectares (37.6 million acres) in 2005, according to a World Bank report titled *Economics of Adaptation to Climate Change—Ecosystem Services*.

The value of "ecosystem services" has emerged as an analytical tool for evaluating goods and services that the environment provides to humanity more or less for free. Mangroves, for instance, provide protection from storms by reducing water flow and absorbing wave energy. The World Bank says, "The importance of mangroves was demonstrated by the Asian tsunami in 2004. Coastal areas with good mangrove forests suffered far less damage and loss of life than adjacent areas without mangroves." One analysis values of mangroves at $400 per hectare.

The World Bank report finds that around the world, mangroves at risk of destruction currently protect or provide a livelihood for 175 million people at an economic value of $418 billion a year.

These figures are, of course, subject to dispute. There are a lot people—like resort developers and shrimp farmers—who think that the absence of mangroves is more valuable than their presence.

Attempts to value the natural environment's economic contribution to human well-being are fairly recent and subject to wide variations. In a 2002 paper in the journal *Ecological Economics*, Robert Costanza, head of the Gund Institute for Ecological Economics at the University of Vermont, an colleagues calculated the value of ecosystem services globally to be about $2.084 trillion annually.

A clear and well-known example of this evaluation method is the upstate New York Catskill/Delaware watershed. The system of relatively undisturbed land provides 1.4 billion gallons of clean water to New York City residents every day. In order to keep its water clean, the city was faced with a choice: spend $6 billion in construction plus $300 million a year for a water filtration plant; or protect the existing ecosystem that does the same work for them. The latter alternative would cost about $750 million over ten years. The environment in this case was worth about $6 billion in taxes or water use fees that New Yorkers don't have to pay—about $320 per resident.

"It was pointed out that the problems arose from a relatively few farmers," Nobel Prize economist Kenneth Arrow said in an interview in the Izaak Walton League's magazine a few years ago, "and it was cheaper—much cheaper—to buy them out and add their farms to the natural ecosystem than to build a very expensive purification plant.

"That was a clear cut case where the value of the ecological services was the avoidance of a very large cost," Arrow

said. "But it's not easy to find examples that are that simple, by the way."

Attempts to evaluate the services provided by ecosystems vary. The National Oceanic and Atmospheric Administration recently asked U.S. residents how much they'd be willing to pay to protect Hawaii's coral reefs. They were answered with a value for the reefs of $33.57 billion a year. A British report, the National Ecosystem Assessment, found that the health benefits of living close to open space can be calculated at about $470 per person per year.

The issue of the ecosystem values to human health is getting increased attention. A study last year in *Nature* by Felicia Keesing of Bard College and colleagues found that preserving biodiversity reduces the prevalence of infectious diseases.

A co-author, Drew Harvell of Cornell University, said, "As buffering species disappear, rates of disease spread can accelerate." Intact ecosystems can provide a larger pool of pathogens, but biodiversity loss frequently increases the rate of disease transmission. The authors cite the case of Lyme disease, which can be transmitted to human by ticks carried by white-footed mice. In intact communities with opossums, the ticks attack the opossums. But the ticks don't survive on the opossums, so it reduces the rate of transmission.

There is, however, a considerable paradox involved in these discussions about ecosystems: As ecological degradation has accelerated, human well-being has increased. In a September 2010 paper in BioScience, Ciara Raudsepp-Hearne and colleagues write, "The Millennium Ecosystem Assessment paradoxically found that human well-being has increased despite large global declines in most ecosystem services."

The authors consider four possible explanations for the paradox. First, it's possible that human well-being is not being measured properly. The Human Development Index measures life expectancy, literacy, educational attainment, and per capita GDP. This scale has shown improvements, especially in GDP per capita, childhood survival rates, and education. Furthermore, there appears to be a correlation between rising HDI values and happiness. So the authors conclude that human well-being is being measured using the right values.

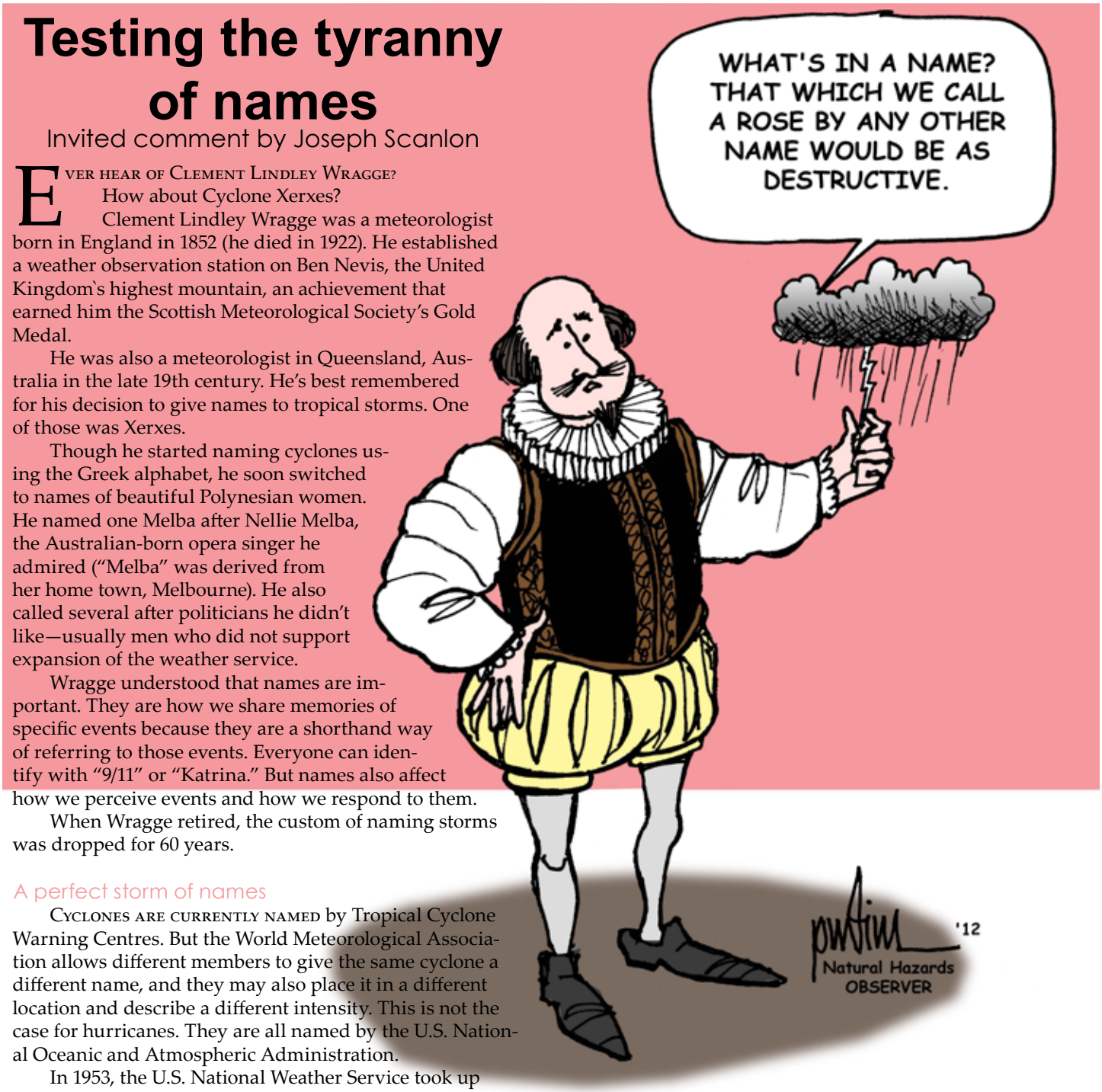
A second hypothesis to explain the paradox is that food production is more crucial than other ecosystem services. Food production is improving, child malnutrition has declined in the Green Revolution, and food production has generally kept pace with population growth. The authors found "available evidence suggests that the benefits of food production currently outweigh the costs of declines in other ecosystem services at the global scale, and that this is a strong contributing factor to the environmentalist's paradox."

A third possible explanation is that technology and social innovation has "decoupled human well-being from ecosystem degradation." And a fourth is that there is a time lag between ecosystem service degradation and deleterious impacts on human welfare. The report rejected the third hypothesis and found mixed evidence for the fourth.

Valuing ecosystem services has been an active area of academic pursuit, but has so far not made much of an impact in the policy arena. One of the pioneers of ecosystem valuation, Stanford's Gretchen Daily, has founded the Natural Capital Project, one of whose goals is to increase the visibility of this type of analysis on policy. Ecosystem valuation may become an important factor in evaluating holistic approaches to climate change adaptation.

Testing the tyranny of names

Invited comment by Joseph Scanlon



Ever hear of Clement Lindley Wragge? How about Cyclone Xerxes?

Clement Lindley Wragge was a meteorologist born in England in 1852 (he died in 1922). He established a weather observation station on Ben Nevis, the United Kingdom's highest mountain, an achievement that earned him the Scottish Meteorological Society's Gold Medal.

He was also a meteorologist in Queensland, Australia in the late 19th century. He's best remembered for his decision to give names to tropical storms. One of those was Xerxes.

Though he started naming cyclones using the Greek alphabet, he soon switched to names of beautiful Polynesian women. He named one Melba after Nellie Melba, the Australian-born opera singer he admired ("Melba" was derived from her home town, Melbourne). He also called several after politicians he didn't like—usually men who did not support expansion of the weather service.

