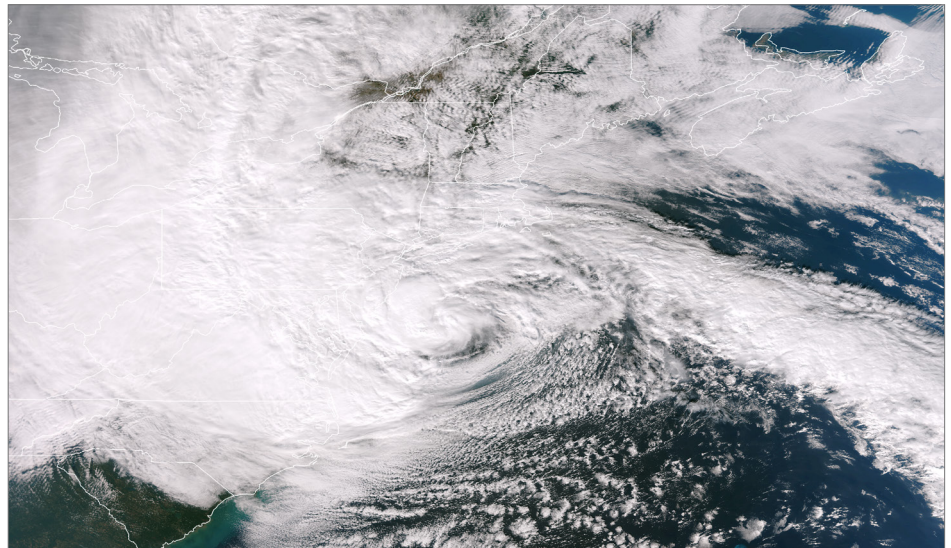


## ESRL Physical Sciences Division

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Satellite image on 29 October 2012 showing the storm system of post-tropical storm Sandy just before making landfall along the New Jersey coast.

# Interpreting Climate Conditions

Climate attribution is a scientific process for identifying the major causes of observed climate and weather patterns. This includes extreme events for which great public interest exists because they produce profound societal impacts, and trends of decade-to-century duration. Key research questions are: What are the causes of extreme events? Is there a change in frequency? To what extent are human influences or natural processes at play?

## Why attribution?

Policy-makers, decision-makers, and the public are increasingly interested in explanations of current climate conditions and how they compare with the past. They also want to know why climate is evolving as observed; that is, to provide attribution of the causes for observed climate variations and change.

Of great importance is ensuring that natural variability, when occurring, is not misunderstood to indicate that climate change is either not happening or that it is happening more intensely than the true

human influence. For example, learning whether recent drought in the western U.S. is due mainly to natural factors of climate variability where a return toward previous climate conditions might be anticipated, or if it is instead a longer-term trend toward increasing dryness in the region due to human-caused climate change. Armed with this information, preparations can be made to respond to similar events in the future.

## How is attribution performed?

ESRL's Physical Sciences Division led the creation of a Climate Attribution activity to provide explanations of the observed state of the climate system, specifically: U. S. annual surface temperature and precipitation; U. S. extreme events and major climate anomalies, including drought, cold outbreaks, heat waves, and floods; intensity of the hurricane season; and apparent abrupt regional changes. The group will assess the performance of climate predictions including: explaining the success and failure of U.S. seasonal temperature and precipitation predictions, ocean predictions and drought outlooks.

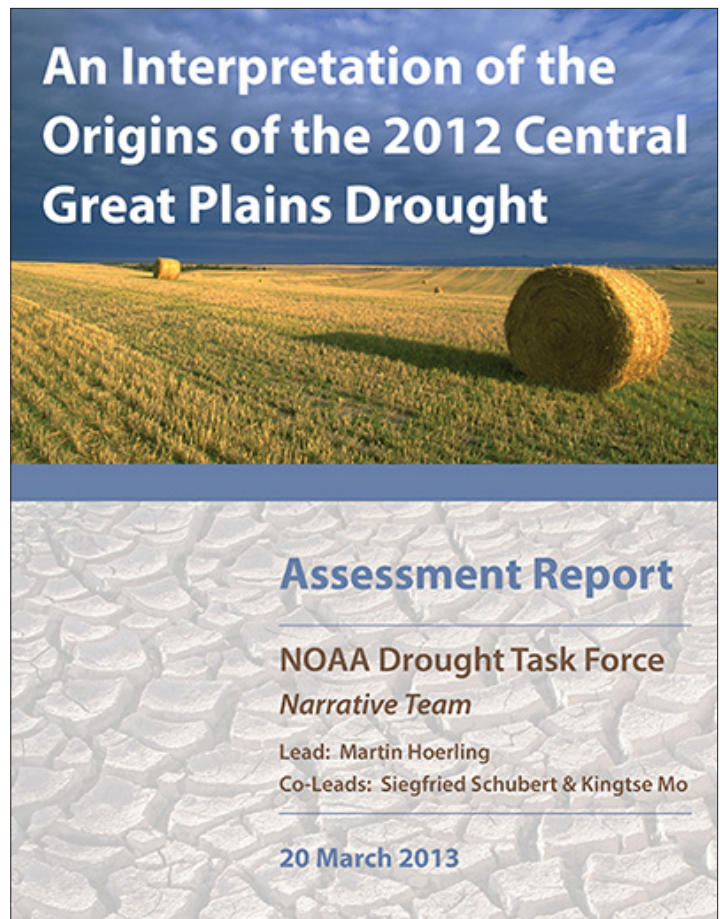
The scientific methods used can involve both analyzing observations and their past climate

relationships, and experimentation with climate models to evaluate climate processes that could force changes.

## What are the benefits?

Timely and authoritative explanations of current and evolving climate conditions are required to meet surging public interest and needs for climate information.

Without clear and present knowledge of the state of the climate system, policy and decision makers cannot make informed decisions concerning how society should invest in critical infrastructure in risk-prone areas. The over 1,800 lives lost in Hurricane Katrina alone, the vast devastation of Gulf coastal and related marine resources, the more than 180,000 lost jobs, and the \$100B financial loss during the 2005 hurricane season are striking examples of the need to inform policy and decision makers of the causes of such events and related implications for the future. ESRL's Physical Sciences Division has led the assessment of several recent droughts, each of which had major impacts on the Nation's commerce and economy, including the Texas 2011 event, the U. S. 'Cornbelt' 2012 event, and the 2012-2014 California drought. These studies are occurring in coordination with interagency groups and with the National Integrated Drought Information System (NIDIS) in order to provide timely and expert scientific information to stakeholders and decision makers seeking to mitigate drought impacts. Floods, such as occurring in Missouri River Basin in 2011 for which an assessment was done in partnership with the U.S. Army Corp of Engineers, or over northeast Colorado in



*This report describes the morphology of the 2012 U.S. central Great Plains drought, placing the event into a historical context, and providing a diagnosis of its proximate and underlying causes. The full report can be found online at: [www.drought.gov/drought/content/drought-task-force-report-page](http://www.drought.gov/drought/content/drought-task-force-report-page)*

2013 for which there is an ongoing study, address additional societal risks from weather and climate extremes. The causes of these and other events are examined in a predictive context to learn what factors could have led to improved early warning and preparedness.

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