



Attribution

A Core Component of a *National Climate Service*

First International Meeting on Attribution of Climate Events

January 26 2009

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Attribution: a Climate Service Activity



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• Attribution is the *scientific process* of establishing cause & effect.

- determining the principal causes or physical explanation for observed conditions

Attribution is a *service activity* that *explains* climate conditions.

- distinguishing cyclical from trend, natural from anthropogenic; regular and reliable

• Attribution is a *service activity* that *explains* climate predictions.

- elucidating the success and failure of forecasts, diagnoses limits in models

• Attribution is *stewardship*....an obligation of NOAA science

- conducting careful, responsible science for public good, and enabling decision making

Who is Asking for Climate Attribution?

- **Public:** *they don't just want to know what happened, but why it happened and the likelihood of it happening again....*



—“The cat did it.”—
“El Nino did it”

- **Policy Makers:** *Global Change Research Act states Congress's desire for a continual and iterative appraisal of climate, not merely quadrennial assessment reports.*
- **Decision Makers:** *reliable and timely explanations of evolving climate conditions empowers the Nation with science-based knowledge to manage risk and seize opportunities.*

Attribution is fundamentally science based, being propelled by surging demand for climate information...

Attribution of NOAA Climate Forecast Performance

7 October 2005

the US House Committee on Science met to have NOAA explain its prediction of hurricanes.



What Caused the Record 2005 Hurricane Season?



Hurricane Katrina
Gulfport, Mississippi
August 29th, 2005

Predictions of tropical activity in the 2005 season

Source	Date	TropicalSt	Hurricanes	Major Hurricanes
CSU	Avg 1950-0	9.6	5.9	2.3
NOAA	Avg	11	6	2
CSU	3 Dec 2004	11	6	3
CSU	1 April 2005	13	7	3
NOAA	16 May 2005	12-15	7-9	3-5
CSU	31 May 2005	15	8	4
NOAA	2 Aug 2005	18-21	9-11	5-7
CSU	5 Aug 2005	20	10	6
Actual activity		28	15	7

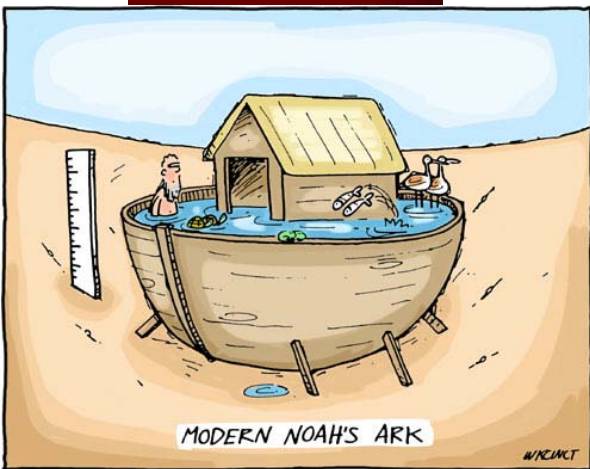
Attribution of US Drought

Spring 2006

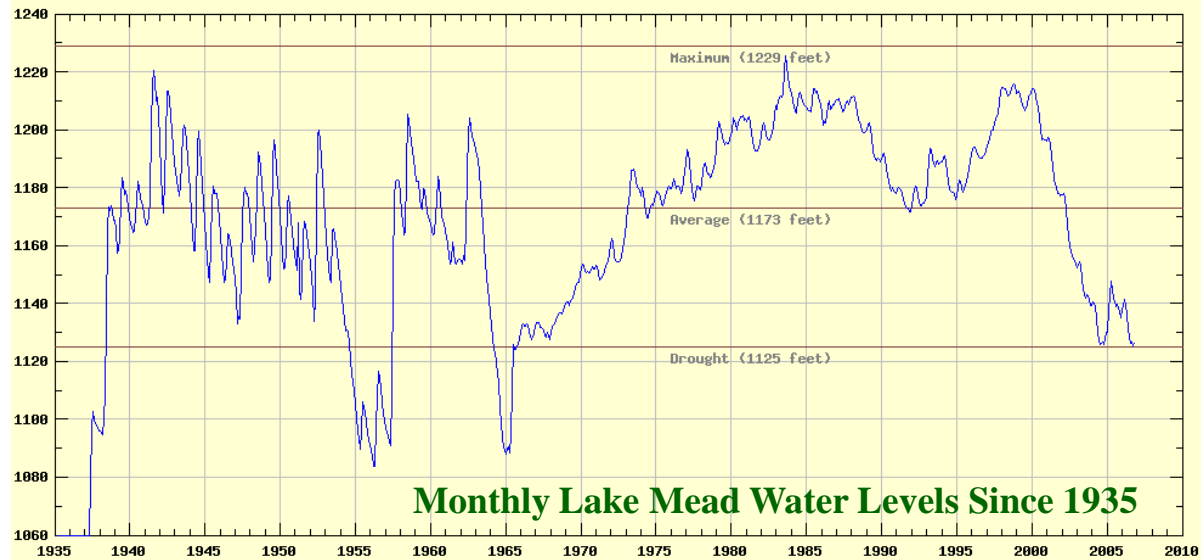
The Senate Commerce Disaster Prevention & Prediction Subcommittee requested NOAA to explain persistent drought conditions in the West.