Wragge understood that names are important. They are how we share memories of specific events because they are a shorthand way of referring to those events. Everyone can identify with "9/11" or "Katrina." But names also affect how we perceive events and how we respond to them.

When Wragge retired, the custom of naming storms was dropped for 60 years.

A perfect storm of names

Cyclones are currently named by Tropical Cyclone Warning Centres. But the World Meteorological Association allows different members to give the same cyclone a different name, and they may also place it in a different location and describe a different intensity. This is not the case for hurricanes. They are all named by the U.S. National Oceanic and Atmospheric Administration.

In 1953, the U.S. National Weather Service took up where Wragge left off, giving hurricanes women's names. Since 1979, however, they have alternated between female and male. Cyclone Tracy, which devastated Darwin, Australia on Christmas Day, 1974, was female. Hurricane Andrew, which struck Florida in 1992, was male. Hurricane Katrina, which battered the Gulf Coast in 2005, was female. Names of especially ferocious storms are not re-used. There will not be another Katrina.

I'm sorry to report that there's never been a Hurricane Joseph, although there was a Josephine in 1984. The name is scheduled for reuse in 2014.

The origin of the practice of naming non-weather disasters is less clear.

Every American knows the meaning of 9/11. The terrorist airplane hijackings and attacks in New York and Washington took place on the ninth month (September) and the eleventh day of that month, thus 9/11. The association was enhanced by the fact 9-1-1 is the number Americans call in an emergency.

That reference is lost on most of the rest of the world. In Britain, the 11th day of September would be 11/9 and the British dial 9-9-9 not 9-1-1 in an emergency.

However when terrorists attacked three trains on London Underground and one London bus in July, 2005, the British copied American usage, labeling the incidents "7/7" since they happened on July 7th, the seventh day of the seventh month. The fact that the number seven designated both day and month eliminated any confusion from differing UK and U.S. usage.

While the meaning of 9/11 is clear—at least to Americans—its origins are not. Even though 9/11 was chosen as "word of the year" by the American Dialect Society in 2001

(29 of 55 votes cast) it did not come into common usage until 2004 according to Geoffrey Nunberg, a linguist at University of California Berkeley School of Information and author of The Years of Talking Dangerously, an analysis of words and phrases popularized during the George Bush administration (Nunberg 2009).

Ground Zero

Though the origins of 9/11 are murky, the origins of "Ground Zero" are not.

The name started out life as "point zero," designating the site of the first atomic bomb test, though other accounts from eyewitnesses simply referred to "zero." Kevin Dougherty of Stars and Stripes (Dougherty 2001) wrote that "Ground Zero" was first used in an article in the New York Times in 1946 and used in a general way. The term morphed into a general term for the site of an atomic bomb explosion. Regarding the 2001 Manhattan terrorist attacks, Jim Axelrod of CBS used it at 7:47 p. m. on 9/11 and Rehema Ellis of NBC used it at almost exactly the same time. Axelrod apparently heard others using it, because he said, "Ground Zero, as it's being described." Ellis used it as a factual description. "We're just a block away from the World Trade Center," she reported, "and the closer we get to 'ground zero' the harder it is to breathe and see."

Ground Zero is also book title about the December 6, 1917, Halifax explosion, which occurred when the Mont Blanc, a French ship carrying munitions, exploded in the Halifax harbor with one-seventh the power of the first atomic bomb. It left one-fifth of the town's population injured or dead. The book was published in 1994, long before the term became linked with the September 11 attacks (Ruffman and Howell 1994).

In his blog on "The linguistic impact of '9/11' is 9/11," Dennis Baron concluded most phrases around the terrorist attack on September 11th, 2001, like "war on terror," and "weapons of mass destruction" are no longer in regular use, but 9/11 has stuck (Baron 2011). He suggests one reason 9/11 caught on is that Americans often refer to the convenience store 7-Eleven.

9/11 has become part of the language, 7/7 less so, but both are understood. We also recognize the Great Chicago Fire of 1871 and the San Francisco Earthquake of 1906 (though the latter was first known as the San Francisco fire). And it only takes one word—"Challenger"—for most of us to recall what happened on January 28, 1986, when the space shuttle of that name disintegrated shortly after take-off, killing the seven people on board, including a teacher, Christa McAuliffe.

Because there have been so many movies, books, songs, and articles, the single word Titanic is enough for us to recall the ship that hit an iceberg during its first voyage 100 years ago, though we may not know many details—like the fact that most first class passengers survived and most lower class and steerage passengers did not.

The first time

Some events are so dramatic that we can recall precisely how we first heard of them. That was true for 9/11, it was true

for Challenger, it was true for the Kennedy assassination, and it was true for an earlier generation of Americans for the December 7, 1941 Japanese attack on Pearl Harbor. It was also true for the 1917 Halifax explosion. Like most people, I can remember how I first learned that an aircraft had hit the World Trade Center, how I learned about Challenger, who called my home to tell us that Kennedy had been shot.

I can also recall what I was doing when Franklin Delano Roosevelt died but I don't recall Pearl Harbor. By the time it occurred, Canada had been at war for more than two years and my father had long since gone overseas. I also know that when we interviewed persons who were alive on December 6, 1917 when the Mont Blanc exploded in Halifax harbor, even 60 years later they all recalled exactly how and what they heard. Although the explosion occurred before radio was widespread—let alone television—news of it spread through Nova Scotia by railway telegraph, party line telephone, and word-of-mouth as fast as news of the Kennedy assassination nearly half a century later. One woman told us she "just happened" to be eavesdropping on the party line telephone when she heard what happened.

But some of what we "know" or think we know is legend. Until I started researching this article I was not aware that a reporter for a Chicago newspaper made up the story that the Great Chicago Fire was started by Catherine O'Leary's cow.

Generic labels

Occasionally an incident has so much impact that the name can be generic. For example, though ice storms are not uncommon in eastern Canada they usually have minimal impact. But in January 1998, one was so severe and lasted such a long time that it forced 65 Ontario communities to declare a state of emergency all at the same time. It also virtually shut down Montreal and communities south of that city. It is known as the ice storm. No further designation is necessary.

While memories of the 1998 ice storm remain, some storms are forgotten because their impact was not great enough to make them memorable. However, no one living along the Gulf Coast will forget Katrina. And no one in the Toronto area old enough to remember will forget Hazel, which dumped so much water around Toronto in mid-October, 1954 (11.23 inches of rain in 48 hours) that it left 81 dead, more than 4,000 homeless and swept away an entire street. (I can still remember the name of that street, Raymore Drive.) Of course, a hurricane can trigger different memories for different people. New Yorkers will remember Hurricane Irene not for its impact but because of the decision of authorities in New York City to take extensive precautions because of its potential impact.

While cyclones and hurricanes are officially named, names of other natural event are tied to a location or created by the media. These descriptors are not always accurate.

Tornados are usually named for the community with the most severe impact. Thus in Canada we have the 1912 Regina tornado and the 1987 Edmonton tornado. The United States has the June 8, 1953 Flint-Beecher tornado, also known as the Flint and/or Beecher tornado since it hit the Beecher community in Flint, Michigan. This is still the deadliest tornado in Michigan's history. It killed 116 people and injured 844.

It`s not just natural events that lead to variations in names. Michael Lindell pointed out that in the American Civil War, Southerners named battles for the nearest town. Northerners named them for the nearest geographical feature. Thus, the Battle of Sharpsburg and the Battle of Antietam refer to the same event.

Sometimes names describe a broader area and time period but are widely adopted, for example, the 1993 Midwest floods.

Names and perception

Names may determine how an event is perceived.

In November 1979, a freight train carrying chlorine, caustic soda, styrene, toluene, and propane derailed at a level crossing road in Mississauga, Ontario, just west of Toronto. As firefighters tried to deal with the chemical leaks and fires—chlorine gas spewed out of the wreck and several propane cars exploded—Peel Regional Police Force started evacuating the area, an evacuation that eventually affected 217,000 residents. The incident became known not as the Mississauga train derailment or Mississauga chemical spill but as the Mississauga evacuation. Media attention didn't focus on the fire or chemical leaks—fire department personnel were not even present at initial news conferences—but on the evacuation and police who were in charge of it. That led to some annoyance at the fire department. Police soon realized it, trying to make amends (Scanlon and Padgham 1980).

Naming may also have political implications. Not surprisingly officials in San Francisco preferred to talk about the fire rather than the earthquake and officials in Florida did not want researchers to describe destructive hurricanes as disasters. San Francisco was worried about settlement, Florida about tourism.

Sometimes a name can be just plain wrong.

In February 1990, 14 million used rubber tires caught fire in a rural part of the city of Nanticoke in southern Ontario. The first responding firefighters came from the volunteer fire department in nearby Hagersville and the Hagersville chief was the first to talk to the media. As a result the fire, which lasted 18 days and involved scores of emergency agencies, was labeled the Hagersville tire fire (Scanlon and Prawzick 1991). When a television special was broadcast it originated from Hagersville. The hosts ignored local people who tried to tell them they were in the wrong place. The name was so widely accepted that when I mentioned the tire fire in lectures I had to start by calling it the Hagersville fire.

