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For Immediate Release

New report finds human-caused climate change increased the severity of many extreme events in 2014

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Human activities, such as greenhouse gas emissions and land use, influenced specific extreme weather and climate events in 2014, including tropical cyclones in the central Pacific, heavy rainfall in Europe, drought in East Africa, and stifling heat waves in Australia, Asia, and South America, according to a new report released today. The report, "Explaining Extreme Events of 2014 from a Climate Perspective" published by the *Bulletin of the American Meteorological Society*, addresses the natural and human causes of individual extreme events from around the world in 2014, including Antarctica. NOAA scientists served as three of the five lead editors on the report.

"For each of the past four years, this report has demonstrated that individual events, like temperature extremes, have often been shown to be linked to additional atmospheric greenhouse gases caused by human activities, while other extremes, such as those that are precipitation related, are less likely to be convincingly linked to human activities," said Thomas R. Karl, L.H.D., director of NOAA's National Centers for Environmental Information. "As the science of event attribution continues to advance, so too will our ability to detect and distinguish the effects of long-term climate change and natural variability on individual extreme events. Until this is fully realized, communities would be well-served to look beyond the range of past extreme events to guide future resiliency efforts."

In this year's report, 32 groups of scientists from around the world investigate 28 individual extreme events in 2014 and break out various factors that led to the extreme events, including the degree to which natural variability and human-induced climate change played a role. When human influence for an event cannot be conclusively identified with the scientific tools available today, this means that if there is a human contribution, it cannot be distinguished from natural climate variability.

The report this year added analysis on new types of events including wildfires and Antarctic sea ice extent, and in one case looked at how land use patterns may influence the impacts and severity from precipitation.

A long exposure image shows the El Portal Fire burning near Yosemite National Park, California in late July 2014. On the morning of July 28, the fire had burned more than 2,500 acres and was

just five percent contained. More than 400 firefighters and several helicopters battled the flames. (Credit: Stuart Palley, EPA)

Key findings for each of the assessed events include:

North America:

- Overall probability of California wildfires has increased due to human-induced climate change, however, no specific link could be made for the 2014 fire event.
- Though cold winters still occur in the upper Midwest, they are less likely due to climate change.
- Cold temperatures along the eastern U.S. were not influenced by climate change, and eastern U.S. winter temperatures are becoming less variable.
- Tropical cyclones that hit Hawaii were substantially more likely because of human-induced climate change.
- Extreme 2013-14 winter storm season over much of North America was driven mainly by natural variability and not human caused climate change.
- Human-induced climate change and land-use both played a role in the flooding that occurred in the southeastern Canadian Prairies.

Around the World:

South America

- The Argentinean heat wave of December 2013 was made five times more likely because of human-induced climate change.
- Water shortages in Southeast Brazil were not found to be largely influenced by climate change, but increasing population and water consumption raised vulnerability.

Europe

- All-time record number of storms over the British Isles in winter 2013-14 cannot be linked directly to human-induced warming of the tropical west Pacific.
- Extreme rainfall in the United Kingdom during the winter of 2013-2014 was not linked to human-caused climate change.
- Hurricane Gonzolo was within historical range of strength for hurricanes transitioning to extratropical storms over Europe.
- Extreme rainfall in the Cévennes Mountains in southern France was three times more likely than in 1950 due to climate change.

- Human influence increased the probability of record annual mean warmth over Europe, NE Pacific, and NW Atlantic.

Middle East and Africa

- Two studies showed that the drought in East Africa was made more severe because of climate change.
- The role of climate change in the Middle East drought of 2014 remains unclear. One study showed a role in the southern Levant region of Syria, while another study, which looked more broadly at the Middle East, did not find a climate change influence.

Asia

- Extreme heat events in Korea and China were linked to human-caused climate change.
- Drought in northeastern Asia, China and Singapore could not conclusively be linked to climate change.
- The high west Pacific tropical cyclone activity in 2014 was largely driven by natural variability.
- Devastating 2014 floods in Jakarta are becoming more likely due to climate change and other human influences.
- Meteorological drivers that led to the extreme Himalayan snowstorm of 2014 have increased in likelihood due to climate change.
- Human influence increased the probability of regional high sea surface temperature extremes over the western tropical and northeast Pacific Ocean during 2014.

Australia

- Four independent studies all pointed toward human influence causing a substantial increase in the likelihood and severity of heat waves across Australia in 2014.
- It is likely that human influences on climate increased the odds of the extreme high pressure anomalies south of Australia in August 2014 that were associated with frosts, lowland snowfalls and reduced rainfall.
- The risk of an extreme five-day July rainfall event over Northland, New Zealand, such as was observed in early July 2014, has likely increased due to human influences on climate.

Antarctica

- All-time maximum of Antarctic sea ice in 2014 resulted chiefly from anomalous winds that transported cold air masses away from the Antarctic continent, enhancing

thermodynamic sea ice production far offshore. This type of event is becoming less likely because of climate change.

“Understanding our influence on specific extreme weather events is ground-breaking science that will help us adapt to climate change,” said Stephanie C. Herring, Ph.D., lead editor for the report at NOAA’s National Centers for Environmental Information. “As the field of climate attribution science grows, resource managers, the insurance industry, and many others can use the information more effectively for improved decision making and to help communities better prepare for future extreme events.”

The report was edited by Herring, along with Martin P. Hoerling, NOAA’s Earth System Research Laboratory; James Kossin, NOAA’s National Centers for Environmental Information; Thomas Peterson, World Meteorological Organization’s Commission for Climatology and formerly with NOAA’s National Centers for Environmental Information; and Peter A. Stott, UK Met Office Hadley Centre. The report includes a global authorship from 21 countries. View the full report on the AMS website (<https://www2.ametsoc.org/ams/index.cfm/publications/bulletin-of-the-american-meteorological-society-bams/explaining-extreme-events-from-a-climate-perspective/>).

"AMS is pleased to collaborate with NOAA on providing the public with an accessible, peer-reviewed basis for understanding our changing world," said AMS Executive Director Keith Seitter. "Between the State of the Climate report earlier this year and now this annual Explaining Extremes collection, an ever clearer picture emerges of our advancing scientific capabilities to identify how climate change is affecting us."

NOAA’s mission is to understand and predict changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and to conserve and manage our coastal and marine resources. Join us on Facebook, Twitter, Instagram and our other social media channels.