Current:

US Dep. of Interior is seeking NOAA expertise to explain the current decline in Colorado River Flow, and implications for future EIS.



Are We Past Peak Water in the West?

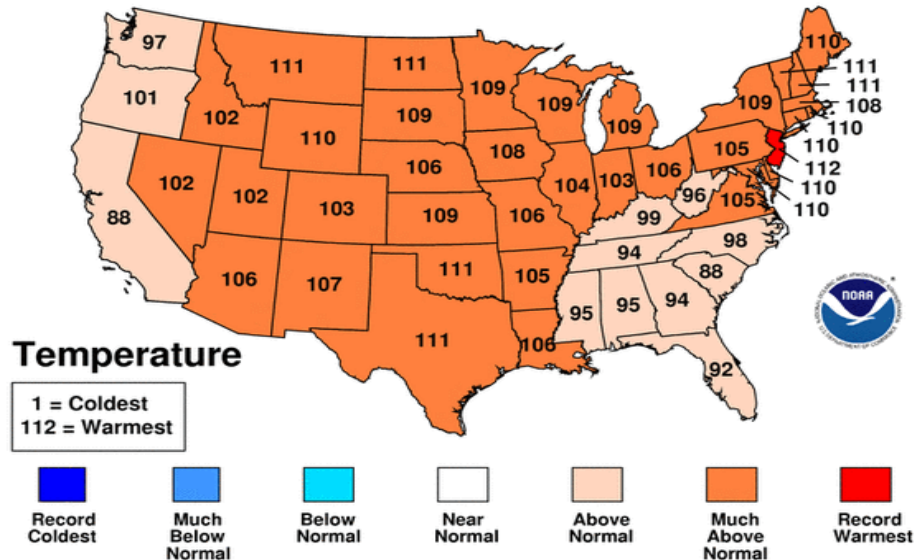


Attribution of Record Setting Warmth

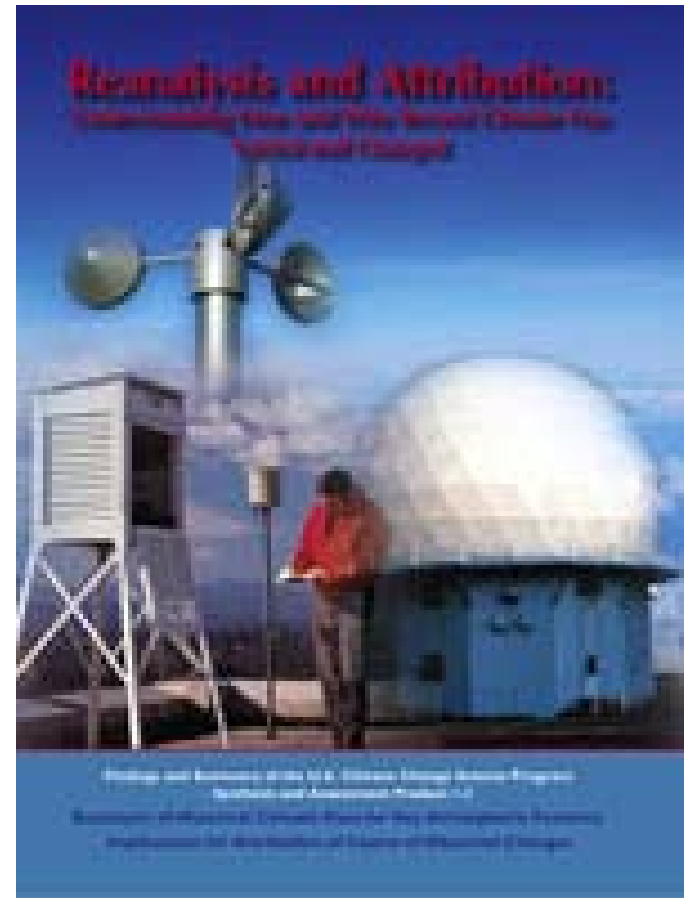
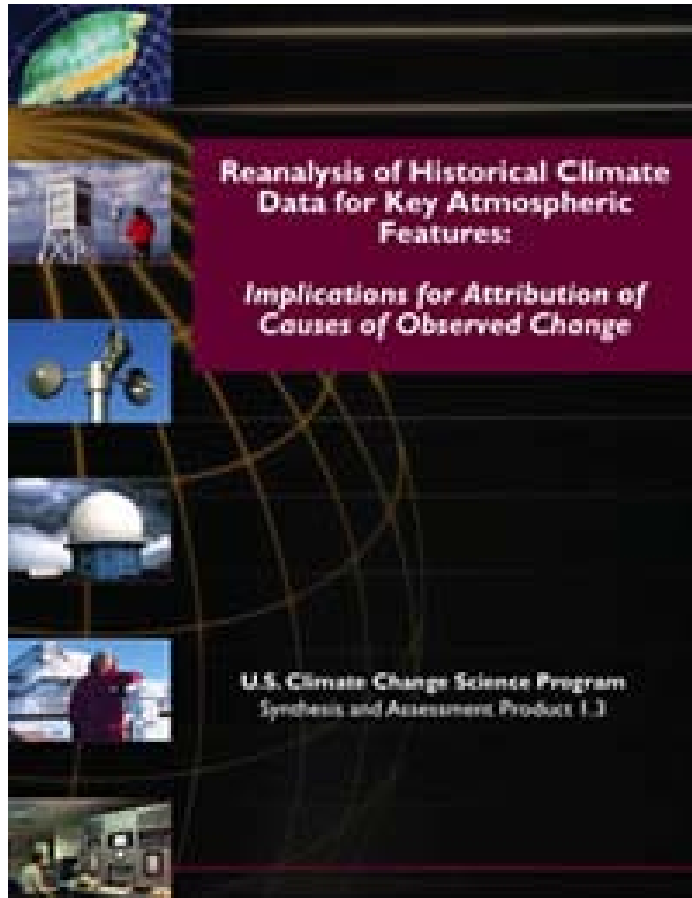
9 January 2007 NOAA reports 2006 was the warmest year on record for the U.S.

How Large of a Role Did Greenhouse Gas Emissions Play? What Were The Transient Factors?

January-December 2006 Statewide Ranks
National Climatic Data Center/NESDIS/NOAA



US Climate Change Science Program: Synthesis and Assessment Product 1.3 2008



Report Organization and Authors

Preface, Executive Summary, Introduction, Recommendations

Convening Lead Author: Dr. Randall M. Dole, NOAA

Ch. 2: Reanalysis of Historical Climate Data for Key Atmospheric Features

Convening Lead Author: Dr. Siegfried Schubert, NASA

Lead Authors: Dr. Phil Arkin, University of Maryland
Dr. James Carton, University of Maryland
Dr. Eugenia Kalnay, University of Maryland
Dr. Randal Koster, NASA

Contributing Authors: Dr. Randall Dole NOAA, Dr. Roger Pulwarty NOAA

Ch. 3: Attribution of the Causes of Climate Variations and Trends over North America during the Modern Reanalysis Period

Convening Lead Author: Dr. Martin Hoerling, NOAA

Lead Authors: Dr. Gabriele Hegerl, U. of Edinburgh, UK
Dr. David Karoly, U. of Melbourne, Australia
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Dr. David Rind, NASA

Contributing Author: Dr. Randall Dole, NOAA

Chapter 3 Questions on Attribution

- Q1: What is climate attribution, and what are the scientific methods used for establishing attribution?**
- Q2: What is the present understanding of the causes for the North American climate trends in annual temperature and precipitation during the reanalysis period?**
- Q3: What is the present understanding of the seasonal and regional differences in US temperature and precipitation trends during the reanalysis period?**
- Q4: What is the nature and cause of apparent rapid climate shifts,] having material relevance to North America, over the reanalysis period?**
- Q5: What is our present understanding of the causes for high-impact drought events over North America over the reanalysis record?**