Sometimes names are accepted but there is still debate about an incident's impact. Chicago's mayor, for example, tried to downplay the death toll from that city's 1995 heat wave, which was eventually established at 739. It became clear that like many disasters it hit different ethnic groups unevenly. Yet Eric Klinenberg in his book Heat Wave reports there is still skepticism about the accuracy of that figure (Klinenberg 2002).

Finally, there is the question of naming earthquakes. They are supposedly named for the location nearest the epicenter, but this is not always the case. Loma Prieta for example got its name from the Spanish name of a peak in the Santa Cruz Mountains of Northern California. The epicenter was near the

mountain. But the Miramichi earthquakes in New Brunswick had their epicenter near a town called Plaster Rock. But the federal department of Energy, Mines and Resources named it after the Miramichi—both a river and a district—and the name stuck (Scanlon 1982).

This might seem irrelevant but it may make a difference.

When Eugenie Royal and Christine Rodrigue studied two California communities hit by the "Northridge" earthquake they found most attention went to the more prosperous town, Ferndale, which also got the most media attention. For that and other reasons it received more assistance than its less prosperous but harder hit neighbor, Rio Dell (Royal and Rodrigue 1998).

They also noted the earthquake was called the Northridge earthquake though the epicenter was well within Reseda, a modest and downwardly transitional San Fernando Valley community, per capita income $15,142. Northridge, north of Reseda, is a considerably more upscale community. Per capita income is $24,122.

Joseph Scanlon is professor emeritus and director of the Emergency Communications Research Unit at Carleton University in Ottawa, Canada. He can be reached at jscanlon@connect.carleton.ca.

This article originated with a query from an Irish colleague, Donal O'Mathuna asking me where names originated and whether they had official status. I received help from Lori Peek, Ron Perry, Mike Lindell, Pat Young, Bill Anderson, and Dan Whipple, and from such varied sources as the Australian Tropical Cyclone Warning Center, the research staff at Library of Congress and Terry Leonard of Stars and Stripes. My daughter Meaghan spotted the blog by Dennis Baron about 9/11. Errors or omissions are mine alone. Comments, additional information and corrections are welcome.

References

Baron, Dennis. 2011. **The only linguistic impact of 9/11 is 9/11 itself**. *The Web of Language*. Retrieved September 15, 2011 from illinois.edu/db/view/25/58728.

Dougherty, Kevin. 2001. "Ground Zero" no longer belongs to the military. *Stars and Stripes*, Oct. 5, p. 10.

Klinenberg, Eric. 2002. *Heat Wave: A Social Autopsy of Disaster in Chicago*. Chicago: University of Chicago Press.

Nunberg, Geoffrey. 2009. *The Years of Talking Dangerously*. New York: Public Affairs.

Royal, Eugenie, and Christine M. Rodrigue. 1998. The Northridge and Ferndale earthquakes: Spatial inequities in media attention and recovery. *National Social Science Journal*, Vol. 11 (2): 109-120.

Ruffman, Alan, and Colin D. Howell. 1994. *Ground Zero: A Reassessment of the 1917 Explosion in Halifax Harbour*. Nimbus Publishing Ltd. and Halifax: Gorsebrook Institute for Atlantic Studies at St. Mary's University.

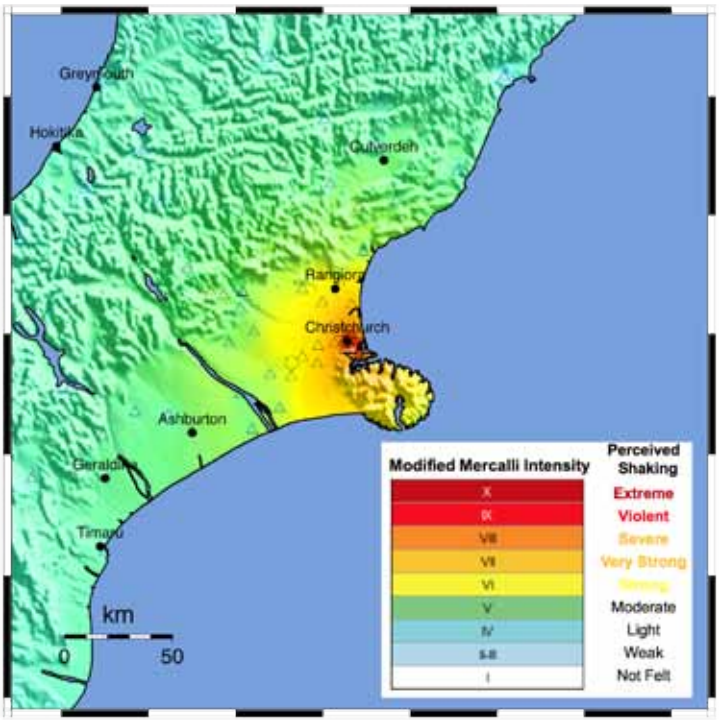
Scanlon, Joseph. 1982. The Miramichi earthquakes: The media respond to an invisible emergency. In *Preliminary Report of the Miramichi, New Brunswick, Earthquake Sequence of 1982*. Ottawa: Energy, Mines and Resources Canada pp. 83-86.

Scanlon, Joseph and Angela Prawzick. 1991. Not just a big fire: Emergency response to an environmental disaster. *Canadian Police College Journal* Vol. 13 (4): 229-259. (This article describes the inaccurately named "Hagersville" tire fire.)

Scanlon, Joseph, and Massey Padgham. 1980. *The Peel Regional Police Force & The Mississauga Evacuation*. Ottawa: Canadian Police College.

Christchurch ...

(Continued from page one)



New Zealand seismicity

Every year, New Zealand has between 100 and 150 earthquakes large enough to be felt. Since record keeping began in the 1840s, New Zealand has been hit by an average of several magnitude 6 earthquakes every year, one magnitude 7 every 10 years, and a magnitude 8 every century.

Despite the high seismicity of New Zealand, the Canterbury region of South Island had remained nearly silent for a centuries. The newly revealed Greendale fault, on which these earthquakes originated, was unknown. The ground rupture revealed a portion of it during the Darfield earthquake. Clearly the fault segment that ruptured during the February 2011 earthquake appears to be a continuation of the first, although no direct connection between the fault segments has been recognized. Technically, Christchurch and Lyttleton could have been better prepared if the location of Greendale fault and its potential to create large earthquakes had been known.

According to GNS Science seismologist Bill Fry, the Christchurch earthquake was relatively strong compared to its moment magnitude. The amount of energy released for the February event was larger than the amount of energy that would be released on average for the same magnitude earthquake. This was because the fault was held together by a large amount of friction. So the rupture resulted in sudden release of a large amount of seismic energy. It generated the strongest recorded ground acceleration in New Zealand's history.

Numerous records obtained from a dense network of seismic stations provide valuable information on the event, offering the opportunity of relating damage to ground shaking. This strike-slip event with oblique motion (mostly side-to-side motion but some up-and-down) moved at 2g, or twice the acceleration of an object caused by the force of gravity. As shown in the ground shaking map below, this level of shaking, greater than that expected particularly for a moderate-size quake, meant structures were shaken by the force twice their weight.

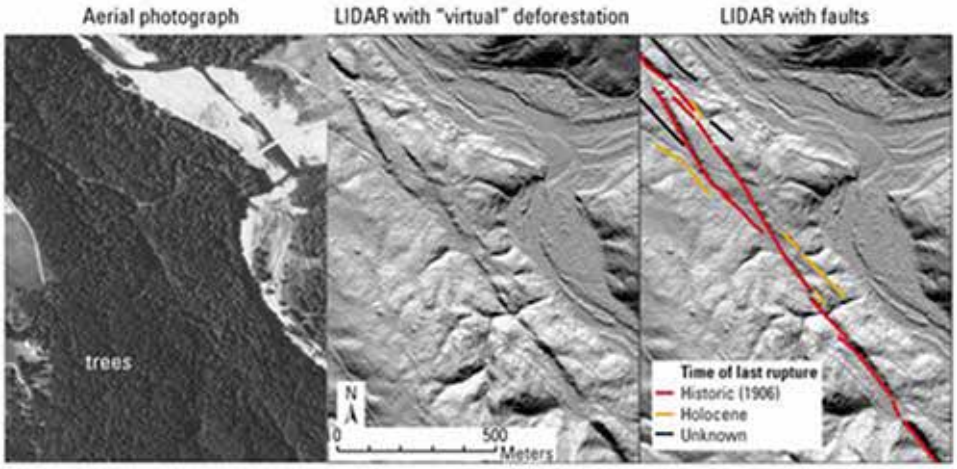
On the intensity scale, which quantifies the effects of an earthquake on the humans and man-made structures on a scale from I (not felt) to XII (total destruction), the Christchurch earthquake has a maximum IX intensity. By definition, intensity IX means that ground shaking resulted in general panic; damage considerable in specially designed structures, well designed frame structures thrown out of plumb; damage great in substantial buildings, with partial collapse; buildings shifted off foundations.

During the strong shaking, the simultaneous vertical and horizontal seismic shifts made it almost impossible for older masonry buildings to survive as shown in the photo below, where two-story masonry structures had severe damage to their facades and bearing walls.

Another factor, which contributed to the massive destruction, is widespread liquefaction, a phenomenon whereby a saturated soil substantially loses its carrying capacity when shaken, and thus undermines buildings and structures. It's similar to shaking a soda can—when the built up pressure is released, the fluid comes shooting to the surface, a sketch describing this phenomenon and its consequence during the Darfield earthquake are shown below. In and around the central business district of Christchurch, the soil types are dominated by fine sands, and ground water level is high, conditions that make this area particularly vulnerable to liquefaction. Strong ground shaking and liquefaction resulted in the demolition of 1,000 buildings within the CBD.

