

Top 10 Extreme Weather Events of 2008

1. Hurricane Ike

Ike, a Category 4 hurricane, was the biggest storm of this year's Atlantic hurricane season. It made U.S. landfall on Sept. 13 at Galveston, Texas with winds above 100 mph. It was blamed for at least 61 deaths in the U.S. and was one of the five costliest hurricanes in U.S. history. Maximum sustained winds reached 145 mph. And, the diameter of the storm -- at one point, 450 miles -- made it one of the most massive Atlantic hurricanes ever recorded.

Global Warming Link: In the 2008 season, above-normal sea surface temperatures and water vapor in the atmosphere associated with global warming likely contributed to the above-average tropical storm activity.

Expert: Kevin Trenberth, trenbert@ucar.edu, 303-497-1318

Consensus Science: "It is likely that hurricane rainfall and wind speeds will increase in response to human-caused warming." (ES, p.7) ⁱ

2. Tornadoes

It was an extremely active year for tornadoes in the U.S. An estimated 125 people died in nearly 1,500 tornadoes across the country, making it one of the top 10 deadliest January-October periods since reliable record-keeping began in 1953. Other unusual events included powerful January twisters in Wisconsin and Washington state.

Global Warming Link: As of yet, there is no proven link between tornadoes and global warming. However, the La Niña storm track in the spring meant all cyclones moving across the U.S. picked up warm, moist air from the Gulf of Mexico, which provided more energy for all the thunderstorms and created increased instability and risk of tornadoes.

Expert: Kevin Trenberth, trenbert@ucar.edu, 303-497-1318 or Stu Ostro, sostro@weather.com, 404-210-7105

Consensus Science: No consensus science studies have yet reported a link between tornadoes and global warming. However, sea surface temperatures worldwide are about 1 degree Fahrenheit higher than they were 40 years ago. Warmer temperatures increase the amount of water vapor in the air, which, in turn, produces more energy to fuel storms.

3. Hurricane Gustav

Hurricane Gustav made landfall on Sept. 1 near Cocodrie, La. as a Category 2 storm with maximum sustained winds at 110 mph. Nearly two million people fled coastal areas as many feared a repetition of 2005's Hurricane Katrina. Gustav was blamed for 25 U.S. deaths and its ferocious winds brought down trees and power lines, leaving thousands of residents without power.

Global Warming Link: In the 2008 season, above-normal sea surface temperatures and water vapor in the atmosphere associated with global warming likely contributed to the above-average tropical storm activity.

Expert: Kevin Trenberth, trenbert@ucar.edu, 303-497-1318

Consensus Science: “It is likely that hurricane rainfall and wind speeds will increase in response to human- caused warming.” (ES, p.7) ⁱⁱ

4. Midwest Flooding (Part One, Spring)

In late March, flooding was blamed for at least 17 deaths in Missouri, Arkansas, Oklahoma, Texas, Indiana, Ohio, Kentucky and Illinois. A slow-moving storm system brought rains in excess of 10 inches to the region. These rains, combined with melting from unusually heavy snows in the winter, led to the floods.

Global Warming Link: Global warming causes higher temperatures and more water vapor in the atmosphere. In winter, this means more moisture and heavier snows and, in spring, it means earlier and quicker snow melt and risk of heavier rainfalls. This melting, combined with heavy and multiple rainfalls, can lead to greater risk of flooding.

Expert: Kevin Trenberth, trenbert@ucar.edu, 303-497-1318

Consensus Science: “One of the clearest trends in the United States observational record is an increasing frequency and intensity of heavy precipitation.” (p. 46) ⁱⁱⁱ

5. Midwest Flooding (Part Two, Summer)

During the first half of June, much of the Midwestern U.S. received copious amounts of rain as one storm system after another traversed the region. Parts of Indiana, Illinois, Iowa and Wisconsin received more than a foot of rain with widespread flooding reported along the Mississippi River and its tributaries. During the month of June, more than 1,100 daily precipitation records were broken throughout the region.

Global Warming Link: While global warming cannot be held responsible for the occurrence of any specific storm system, it has added about 4 percent more water vapor into the atmosphere. That increase, in turn, causes more intense events with heavier rains and greater risk of flooding.

Expert: Peter Schultz, pschultz@usgcrp.gov, 202-419-3479

Consensus Science: “The amount of precipitation falling in the heaviest 1 percent of rain events increased by 20 percent during the 20th century.” (p. 47) ^{iv}

6. Southeast Drought

Rainfall deficits between September 2007 and August 2008 were still 10 to 20 inches over parts of the western Carolinas to northern Alabama even after the 5 to 9 inches of rainfall from Tropical Storm Fay, with extreme to exceptional drought persisting in the western Carolinas. Below-normal precipitation is expected to last through February 2009 in the south Atlantic states and drought is expected to persist in the Carolinas, Georgia and northeast Alabama.

Global Warming Link: Global warming increases drying and exacerbates droughts arising from other causes. Dry conditions in the Southeast are consistent with what climate scientists expect in a warmer world.