CCSP 1.3 Report: Recommendations *For Improving Climate Attribution Capabilities*

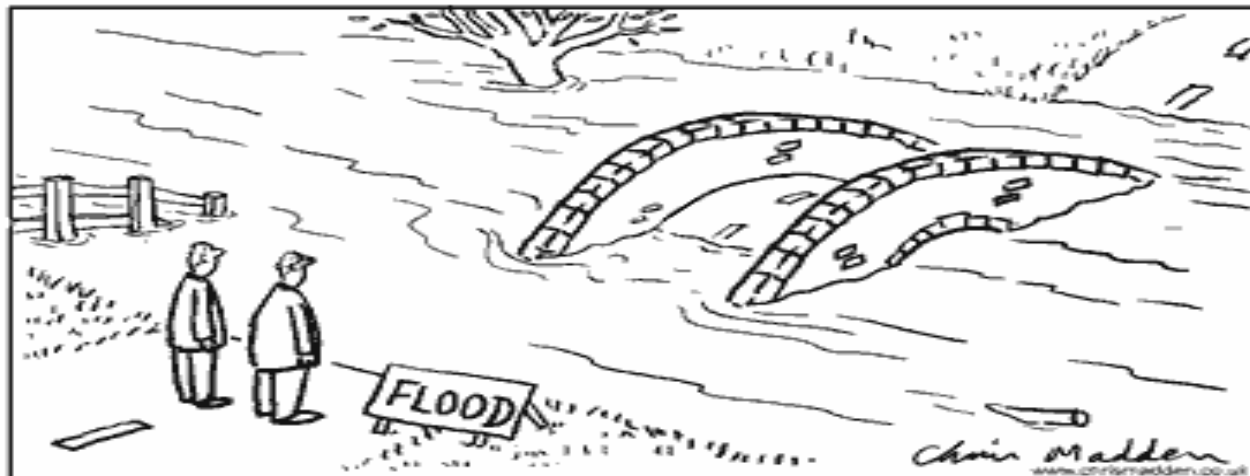
- R1:** Develop a national capability in climate attribution to provide regular and reliable explanations of evolving climate conditions relevant to decision making.
- R2:** Focus research to better explain causes of climate conditions at regional and local levels.
- R3:** Explore a range of methods to better quantify and communicate attribution findings.

NOAA CSI (Climate Scene Investigators)