Other risks around the world

During the February earthquake two-story masonry structures suffered complete facade damage in the Christchurch historical district. *(photo courtesy of Walter Mooney)*



(Left) A regular aerial photograph of an area of trees obscuring part of the San Andreas Fault zonein Sonoma County in California.

(Center) The same area in a computer rendering of LIDAR data to "virtually" remove the trees and other vegetation. Scarps and other landforms associated with the Quaternary-active fault are now much easier to see.

(Right) Fault strands traced onto the LIDAR.

(*Courtesy U.S. Geological Survey*)

Christchurch is just one of many cities at risk of amplified ground shaking and liquefaction. Many urban areas around the world, including the San Francisco Bay area, greater Los Angeles, and metropolitan Tokyo are built over soft sediments located in valleys or over basins. These urban areas sit atop geological features that may amplify earthquake ground motions, just as Christchurch experienced.

For example, the underlying basin structure in western Los Angeles would cause Manhattan Beach and its surroundings to experience up to 10 times the amount of amplification as nearby urban centers located on solid rock. In addition to residential buildings, Manhattan Beach houses many large-diameter oil tanks, all of which may be vulnerable to amplified ground motions during a large earthquake.

The challenge is how to account for such significant, higher-than-expected amplified ground shaking, as seen in Christchurch, when evaluating the design of existing and new structures in urban areas.

New Zealand's recent quakes demonstrated that resilience in urban areas requires not only accounting for possible amplified ground shaking and liquefaction but also identifying previously unmapped fault lines. The Greendale fault, on which the Christchurch and Darfield quakes nucleated, was unknown because of the historically low seismicity of the Canterbury region. Similarly, future ruptures of unknown faults may generate large magnitude quakes without any warning in other urban areas currently having low seismic activity.

Mapping previously unknown faults requires considerable field and lab work. In the San Francisco Bay area, after a century of study by geologists, many faults have been mapped, but not all faults are apparent at the surface. Some quakes still occur on previously unknown faults. A recent example of a damaging quake on a previously unknown fault occurred on September 3, 2000, in Yountville in California's Napa Valley. This magnitude 5.2 quake struck 10 miles northwest of Napa injuring 25 people, and causing at least $10 million in damage.

A more tragic example is the magnitude 7.0 earthquake that struck Port-Au-Prince, Haiti, in 2010, causing more than 200,000 casualties and leaving 1.5 million people homeless. This devastating earthquake was also generated by a previously unmapped fault.

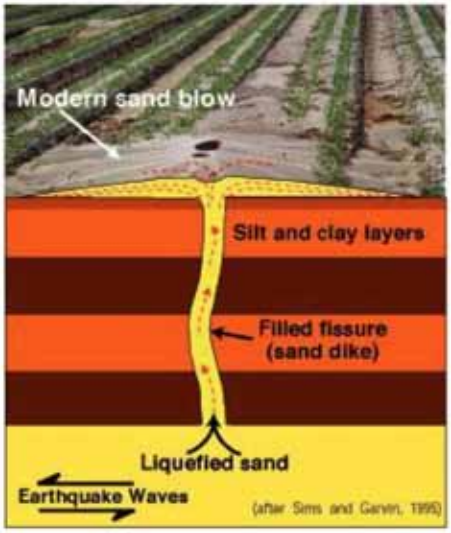
Another surprising event was the magnitude 5.8 quake near the town of Mineral, Virginia, on August 23, 2011. The quake, the largest in the eastern United States since the 1886 magnitude 6.9 Charleston, South Carolina earthquake, also occurred on a previously unmapped fault.

Identification techniques

Today, scientists use modern techniques, which were not available in the past, to identify and map fault lines. One of the newest tools for mapping faults obscured by extensive vegetation is Laser Imaging Detection and Ranging (LIDAR). LIDAR uses laser light projected from an airplane to make a detailed image of the ground surface. It provides a picture of the ground hidden beneath, using a sophisticated computer program that produces an image of the land stripped clean of all its trees, bushes and greenery.

This technology has been used to make a detailed map of the San Andreas Fault along the Sonoma and Mendocino County Coast in California. The figure below shows how LIDAR can help reveal active faults in this area.

Around the world, increasing population contributes to the creation of high-density developments, which place residential and commercial buildings, and infrastructure at more elevated risk than traditional low-density development on equivalent hazard-exposed land. The Christchurch quake



is raising a very sobering alarm to other major, high-density metropolitan areas, which may be under the potential threat of unknown fault lines. For resilience of urban areas against future earthquake hazards, it is crucial to find traces of active faults and to identify their potential to rupture and create strong shaking.

Erol Kalkan is a geologist with the United States Geological Survey in Menlo Park, California. This article is based on research outlined in a special issue of the journal **Seismological Research Letters** *for November/December 2011.*

Many urban areas around the world, including the San Francisco Bay area, greater Los Angeles, and metropolitan Tokyo are built over soft sediments. These urban areas sit atop geological features that may amplify earthquake ground motions.

Resources

Below are brief descriptions of some of the resources on hazards and disasters that have recently come to the attention of the Natural Hazards Center. Web links are provided for items that are available free online. Other materials can be purchased through the publisher or local and online booksellers.

All of the material listed here is available at the Natural Hazards Center Library. For more information contact librarian Wanda Headley at wanda.headley@colorado.edu

ALL HAZARD

The Disaster Experts: Mastering Risk in Modern America. By Scott Gabriel Knowles. 2011. ISBN: 978-0-8122-4350-5. 280 pp. $45 (hardcover). University of Pennsylvania Press. **www.upenn.edu/pennpress**.

"When it comes to mastering risk," writes Scott Gabriel Knowles, "knowledge is not usually the problem." Instead, the problem is converting knowledge into action.

Knowles begins his exploration of converting expertise into action with the research response to the September 11, 2001, World Trade Center attacks. Then he expands further into an examination of the hazards in post-industrial urban America. Portions of the book draw heavily on the groundbreaking work of Henry Quarantelli, Russell Dynes and Eugene Haas, research that is familiar to everyone who works in the disaster field.

He also quotes Natural Hazards Center director Kathleen Tierney who set out the proactive research agenda for the next generation of disaster researchers. Tierney said work ahead needed "a critical perspective on risk that focuses on the ways in which risk and power are related. Such an approach would recognize that political and economic power determine the ability to impose risks on others, shape public discourse about risks, sponsor and conduct research that presents risks in particular ways, and lobby for particular positions on the acceptability of risk."

The book tracks the history of disaster expert opinion in clear and lively prose.

North by 2020: Perspectives on Alaska's Changing Social-Ecological Systems. Amy Lauren Lovecraft and Hajo Eicken, eds. 2011. ISBN: 978-1-60223-142-9. 736 pp. $70 (softcover). University of Alaska Press. **www.alaska.edu/uapress/**

This book takes a deep and varied look at the social issues facing Alaska in the coming decade, which are "complex, culturally sensitive, and potentially divisive," as Virgil (Buck) Sharpton, chair of the U.S. Arctic Research Commission, says in his foreword.

The framework for the volume is a thematic, holistic look at the changes overtaking Alaska in only a generation. These themes are wide-ranging. They cover: socio-ecological research methods; indigenous knowledge; freshwater systems; coastal systems; marine resources; marine infrastructure; energy development; and artistic expression.

The volume is to a certain extent focused on the changes brought about by global warming. Higher latitudes are warming more dramatically than mid- and low-latitude regions. In an interesting and innovative section entitled "Expressions of climate change in the arts," this book looks at how artists interpret these changing surroundings and their consequences.

Behind the Backlash: Muslim American's After 9/11. By Lori Peek. 2011. ISBN: 978-1-59213-983-5. 230 pp. $26.95 (softcover). Temple University Press. **www.temple.edu/tempress**.

Someone was to blame for the attacks in the United States on September 11, 2001, and the easiest people to blame were the generic "Muslims." Lori Peek's fascinating book listens to the voices of 140 Muslim-Americans who were subjected to discrimination and harassment both before and after the attacks.

Two women describe their frustration with the stares they encountered: "Right after 9/11, I was scared of looking into people's eyes in the subway. That's why I was always looking down. I didn't want to see that they were staring at me. Now I'll look around a little more. When I'm studying for class, I can see they try to see what I'm studying. They'll look at my books."

And Mohammed, born in Morocco, but living in the

United States since he was very young: "When I heard President Bush give that whole long talk about how Americans should respect Muslims and respect Islam, it's a beautiful religion and stuff, I said, 'Wow, I really like this guy. I'm actually growing to respect him.' But then, in the next breath he says, 'But we must go to war with these Muslim terrorists.' On the one hand he says, 'Respect the Muslims; respect the Arabs.' Then out of the other side of his face he says, 'We must go to war with the Arab terrorists.' It's confusing to the American people. What's up with the Arabs? Should we respect them or are they Arab terrorists? How can we tell who's a regular, nice Muslim and who's a Muslim terrorist?"

Peek takes these specific instances and weaves them into a narrative of scapegoating and blame after an disaster that will inform discussions about religion, race relations, and disaster research.

