Climate Attribution

- *What is it?*

- *Why do it?*

- *How are we doing it?*

Earth System Research Laboratory

What is Attribution?

- Attribution is the *scientific process* of establishing the physical causes or physical explanation for observed climate conditions.

- Attribution, by scientifically ascertaining mechanisms responsible for climate conditions, informs predictability and prediction science.

Why do Attribution?

° *Policy makers don't just want to know what happened, but why it happened & the likelihood of it happening again.*

° *Climate science must distinguish impacts caused by temporary fluctuations from persistent impacts due to climate changes.*

° A major role for *attribution science is to inform decision makers on whether they need to transition from a preparedness mode of precautionary response/actions to an adaptation mode involving investment responses and actions (i.e., behavioral change).*

How Are We Doing Attribution?

° **Attribution is not a "sometime" activity, its _an all-the-time activity_**

   Vision is to build a capacity to explain climate conditions all the time, in real time.

° **Successful attribution is "connecting data" not " just collecting data"**

   Successful attribution requires a skilled, integrated Team.

° **Model experimentation to link climate conditions & forcings**

   Attribution requires repeated and ongoing experimentation. We employ multi-model, large ensemble, multi-forcing simulations with GCMs.
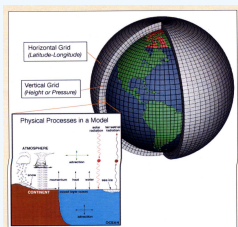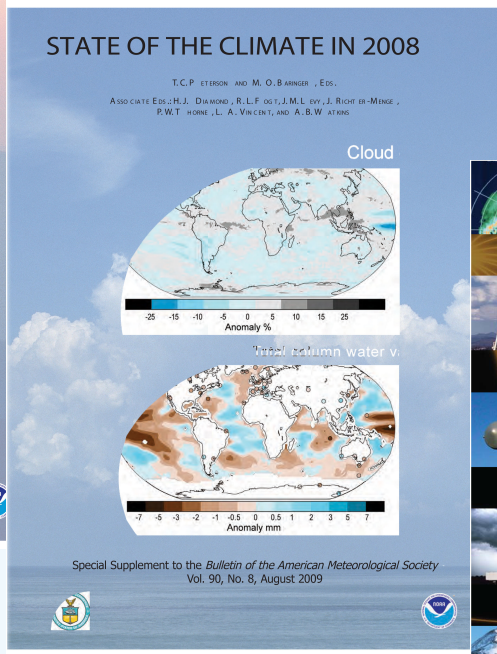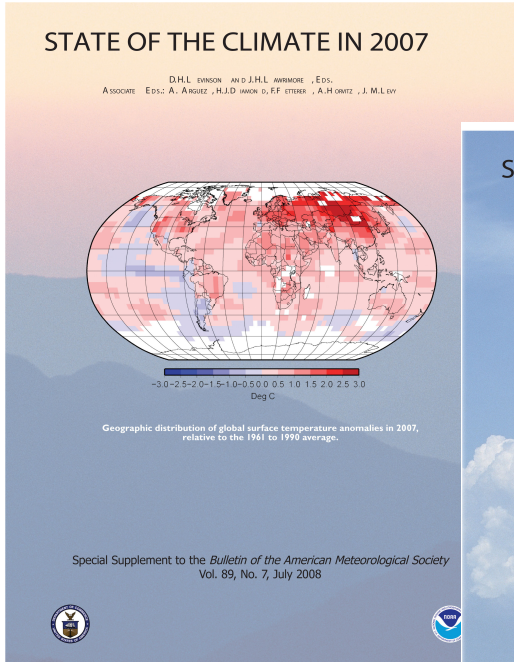
° **We are conducting attribution "opportunistically"**

   Our attribution activity is resource constrained. It therefore is opportunistic rather than comprehensive, and delayed mode rather than real time.

Communicating Attribution Science

STATE OF THE CLIMATE IN 2007

D.H.L evinson and J.H.L awrimore, Eds.
Associate Eds.: A. Arguez, H.J.D iamond, F.F etterer, A.H orvitz, J. M.L evy

-3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0
Deg C

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

STATE OF THE CLIMATE IN 2008

T.C.P eterson and M. O.B aringer, Eds.
Associate Eds.:H.J. Diamond, R.L.F ogt, J.M.L evy, J. Richter-Menge, P.W.T horne, L. A.V incent, and A.B.W atkins

Cloud

-25 -15 -10 -5 0 5 10 15 25
Anomaly %

-7 -5 -3 -2 -1 -0.5 0 0.5 1 2 3 5 7
Anomaly mm

Special Supplement to the *Bulletin of the American Meteorological Society*
Vol. 90, No. 8, August 2009

Reanalysis of Historical Climate Data for Key Atmospheric Features:

Implications for Attribution of Causes of Observed Change

U.S. Climate Change Science Program
Synthesis and Assessment Product 1.3

° *Explaining Current Climate Events*

° *Explaining NA Historical Climate Variability*
° *Articulating a Vision for Climate Attribution*

Monthly Conference Calls
Intense Attribution Periods

The NOAA Climate Services Portal
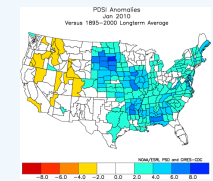*http://www.climate.gov/*

Attribution in Action
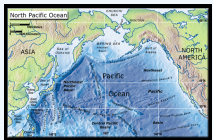
Focus Activities During the past 12-months

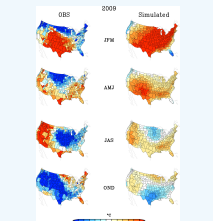° **Assessing Causes for Heavy 2009/10 Precipitation in the Red River Basin**

° **Explaining Causes for the 2009/10 Mid-Atlantic Record Snowfall**

° **Assessing Factors Responsible for Current Lack of North American Drought**

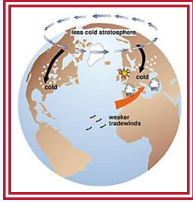° **Determining Climate Impacts of 2009/10 North Pacific Ocean Cooling**

° **Explaining Extreme Seasonality in 2009 U.S. Surface Temperatures**

Attribution in Action
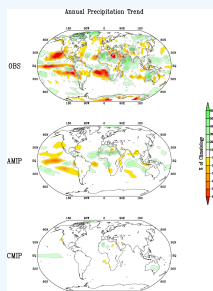
Focus Activities During the past 12-months

° **Determining the Severity of the December 2009 Blocked NAO Event**

° **Determining the Ocean's Role in the Spring 2008 Midwest Floods**

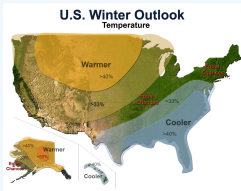° **Explaining Cold 2008 North American Surface Temperatures**

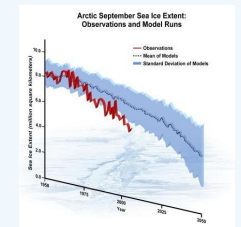° **Distinguishing Natural vs Anthropogenic Forcing of Regional Pcpn Trends (1977-06)**

Attribution in Action
Focus Activities During the past 12-months

° **Explaining Success/Failures of Recent NOAA Seasonal Outlooks**

° **Determining the Impact of the 2007 Arctic Sea Ice Loss**

° **Explaining Causes for the 1930s and 1950s U.S. Droughts**