A Near-Realtime Attribution Activity

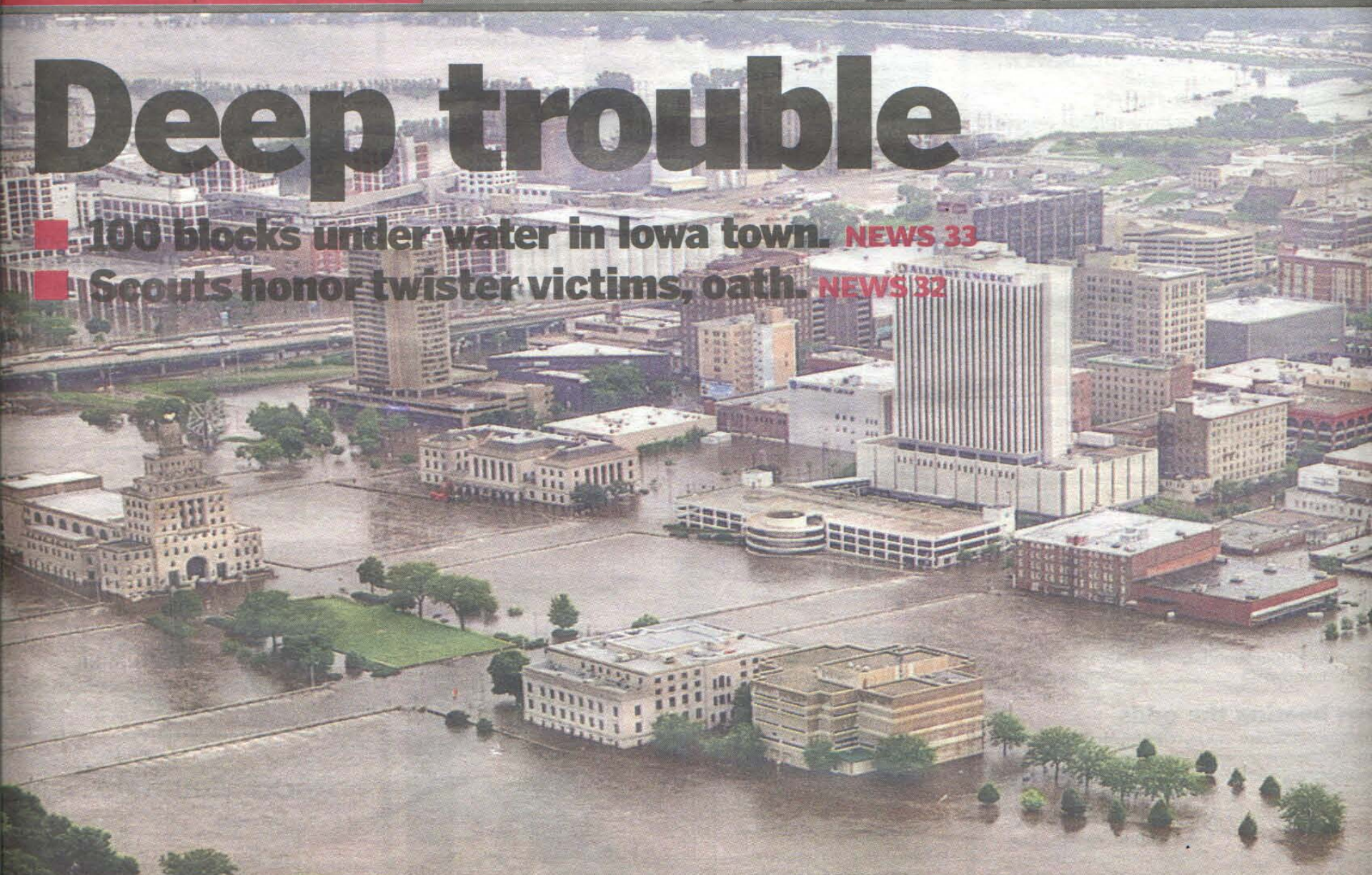




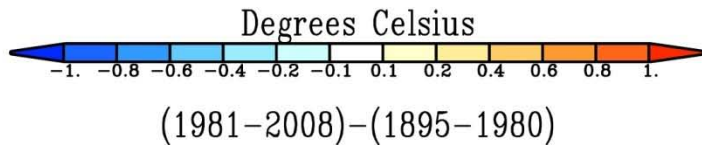
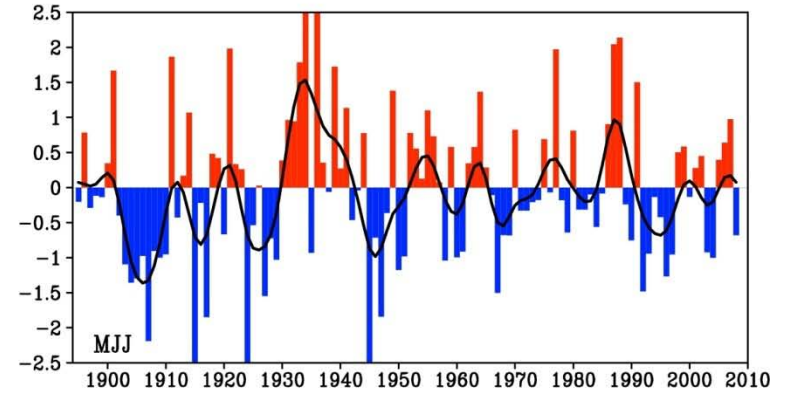
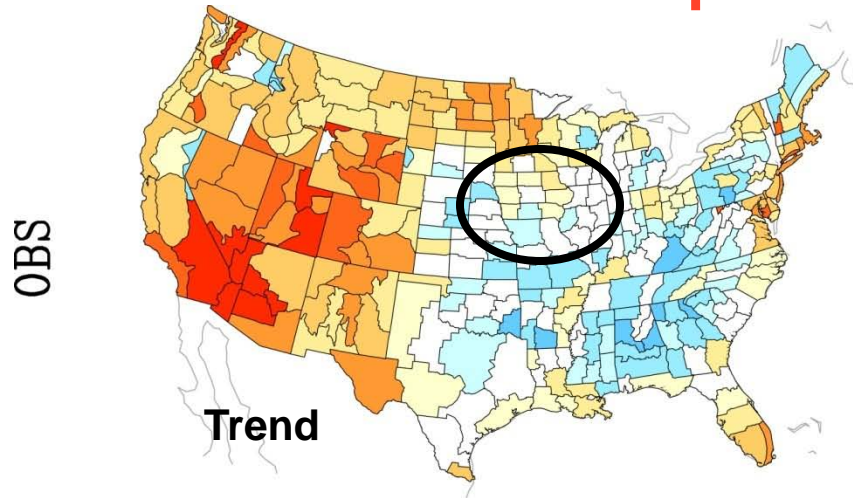