The Disaster Bookstore. www.disasterbookstore.com.

Announcing a new online bookstore featuring high-quality, low-cost books on emergency and risk management, hazards, and disasters, as well as related products, such as disaster time line charts.

This site is the successor to the bookstore operated by the Public Entity Risk Institute (PERI). As such, it is the exclusive seller of the book *Emergency Management: The American Experience, 1900- 2005* and a number of other PERI-sponsored products. Check the website to see the unique mix of commercial and non-commercial products.

The online store offers convenient and prompt service.

CLIMATE

Climate Change and National Security: A Country-Level Analysis. Daniel Moran, editor. 2011. ISBN: 978-1-58901-741-2. 320 pp. $29.95 (softcover). Georgetown University Press. www.press.georgetown.edu.

Each nation is going to face its own individual challenges as a result of the changing climate. *Climate Change and National Security* brings together a range of experts to examine 42 key countries and regions and the national security risks that climate change may pose through 2030.

The first country the book profiles in this context is, unsurprisingly, China, now the world's largest emitted or greenhouse gases. Chapter author Joanna Lewis writes that China's Communist Party has shown tremendous resilience in addressing both internal and external threats, but their response will depend largely on how big a threat they judge climate change to be. The nation has been notoriously reluctant to cut back on its carbon emissions out of a fear of slowing economic growth.

"Because of China's great size," she writes, "whatever impacts it suffers and whatever actions it takes as a consequence of climate change are certain to have at least regional implications. A major regional threat that may be aggravated by climate change is that of political instability in Tibet. The crucial role of the Tibetan Plateau as the major watershed of Asia can only heighten the interest of outsiders in developments there, while perhaps emboldening both the Tibetan and Chinese leaderships in unpredictable ways."

India is another Asian economic tiger that may face unaccustomed pressures from climate change. T.V. Paul writes, "Although India has yet to incorporate environmental security as part of its national security outlook, a determined effort to do so might still allow it to significantly ameliorate the challenges posed by climate changes. India's adaptive capacity lies primarily in its institutions of democracy, secularism, and a free press, which have stood it in good stead in the face of famines, invasions, caste and communal divisions, and disease throughout its history … In the last two decades or so, India has experienced a number of environmental crises-for example, the Gujarat earthquake in 2001, several floods, especially in Orissa and Andhra Pradesh, and the Southeast Asian tsunami in 2004. During all these, India largely depended on its own resources, and the state was able to mobilize help to the affected, although there were reports of slow implementation and poor management."

Urban Climate Change Crossroads. Richard Plunz and Maria Paola Sutto, eds. 2008. ISBN: 978-1-4094-0078-3. 184 pp. $40.20. Ashgate Publishing Limited. www.ashgate.com.

In the realm of climate change, as with most disasters, it is better to be rich than poor. The authors of the essays in this book urge a bottom-up approach to dealing with climate change, taking the viewpoint of the least privileged members of global society and building from there.

In her paper on environmental justice, Julie Sze notes, "The 19 million people living in the New York region have a deeper carbon footprint than the 766 million people living in the 50 least-developed countries." She argues that in order to provide a just and effective approach to climate change, "Climate policy must originate from the perspective of the disenfranchised."

One needn't be a student of deep history to know that such an approach would be unprecedented. "Environmentalists can rail against consumption and counsel sacrifice all they want, but neither poor countries like China nor rich countries like the United States are going to dramatically reduce their emissions if doing so slows economic growth. For that to happen, we'll need a new paradigm centered on technological innovation and economic opportunity, not on nature preservation and ecological limits," writes Matthew Nisbet in one chapter.

This book approaches climate from the perspective of urban issues and urban planning. The population of cities continues to grow around the world. Cities cover two percent of the land surface, but account for 75 percent of the energy demand and emit 80 percent of the carbon dioxide. In 1975, there were five cities with more than 10 million people in them—megacities. In 2007, there were 19. In 2025, there will be 27, 22 of which will be in developing countries. "Urban risk reduction must be accompanied by the objective of poverty reduction, which must be associated with international engagement in improving the living standards of these people," writes planner Cinzia Abbate.

Assessing Vulnerability to Global Environmental Change: Making Research Useful for Adaptation Decision Making and Policy. Anthony G. Patt, Dagmar Schröter, Richard J.T. Klein, and Anna Cristina de la Vega-Leinert, eds. 2008. ISBN: 978-1-84407-697-0. 288 pp. $140.70 (hardcover). Earthscan. www.earthscan.co.uk

Addressing global climate change is an exercise in politics—or at least that's the premise of this book. "The study of contemporary global change vulnerability can best be seen as an act of policy analysis, rather than an exercise of social and systems science research," the editors write. "Being within the domain and discourse of policy analysis eliminates the need

for generalizable and broadly applicable results, but it does mean that discussions of vulnerability constantly raise questions that involve both facts and values."

Scientists studying the vulnerability of populations must listen carefully to the people they are among, take their concerns to heart, practice a transparent dialog, and adopt practical solutions fitted out to the region involved. These factors may seem obvious,"but actually putting them into practice raises a number of design issues for vulnerability assessments," the editors say. The book is an in depth look at research parameters for specific vulnerability assessments in affected areas.

These premises can take you off in interesting and unexpected directions. In chapter six of this book, for instance, Dagmar Schröter talks about the vulnerability of ecosystem services and pollination. It is not generally known that there's a bee crisis, with both wild and cultivated pollinators declining rapidly. Schröter cites the threat to California's almond crop. She doesn't mention it, but in Africa the population of wild and cultivated bees has declined to such an extent that Coca-Cola has to pay women to pollinated its critical vanilla crop by hand. This system is far less productive than natural pollination, and he difference in the crops is obvious even to an untrained observer.

The book looks at many other aspect of environment change and population vulnerability, including health, sea level rise, economic welfare and other issues.

TSUNAMI

Dual Disasters: Humanitarian Aid After the 2004 Tsunami. By Jennifer Hyndman. 2011. ISBN: 978-1-56549-335-3. 192 pp. $75 (hardcover). Kumarian Press. www.kpbooks.com.

This book focuses on the 2004 Asian tsunami, but it also explicitly draws lessons for the 2010 Haiti earthquake. Hyndman focuses on the interconnection between natural disaster and government stability. Haiti, for instance, has been a failed state for most modern existence. In the September 2011 *Natural Hazards Observer*, Richard Olson wrote, "Poor governance capabilities means that, even if the political will were present, 'the lights may be on, but no one is home' when it comes to assuring even the most minimal on-the-ground attention to risk … In the end, low human development, low governance, and high levels of corruption are a deadly triad, as Haiti amply demonstrated."

Hyndman writes knowledgeably about the setting of priorities and governance, emphasizing the necessity of local self-determination, and citing the Haiti and Asian examples. "Addressing hard questions about who sets project priorities, governs aid distribution, and manages context of Haiti is vital," she says. "After the 2004 tsunami in Aceh, Indonesia, the government was criticized for taking months to develop a plan for rehabilitation and reconstruction. This effectively left international humanitarian organizations to stabilize the crisis in the early weeks and months. Yet, a blueprint finally issued by the government ofIndonesia (Gol) provided a detailed outline of what it wanted, asserting its sovereignty over the recovery process and over international aid agencies based in Aceh, a long contested region of its territory that had been closed to foreigners until the disaster hit."

There were different political ramifications from the 2004 tsunami, Hyndman points out. "The utter destruction and dramatic loss of life in Aceh accelerated peace talks" in the long an costly conflict there. In Sri Lanka, however, the government response reignited tensions there. This book ably discusses the many unexpected political consequences of disasters.

EARTHQUAKES

Haiti After the Earthquake. By Paul Farmer. 2011. ISBN: 978-1-58648-973-1. 456 pp. $27.99 (hardcover). Public Affairs. www.publicaffairsbooks.com.

Farmer is a doctor who offers here a narrative journey through the medical response after the Haiti earthquake. It has a lot of anecdotes, interrupted by Farmer's analysis of medical response in the Haitian context. He was involved at a very high level of the relief, and his insights offer a compelling picture of the medical crisis.

"After decades of inattention and unwitting sabotage of Haiti's health system—too little foreign aid flowed to the public sector—there was suddenly a great deal of interest in helping Port-au-Prince's public hospitals," he writes. "But helping is difficult in a broken and underfunded system."

The book also includes narratives of the experiences of a number of other medical personnel who responded to the crisis.

VOLCANOES

Volcanoes of the World. By Lee Siebert, Tom Simkin, and Paul Kimberly. 2010. ISBN: 978-0-520-26877-7. 568 pp. $75 (softcover). University of California Press. www.ucpress.edu.

This is the definitive catalog of volcanoes, especially those active in the Holocene. This is the third edition of the volume, and it will be updated in the future as more information becomes available.

The authors write, "Although documentation of historical eruptions has significantlyimproved during the past half century, even in the 21st century eruptions can occur unnoticed in sparsely populated and poorly instrumented areas. Ongoing efforts to improve documentation of eruptive activity at both ends of the time continuum are essential in understanding our planet's volcanism and anticipating what future volcanic events might be in store.

"Recognition that volcanoes can resume activity after very long periods of quiescence even exceeding the full duration of the Holocene underscores the importance of extending the record back into the Pleistocene to include all volcanoes that could erupt next year.