Expert: Peter Schultz, pschultz@usgcrp.gov, 202-419-3479

Consensus Science: “A severe drought has affected the southwestern U.S. from 1999 through 2007 ... the southeastern U.S. has experienced severe drought as well.” (p.61)^v

7. California Wildfires

California’s wildfire season got off to an unusually early start in June, mainly because of a lack of rain. California endured its driest spring in 114 years of record keeping, according to the National Climatic Data Center.

The state spent \$305 million on emergency firefighting since the start of the fiscal year on July 1, \$236 million more than lawmakers had allocated in their 2008-2009 spending plan.

“Through global warming, we have now a fire season all year round,” Gov. Arnold Schwarzenegger said. “We used to have fire seasons only in the fall. But now the fire seasons start in February already.”

Global Warming Link: With global warming, there is more global heating. This dries out the land and vegetation. Then, once the moisture is depleted, the heat goes into raising temperatures. In the absence of rain, there is greater fire risk. Warmer winters also mean pine bark beetles live longer and kill off more trees, producing more fuel for fires.

Expert: Kevin Trenberth, trenbert@ucar.edu, 303-497-1318 or Peter Schultz, pschultz@usgcrp.gov, 202-419-3479.

Consensus Science: “Wildfires ... are likely to increase in frequency, severity, distribution and duration in the Southeast, the Intermountain West and the West.”^{vi}

8. Western Snow

A significant winter storm brought heavy snowfall to areas of Montana, Wyoming and Idaho Oct. 10-12. The snowy conditions brought record snowfall and gusty winds knocked down trees and power lines and reduced visibility. Several Wyoming counties reported as much as 33 inches of snow. In Montana, the city of Red Lodge recorded its highest snowfall total during a 24-hour period when 42 inches of snow fell.

Global Warming Link: The snowstorm in the northwest U.S. in October was exceptional for so early in the season. A strong, warm ridge of high pressure aloft set the stage for the pattern that produced the storm and is consistent with many other such scenarios in recent years that are directly related to the larger-scale warming.

Expert: Stu Ostro, sostro@weather.com, 404-210-7105

Consensus Science: “A widespread increase in annual precipitation is projected ... over most of the North American continent.” (p.91)^{vii}

9. Colorado Heat Wave

In August, Denver experienced 24 consecutive days of temperatures of 90 degrees and higher. That broke the city’s previous record of 18 days set in 1874 and 1901. On Aug. 1, it reached 104 degrees, breaking a record set in 1938 and on Aug. 2, it reached 103 degrees, breaking a record set in 1878.

Global Warming Link: Any specific heat wave is caused by particular weather patterns, but global warming is increasing the odds that extreme heat waves occur, leading to more broken records.

Expert: Kevin Trenberth, trenbert@ucar.edu, 303-497-1318

Consensus Science: “(One recent study showed) the more intense and frequent summertime heat waves over the southeast and western U.S. were related in part to base state circulation changes due to the increases in greenhouse gases (GHGs). An additional factor for extreme heat is drier soils in a future warmer climate.” (p. 100)^{viii}

10. Arctic Sea Ice Minimum

On Sept. 14, Arctic sea ice was measured at its second-lowest extent on record. The previous year, it measured the lowest ever. The 2008 coverage area was nearly a million square miles smaller than the 1979 to 2000 average, dramatically strengthening the long-term downward trend of sea ice extent.

Global Warming Link: While not an explicit weather event, the reduction in sea ice is already impacting weather in Alaska, Standing water, rather than ice, changes the coastal microclimate by increasing temperatures, winds and unstable air. People are now more able than in the past to sail to the North Pole. They also can sail through the Northwest Passage in the summer without hitting ice

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Consensus Science: “Melting of highly reflective Arctic snow and ice reveals darker land and ocean surfaces, increasing absorption of the sun’s heat and further warming of the planet.”^{ix}

Experts:

- Robert W. Corell, Vice President of Programs at The John Heinz III Center for Science, Economics and the Environment
- Stu Ostro, meteorologist and The Weather Channel’s senior director of weather communications
- Peter Schultz, director of the U.S. Climate Change Science Program Office
- Kevin Trenberth, head of the Climate Analysis Section at the National Center for Atmospheric Research and lead author of the 2001 and 2007 United Nations IPCC report.

ⁱ The White House report, “Scientific Assessment of the Effects of Global Change on the United States” issued in May 2008, is available online at <http://www.climatechange.gov/Library/scientific-assessment/>.

ⁱⁱ White House Report (see above).

ⁱⁱⁱ The National Oceanic and Atmospheric Administration report, “Weather and Climate Extremes in a Changing Climate” issued in June 2008, is available online at <http://www.climatechange.gov/Library/sap/sap3-3/final-report/>.

^{iv} NOAA Report (see above).

^v White House Report (see above).

^{vi} White House Report (see above).

^{vii} White House Report (see above).

^{viii} NOAA Report (see above).

^{ix} The Arctic Climate Impact Assessment report, Impacts of a Warming Arctic, the Arctic Climate Impact Assessment, issued in 2004, is available at: <http://amap.no/acia>