Deep trouble

- 100 blocks under water in Iowa town. **NEWS 33**
- Scouts honor twister victims, oath. **NEWS 32**

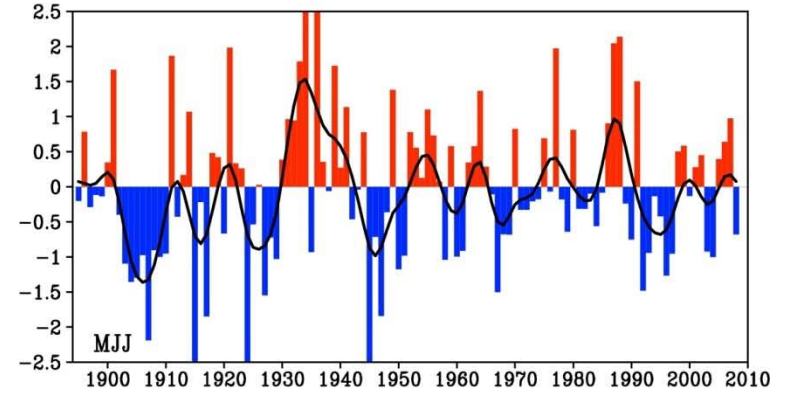
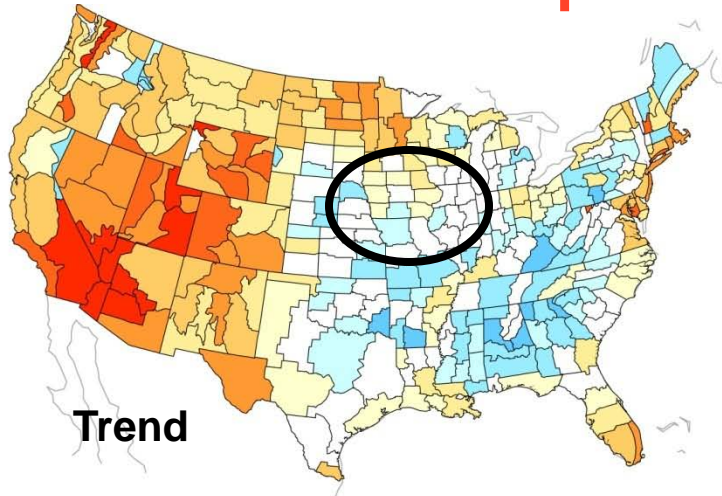