"That effort has begun, and in concert with application of new instrumentation to document current activity, new techniques to date older eruptions, and the continuing contributions of those from many disciplines, will result in increasingly more comprehensive compilations in the years to come."

TORNADOES

And Hell Followed With It: Life and Death in a Kansas Tornado. By Bonar Menninger. 2011. ISBN: 978-1-934572-49-8. 408 pp. $24.95 (hardcover). Emerald Book Company. www.emeraldbookcompany.com.

Bonar Menninger interviewed individual survivors or the next of kin of victims to produce this dramatic account of the June 8, 1966 EF-5 tornado that swept through Topeka, Kansas, leaving 16 dead and more than 500 injured. It also caused an estimated $100 million in property damage.

The book starts with a brief history of tornado measurement, forecasting, and warning, including an account of one of America's first serious tornado researchers, John Park Fin-

ley, who collected data on the causes of and forecasting for American plains tornadoes in the late 1880s.

Menninger mixes the history and culture of the area with his dramatic retelling of the experiences of the tornado survivors and victims.

FIRE

Managing Fire in the Urban Wildland Interface. By Kenneth Blonski, Sheryl Miller, and Carol L. Rice. 2010. ISBN: 978-0-923956-96-7. 396 pp. $85 (softcover). Solano Press Books.

Fire has long played a natural and positive role in the forest, chaparral, and plains environment. But problems have arisen since people have plunked down their homes in the wildlands that fire once considered its own turf. For a long time fire suppression was the chief method of protecting human settlements in this wildland-urban interface. When this strategy led eventually to fiercer and more damaging fires, new approaches were developed that tried to live with and reduce the risk form fires.

Managing Fire is a reference book that draws on experience with fires in this interface—mostly in California, but the lessons are relevant in many places. The book goes from the general—what's the risk? who should define it?—to the specifics of strategy and tactics for reducing the damage from wildland fires.

The book offers detailed and specific approaches to handling fire risk, including involving all of the players who have a stake in the issues. The book also includes crisply written and useful advice for residents who respond, evacuate or shelter in place for a fire.

RISK

The Feeling of Risk: New Perspectives on Risk Perception. Paul Slovic, editor. 2010. ISBN: 978-1-84971-149-4. 456 pp. $139 (hardcover). Earthscan. www.earthscan.co.uk.

It's official: Thinking about disasters is depressing. "The results of these studies suggest that the negative affect elicited by thinking about a recent major disaster leads to a more pessimistic view of the future," write Paul Slovic, Daniel Västfjäll, and Ellen Peters in one of the studies in this volume. They asked Swedish men and women about their feelings when thinking about the 2004 Asian tsunami. Sweden had a large number of tourists visiting affected areas, and consequently suffered considerable loss. They found that people who thought about the disaster tended to have a bleaker view of the future.

They also found that "major environmental events may send psychological ripples globally, with the consequence that individuals remote from the actual disaster may change their everyday decision behavior."

This book is a wide-ranging look at peoples' perception of risk, from cigarette smoking to terrorist attacks.

Contracts and Grants

Below are descriptions of some recently awarded contracts and grants related to hazards and disasters.

Post-seismic response updip of the Chilean megathrust earthquake of February 27, 2010. National Science Foundation grants #1130013 and #1129574. www.nsf.gov/awardsearch/showAward.do?AwardNumber=1130013. Three years. Two grants. $312,672 to principal investigator Anne Trehu, Oregon State University, trehu@coas.oregonstate.edu, and $249,874 to principal investigator Michael Tryon, University of California, San Diego Scripps Institute of Oceanography, mtryon@ucsd.edu.

Among the hazards that arise from large earthquakes are the direct effects of great earthquakes, as evidenced by last year's devastating earthquake off Japan, and local and distant effects of tsunamis. Though they pose enormous risks to life and property in highly populated areas, neither of these phenomena is yet well understood. The recent great earthquake in Chile did not generate a large tsunami, probably because the rupture produced a surface break at the seafloor. Available evidence suggests that slip did not occur at depths shallower than about 30 kilometer down-dip from the trench. Accordingly, the proponents of this project infer that the outer accretionary wedge that lies along the Chile coast above the rupture zone behaves as a poro-elastic medium that will adjust over time to the new stress regime caused by the earthquake. The aim of the proposal is to observe the effects of this transient adjustment, by deploying a focused array of ocean bottom seismographs equipped with flow meters. The principal broader impact of this effort is considerably improved understanding of megathrust earthquakes and tsunamis.

A plate boundary observatory on the Nicoya Peninsula, Costa Rica. National Science Foundation grant #1158167. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1158167. Seven months. $100,239 to principal investigator Timothy Dixon, University of South Florida, tdixon@rsmas.miami.edu.

The work proposed is to augment, upgrade and extend the monitoring period of an existing network of GPS and seismic instrumentation on the Nicoya Peninsula, Costa Rica. The questions to be addressed by the data collected include: (1) What is the relationship between slow slip, tremor, strain accumulation and interplate earthquakes. (2) What is the role of temperature and fluids in tremor and slip generation? 3) Is the occurrence of fast and slow slip tremor spatially and/or temporally separated? The answers to these questions have important implications for understanding seismic processes at subduction zones.

The El Nino-Southern Oscillation (ENSO)-Mediterranean teleconnection: Observations and dynamics. National Science Foundation grant #1205043. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1205043. One year, four months. $265,960 to principal investigator Jeffrey Shaman, Columbia University, jls106@columbia.edu.

Numerous studies have demonstrated statistical associations between the El Nino-Southern Oscillation (ENSO) and precipitation in the Mediterranean basin (southern Europe, North Africa, Anatolia, and the Middle East). The dynamical bases for these teleconnections have yet to be identified. The North African-Asian (NAA) jet extends from the subtropical Atlantic Ocean across North Africa, the Mediterranean, South Asia and Japan to the North Pacific Ocean. Atmospheric jets, such as the NAA jet, have been shown to act as waveguides to atmospheric Rossby wave disturbances and, therefore, to create teleconnections between widely separated regions.

The Mediterranean basin lies in the path of the NAA jet. In their previous work, these investigators showed that the NAA jet is modulated throughout the year by conditions in the equatorial Pacific associated with ENSO. This teleconnection between ENSO and the NAA jet appears to be mediated by stationary barotropic Rossby waves.

This project will examine the hypothesis that the ENSO-Mediterranean teleconnection is the result of changes in the NAA jet caused by ENSO. Observations and a hierarchy of models will be used to investigate the dynamics of the ENSO-NAA jet teleconnection and to determine the extent to which precipitation in the Mediterranean region is controlled by ENSO-modulated changes to the NAA jet.

The broader impacts and the societal relevance of this research are in the economic, social and epidemiological importance of climate, and especially precipitation, variability in the Mediterranean region.

Impact of Sahara dust layers on convective cloud development and precipitation over the tropical eastern Atlantic Ocean. National Science Foundation grant #1139495. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1139495. Three years. $134,224 to principal investigator, Qllong Min, State University of New York at Albany, min@asrc.albany.edu.

The indirect effect currently produces the greatest uncertainty in climate predictions among all known climate forcing mechanisms. Although tropical deep-convective cloud systems have great impacts on large-scale atmospheric circulation, few studies investigate the aerosol impacts on deep convective cloud systems. To improve our understanding of the aerosol indirect effect, and to better quantify their role in regional and global climate changes requires innovative approaches.

The overarching goal of this research is to utilize comprehensive observation analysis and cloud resolving simulations using Weather Research and Forecast (WRF) model coupled with a spectral bin microphysics (SBM) scheme to assess how mineral dust affects the development of tropical deep-convective cloud systems, and to understand mechanisms responsible for the observed changes of dust indirect effect. The combination of our integrated satellite and in-situ data from multiple instruments/platforms and our innovative analysis techniques will greatly benefit research community to address key questions of aerosol-cloud interaction and to develop and validate the realistic representation of aerosol-cloud-precipitation interactions in advanced models on regional and global climate model-grid scales. Two outcomes are expected from

this research effort, i.e., (1) the mechanisms responsible for the observed changes in convective core, stratiform/anvil, and precipitation from the dust-free sector to the dust sector, and (2) an estimation of the changes in cloud properties and precipitation imposed by dusts on the deep convective clouds.

As one of the major sources of aerosols, Saharan dust can be transported across the tropical North Atlantic and into the Caribbean region as well as into Europe. Dust affects cloud properties by the semi-direct effect through changing the radiative heating, and by the indirect effect through acting as cloud condensation nuclei (CCN) and ice nuclei (IN). The heterogeneous nucleation imposed by dust occurs at warmer temperature in a deep convective cloud could potentially change the vertical profile of latent heat and the vertical distribution of supercooled water. These changes in the tropical deep convective systems will have substantial impacts on large scale circulation as well. Nevertheless, the aerosol-cloud interaction is the least understood aspect in the climate system, of which our understanding of the impact of aerosols on mixed-phase and ice clouds by acting as ice nuclei (IN) is the poorest. It is vital to have comprehensive observations and model simulation to assess and understand the physical processes of the indirect and semi-direct effects of dust aerosols on clouds. The outcomes of this work will complement our understanding of aerosol-cloud-climate interactions and benefit the climate community to estimate of the contribution of dust to climate change. Through student training and education outreach, students from various levels will gain some understanding on current climate issues.

An integrated tectonic study of the Jamaica strike-slip restraining bend and Gonave Microplate using GPS, geomorphologic, seismic, and gravity data. National Science Foundation grant #1212336. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1212336. Ten months. $53,777 to principal investigator Paul Mann, University of Houston, pmann@uh.edu.

An integrated, four-year geophysical and geological study of the Caribbean island of Jamaica, which straddles a major strike-slip fault restraining bend that has formed in response to partitioning of Caribbean-North America plate motion between the northern and southern boundaries of the Gonave sliver plate, is being carried out by a research team of scientists from the University of Wisconsin and the University of Texas. New geodetic, geomorphologic, paleoseismic, gravity, and seismic measurements are being combined to: (1) measure Caribbean plate motion near Jamaica to establish the full fault slip budget across the island and Gonave microplate motion relative to the Caribbean and North American plates; (2) establish the locations, slip senses, and long-term slip rates along major active Jamaican faults through a combination of geomorphologic, paleoseismologic, and targeted gravity studies; (3) construct and test forward and inverse models of fault slip rates, to distinguish between proposed models for how slip is transferred between the offset fault strands, and to improve earthquake hazard assessment in this densely populated and earthquake-prone country use constraints from all measurements; (4) combine results with GPS site velocities from Hispaniola to derive a model for Gonave microplate motion that is fully consistent with all the data.

This project should provide a better understanding of earthquake hazard in Jamaica, which has experienced two destructive earthquakes since 1600 and continues to be vulnerable to significant earthquake damage due to seismic energy focusing and liquefaction of unconsolidated alluvium in much of the heavily populated and economically important southern half of the country. The measurements should provide useful information about the earthquake cycle over range of spatial and temporal scales, including the millenial-scale seismic history and potential of the Plantain Garden fault near the capital city of Kingston to the year-to-year budget of interseismic elastic strain that is accumulating in all areas of the island. The research will be done in collaboration with the Jamaican Seismological Network, which is responsible for seismological network operation, seismic research, and earthquake hazard assessment and response.

Assessment of the drought situation in the Horn of Africa. National Science Foundation grant #1160750. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1160750. One year. $76,445 to principal investigator Sharon Nicholson, Florida State University, snicholson@fsu.edu.

This project will examine the current drought in East Africa in a timely manner. There are four scientific goals: (1) to assess the severity of the drought and the extent of regional area affected; (2) to determine the seasonal nature of the drought; (3) to investigate the factors contributing to its unusual severity; and (4) to predict the likelihood that the drought will persist into 2012. Reaching this understanding is more challenging for the Horn of Africa than for most areas of Africa because of the complexity of the seasonal cycle, the multiple factors that influence drought in this region, the lack of access to meteorological data from some of the countries afflicted, and the sparse history of meteorological research on this region.

This project will increase understanding of meteorology in an area of the world that is frequently plagued by weather disasters and where we currently have little understanding of the factors governing such disasters. Finally the project will demonstrate a forecast approach that, if successful, has the potential to be applied to other locations and situations.

Hawaiian and subplinian basaltic volcanism: Constraints on eruption dynamics from Kilauea. National Science Foundation grant #1145187. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1145187. Two years. Four grants. $106,996 to principal investigator Helge Gonnermann, William Marsh Rice University, helge@rice.edu, and $124,448 to principal investigator Terry Plank, Columbia University, tplank@Ideo.columbia.edu, and $169,942 to principal investigator Bruce Houghton, University of Hawaii, bhought@soest.hawaii.edu, and $99,352 to Erik Hauri, Carnegie Institution of Washington, hauri@dtm.ciw.edu.

Understanding the forces controlling basaltic explosive eruptions is of fundamental importance in order to improve understanding of the range of behaviors of our most frequently active volcanoes and to assess hazards of future explosive events. The summit of Kîlauea is the site of large and growing volcano-tourism (e.g., 5000 visitors/day at the overlook at Jaggar Museum), and there is a public need both for better knowledge of the volcanoes' behavior and improved forecasting of the likely course of future eruptions. Although not its usual style, explosive eruptions have punctuated Kîlauea's history, with five moderately large events since 1500 CE.

The study quantifies and models the dominant factors that determine explosive eruptive behavior at Kilauea volcano,

through a study of the eruptive products from three plume-forming and fountaining eruptions. The events are episode 1 of the highest historical fountaining eruption at Kîlauea, the 1959 Kîlauea Iki eruption, a much earlier powerful fountaining eruption in 1480 CE and a powerful; plume-forming eruption in 1635 CE.

The novelty of the approach lies in using new 'rate-meters' to estimate likely durations of magma ascent beneath the volcano to arrive at the influence of this residence time on the ultimate 'fate' of the magma. The investigators will study microtextures (vesicles and microlites), volatiles in melt inclusions, and embayments in eruptive products.

The relationships between sheared convective clouds and tropical cyclone evolution. National Science Foundation grant #1140357. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1140357. Three years. Two grants. $166,678 to principal investigator, Wesley Terwey, University of South Alabama, terwey@usouthal.edu, and $163,486 to principal investigator, Chris Rozoff, University of Wisconsin-Madison, chris.rozoff@ssec.wisc.edu.

Despite improving observational and computational resources, the forecasting of tropical cyclone (TC) structural and intensity evolution is still a significant challenge. The limits of predictability relate to the nonlinear interactions between a TC's multi-scale dynamics and its environment. Recent research underscores how TC evolution is influenced strongly by the details of latent heating. As such, properly accounting for convective processes in TCs is a key step towards a more complete physical understanding of TCs and improved prediction. Yet, potentially essential aspects of convective-scale dynamics remain unresolved. The detailed structure of kinematic and thermodynamic properties found within TCs can provide a broad spectrum of distinct local environments resulting in a variety of convective and mesoscale cloud morphologies. Each convective mode may have unique impacts on TC evolution.

The multiple frameworks for this study will include an idealized cloud model, high-resolution flight-level Doppler radar and in situ observations of TCs, and two full-physics TC simulations. Sensitivity experiments with a cloud model will be used to understand how three-dimensional wind shear and thermodynamic variability within TCs govern isolated convective clouds and convective systems. The impacts of sheared convection on the mean flow will also be documented in the cloud model. The observational analyses and TC simulations will provide realistic settings to evaluate the idealized cloud modeling results and to deduce feedbacks and relationships between the various sheared convective modes, rainbands, and TC dynamics. Vorticity, potential vorticity, and thermodynamic budgets and general statistical analysis of cloud, precipitation, and cold pool properties will be the primary tools of analysis for elucidating open questions related to sheared TC convection.

Predicting trajectories of post-disaster adjustment from pre-disaster assessments of risk and resilience factors. National Science Foundation grant #1143690. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1143690. One year. $54,288. Principal investigator James Hamilton, University of Alabama Tuscaloosa, jchamilt@bama.ua.edu.

Most Americans will experience a traumatic event at some time in their lives. Five to ten percent will have persistent and disabling psychological and physical problems a year or more later. This project focuses on the psychological and physical consequences of one kind of a natural disaster. It focuses on how different preexisting personality traits and social experiences (measured before a disaster) influence the way in which people cope with a natural disaster over time. People who adjust poorly to traumas have a tendency to experience strong negative emotions. In contrast, people who adjust well have high self-esteem, are comfortable in their close relationships, and have others in their lives they can count on for physical and emotional support. However, most research documenting these findings used personality and social information gathered after a major trauma took place. Thus, it is hard to know whether the personal and interpersonal strengths listed above caused positive coping or whether positive coping allowed people to develop or maintain these positive personal and interpersonal strengths.

In a large sample of undergraduate students at the University of Alabama, shortly before the area was struck by tornadoes in the spring of 2011, Hamilton happened to measure basic personality variables, emotional tendencies, and social variables that are all highly relevant to coping with trauma. Thus, Hamilton is in a unique position to follow up on this initial survey to see if the personality and social measures collected prior to the time the tornadoes struck will predict changes in well-being over time.

Natural, random variation in the extent to which people were personally affected by the tornado (e.g., whether someone's home was destroyed, whether a person knows someone who was killed or seriously injured) offers a unique opportunity, in combination with the measured social and personality variables, to see if the severity of events people experience in relation to the traumatic event plays a role in adjustment. Differences in the perceived quality of participants' social support networks will also allow the researchers to test the idea that social support can protect people from the negative consequences of stressful events.

Dynamics of coupled natural and human systems in the Colorado Front Range wildland-urban interface: Causes and consequences. National Science Foundation grant #1115068. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1115068. Three years. $1,430,000. Patrick Bourgeron, University of Colorado at Boulder, patrick.bourgeron@colorado.edu.

The wildland-urban interface in the United States occupies only nine percent of the conterminous surface area but contains nearly 39 percent of all housing units. In the Colorado Front Range, increasing residential development in these locations has been accompanied by sharp increases in the likelihood of severe disturbances such as wildfires and mountain pine beetle outbreaks. The central goal of this project is to analyze the interactions among environmental, social, and economic factors in the Colorado Front Range wildland-urban interface, and to forecast the effects of these interactions on future states of the landscape. The general objectives are to identify the mechanisms by which such interactions occur, identify whether or not the landscape can experience disturbances while maintaining its functions and controls, and evaluate the implications of different environmental and growth policies on landscape and human responses. Narratives will be developed to define key components and boundaries, identify drivers of ecosystem change, and char-

acterize social and economic conditions. Linked computer models will be developed to examine landscape response over time to changes in land cover, fire, insect outbreaks, housing density, and building/landscaping characteristics. Decision making by households and developers under different policy and economic conditions will be included in the models. This project will contribute to the development of general theories about environmental, social, and economic relationships in the context of landscape resilience. Of particular interest are circumstances under which managing for resilience is difficult to achieve because of intractable environmental, social, or economic issues.