Corn Belt Temperature Variations: May-July

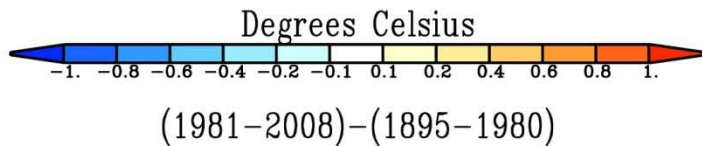
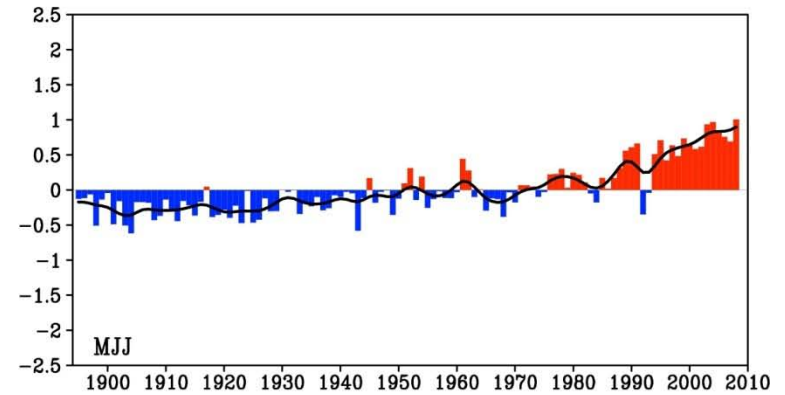
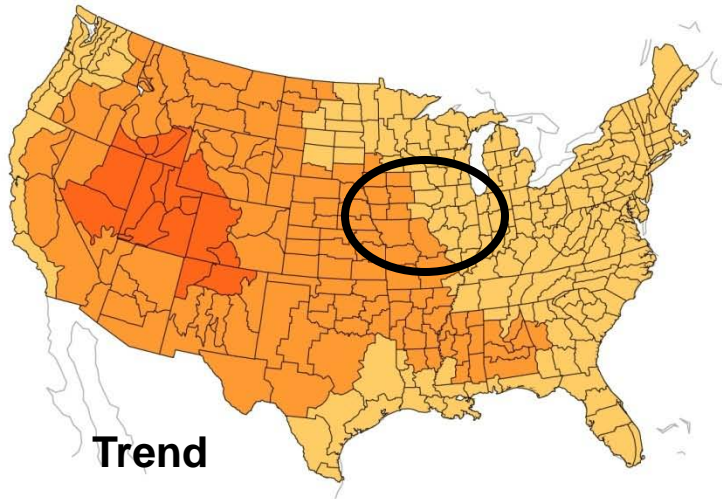


Corn Belt Temperature Variations: May-July

OBS



CMIP



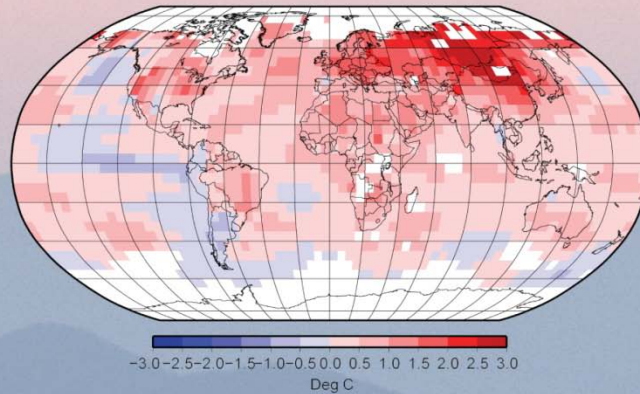
The Variability in Growing Season Corn Belt Temperatures Is Larger Than The Greenhouse Gas Warming Signal... To Date

One Portal for Near-Realtime Climate Attribution Products

STATE OF THE CLIMATE IN 2007

D. H. LEVINSON AND J. H. LAWRIMORE, Eds.

ASSOCIATE Eds.: A. ARGUEZ, H. J. DIAMOND, F. FETTERER, A. HORVITZ, J. M. LEVY



Geographic distribution of global surface temperature anomalies in 2007,
relative to the 1961 to 1990 average.

Special Supplement to the *Bulletin of the American Meteorological Society*
Vol. 89, No. 7, July 2008



Requirements for Sustained & Regular Attribution in NOAA

- **Commitment from NOAA program management**
 - *Existing CPO Program: “Explaining Climate Conditions to Improve Predictions”*
 - *Proposed NOAA Activity: “Integrated Earth System Analysis”: 2011*
 - *Proposed NOAA Activity: “A NOAA Attribution Program”: 2011”*

- **Coordination between NOAA data, prediction and diagnostic centers**

Requirements for Sustained & Regular Attribution in NOAA

- **Defined attribution process. Key pillars of support are:**
 - *observational data (accurate knowledge of what happened)*
 - *model simulations (unravel the causal relations):*
 - *bold, persistent experimentation*
- **Defined Attribution Products for Regular Delivery**
 - *Annual mean US surface temperature*
 - *Regular explanation of success/failure of climate outlooks*
 - *Climate extremes (events of opportunity)*
- **Identified responsibility for delivery of attribution products (e.g NCEP)**
 - *integration of NOAA research, data, and service expertise in generating attribution products*
- **Ensured Timeliness and Accuracy**
 - *near real time products*
 - *appropriate measures of uncertainty*