Project results will be incorporated into scenarios that explore future landscape resilience in the Colorado Front Range, under different climate and forest management conditions. This research provides the first test of the components of an integrated modeling framework for understanding wildland-urban interface responses to changes in environmental, social, and economic factors.

Observations of near-Earth asteroids. National Science Foundation grant #1109940. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1109940. One year. $216,102. Principal investigator David Tholen, University of Hawaii, tholen@ifa.hawaii.edu.

This project will continue an ongoing program of astrometric (positional) observations of near-Earth asteroids. Astrometric follow-up of new observations is essential in order to determine orbits and recover the objects at future observing opportunities. Over 60 percent of NEAs newly discovered in 2008 and 2009 were subsequently lost due to the lack of adequate follow-up. This project will measure using the University of Hawaii 2.24-meter telescope and other telescopes on Mauna Kea. The telescopes and specialized techniques used enable the team to observe fainter objects, with greater positional accuracy, and with better access to the south celestial hemisphere than other groups. They will adapt the newest and most accurate astrometric reference catalog, the PPMXL catalog, for use in NEA astrometry and provide this customized catalog to the community. Improvements will be made to their data processing pipeline to speed the process and enable more positional measurements per object. Finally, the group will plan and carry out measurements of physical characteristics, including shapes, albedos and colors, of selected objects that are possible candidates for human exploration. Accurate NEA astrometry is most critical for the tracking of potentially hazardous asteroids that could collide with Earth. This has implications for earth science questions, such as how Earth acquired its water, as well on strategies for mitigating the impact hazard.

Cyber enabled discovery system for advanced multi-disciplinary study of humanitarian logistics for disaster response. National Science Foundation grants #1124827 and #1123924. http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1123924. Three years. Two grants. $1,512,299 to principal investigator Jose Holguin-Veras, Rensselaer Polytechnic Institute, jhv@rpi.edu and $262,703 to principal investigator Tricia Wachtendorf, University of Delaware, twachten@udel.edu.

This research will develop a cyber-enabled discovery system, integrating state of the art thinking and methodologies from computer, transportation, mathematical, and social sciences, for management of logistics in humanitarian responses to disasters. It will: (1) create new paradigms of humanitarian logistic models that explicitly consider two key aspects not studied by the current techniques—non-hysteretic deprivation costs (lack of access to a given good or service), and materiel convergence (physical movement of supplies and equipment); (2) develop appropriate models to represent human suffering as a deprivation cost; (3) develop analytical models to quantify and influence the amount, type, and arrival patterns of donations; (4) gain insight into the links between media framing of needs and materiel convergence; (5) define mechanisms to modify donor behavior; and (6) develop algorithms and heuristics to solve these formulations. This will lead to models that consider the impacts of logistic decisions on the impacted populations, more effective delivery strategies, more coordinated and effective relief flows, and less congestion at entry points.

This research is an ambitious effort to build a holistic, quantitative understanding of how humanitarian logistics should consider deprivation costs and emergent donor response to disasters. It is based on state-of-the-art economic, logistic, and social science research into the impacts of delivery actions, media portrayal of disaster events, and response needs. The results will improve allocation and delivery of critical supplies during disaster response, as well as better coordination with emergent distributed donor sites, leading to improvement of the nation's emergency response capabilities.

Conferences and Training

January 18-20, 2012
Public Health Law Research Annual Meeting
Public Health Law Research
New Orleans, Louisiana
Cost: $125

This conference will discuss how laws can prevent and mitigate public health issues to ensure a healthier population. Topics include communicable and non-communicable diseases, injury prevention, future public health law research priorities, and the effects of regulation on public health.

http://publichealthlawresearch.org/

January 22-25, 2012
Seventh Gulf Seismic Forum
Saudi Geological Survey
Jeddah, Saudi Arabia
Cost: Free

This conference will address earthquake risk in Saudi Arabia where increased infrastructure and development in quake zones are issues. Cooperation in monitoring and mitigation strategies will also be discussed. Topics include seismological data management, earthquake engineering, induced seismicity, volcanic hazards, and seismic zoning.

http://7gsf.info/

January 31 to February 3, 2012
Connections in the Climate System
Australian Meteorological and Oceanographic Society
Sydney, Australia
Cost: $500

This conference examines the physical components of climate systems, the evolution of climate systems over time, and the connections between climate change and extreme events. Topics include coastal erosion and storm surge impacts, increased hazard intensity and frequency, and the effects of climate change on renewable resources.

http://www.amos.org.au/

February 6-8, 2012
WaterWorld Middle East
PennWell Corporation
Doha, Qatar
Cost: $1,166 before January 26

This conference will discuss strategies to address growing water demands in the Middle East, and how water and power markets are responding. Topics include trends in desalination, integrated water management, industrial water processing, water reuse, private sector development of water resources, and emergency water supplies.

http://www.waterworldmiddleeast.com/

February 7-9, 2012
National Evacuation Conference
Stephenson Disaster Management Institute and the Gulf Coast Research Center for Evacuation and Transportation Resiliency
New Orleans, Louisiana
Cost: $425

This conference focuses on strategies to improve evacuation planning efforts. Participants will choose from sessions in the following six tracks: carless and vulnerable populations, evacuation modeling, communication and behavior, policy, animals, and nuclear power plants. Topics include women, Latino, and immigrant populations, regional modeling, communicating risk, the federal role in evacuation, and the impact of animals on evacuation management.

http://www.nationalevacuationconference.org/

February 19-23, 2012
One Health Summit
Global Risk Forum
Davos, Switzerland
Cost: $1,224

As part of the Global Risk Forum, this summit will bridge the gap between science and practice by examining public health risk management from a multihazard, multidisciplinary perspective. Topics include pandemics, food safety and security, natural hazards, resource depletion, and sustainable development.

http://www.grforum.org/

February 20-24, 2012
Fourth International Maar Conference
Massey University and University of Auckland
Auckland, New Zealand
Cost: $772

This conference will share recent research on maar and cinder cone volcanoes. Topics include magmatic systems, eruptions, environmental and economic factors, community risk assessments, volcanic risk models, emergency planning, and mitigation strategies.

http://www.cvent.com/

February 21-24, 2012
Public Health Preparedness Summit
National Association of County and City Health Officials
Anaheim, California
Cost: $500 until January 17

This conference will teach public health professionals how to effectively respond to and recover from public health emergencies using limited resources. Topics include radiation response, volunteer management, communications, vulnerable populations, and public health law.

http://www.phprep.org/2012/

February 27-29, 2012
Sustainable Water Supply and Sanitation Conference
Holding Company for Water and Wastewater
Cairo, Egypt
Cost: $500

This conference will look at sustainable solutions to water scarcity, increased water demand, and competition among different usages. Topics include potable water, sustainable wastewater treatment systems, innovative waste-

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www.colorado.edu/hazards/

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http://swssc.hcww.com.eg/

February 27 to March 1, 2012
Second National Flood Workshop
Weather Research Center
Houston, Texas
Cost: $350

This conference encourages interdisciplinary discussions about floods, technological advancements in remote data acquisition and modeling, and regulating flood mitigation and floodplain management. Topics include Tropical Storm Allison, the record March 2010 rain and flooding, and advanced flood warning systems for low water crossings. Short courses in storm surge, floodplain management, and hurricane impacts for inland communities are also available.

http://www.wxresearch.com/nfw/

March 12-17, 2012
World Water Forum
World Water Council
Marseille, France
Cost : $911

This conference will facilitate discussions and debates about global water challenges, and promote solutions through prioritized regional action. Topics include technical, legal, financial, and educational solutions, competing interests in water resources, and requirements for successful action.

http://www.worldwaterforum6.org/

March 1-3, 2012
2012 National Severe Weather Workshop
National Oceanic and Atmospheric Association
Norman, Oklahoma
Cost : $90

This conference will discuss effective risk-related communication strategies for weather hazards such as tornadoes and fires. Topics include lessons learned from past disasters, factors contributing to fatalities, community preparedness strategies, weather forecasting technologies, accurate reporting tips, and the future of severe weather information collection.

http://www.norman.noaa.gov/nsww/

March 19-12, 2012
Sustainable Water Management
American Water Works Association
Portland, Oregon
Cost: $595 before February 17

This conference will address sustainable water management from technical, legislative, and regulatory viewpoints with an eye toward integrating resources. Topics include low-impact development, aquifer storage and recovery, climate change impacts, drought preparedness and response, and sustainable irrigation.

http://www.awwa.org/

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The mission of the Natural Hazards Center is to advance and communicate knowledge on hazards mitigation and disaster preparedness, response, and recovery. Using an all-hazards and interdisciplinary framework, the Center fosters information sharing and integration of activities among researchers, practitioners, and policy makers from around the world; supports and conducts research; and provides educational opportunities for the next generation of hazards scholars and professionals. The Natural Hazards Center is funded through a National Science Foundation grant and supplemented by contributions from a consortium of federal agencies and nonprofit organizations dedicated to reducing vulnerability to disasters.

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