Importance of Reliable Continuous Records of the Earth Systems

Earth System Research Laboratory
Global Monitoring Annual Conference
May 18 2010

T. J. Blasing

“Ensuring Continuity and Reliability of Long Term Measurements.”

WHAT'S REALLY CAUSING GLOBAL WARMING...

DARK BLUE: TEMPERATURE ANOMALIES 2004-2009
LIGHT BLUE: GOOGLE SEARCHES FOR "GLOBAL WARMING"

STOP RESEARCHING BEFORE IT'S TOO LATE!
A MESSAGE FROM THE MESSAGE PROLIFERATION ASSOCIATION OF AMERICA
We are:

Sponsored by:

Housed at:

We are here.
1. Is Carbon Dioxide Increasing?

2. Are CO₂ changes anthropogenic?

3. Is the temperature increasing?

4. Are 1 and 3 related?

Beer’s Law
J. Chem. Educ. 67, p 757
Document of Tropospheric CO₂ Increases

Dr. Keeling was the first to document, through continuous measurements, the current rise in atmospheric CO₂, its annual cycle and interannual variations.

Isotopic signatures of fossil carbon are showing up in the atmosphere

CO₂ concentrations at Mauna Loa, Hawaii, USA

CO₂ concentrations (ppmv)

Global Fossil Carbon Emissions

Each year, CDIAC compiles time series of global, regional and national fossil carbon emissions. Gregg Marland leads the effort, with contributions from Tom Boden and Bob Andres. The amount emitted is consistently about twice that needed to explain the Keeling Curve, above. The remaining carbon is taken up by the oceans and terrestrial biosphere.

Carbon dioxide increases are associated with matching drawdowns of atmospheric oxygen.

Documentation of Fossil-Carbon Emissions

Carbon dioxide increases are associated with matching drawdowns of atmospheric oxygen.

Carbon dioxide increases are associated with matching drawdowns of atmospheric oxygen.

Radiative Forcing Components

Hubert Lamb, Founding Director of the Climate Research Unit at the University of East Anglia recognized the importance of a consistent time series of Earth’s near-surface temperature. His work led to a temperature record used by the Intergovernmental Panel on Climate Change (IPCC).

Hubert H. Lamb
(1913-1997)
<table>
<thead>
<tr>
<th>Data Gathering (providing good quality information)</th>
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<tbody>
<tr>
<td>Quality Assurance (techniques, calibration, adjustments)</td>
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<td>Record keeping</td>
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<td>Consistent time series</td>
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<td>Independent redundant measurements/estimates</td>
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<table>
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<tr>
<th>Data Management (preserving/displaying the information)</th>
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<tr>
<td>Discovery of recorded mistakes</td>
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<tr>
<td>Archiving of time series</td>
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<tr>
<td>Presentation</td>
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<th>Analysis (using the information)</th>
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<td>Causes</td>
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<tr>
<td>Effects</td>
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</table>
1. Is Carbon Dioxide Increasing?
1. (revised) Are Greenhouse Gases Increasing?

Importance of redundant/corroborating data

**AGAGE**

**SULFUR HEXAFLOURIDE**

- Mauna Loa, Hawaii
- Other in situ stations

**NOAA**

**METHANE**

Mauna Loa

**CFC - 12**
2. Are CO₂ changes anthropogenic?

Calculations of Global Emissions on an Annual Basis reveal that we’re not only making enough CO₂ to explain the atmospheric increase, but we’re making about twice that much. *This bounds the amount of CO₂ taken up by the atmosphere and oceans*. Because the calculations are made for each fuel type (solid, liquid, gas) *isotopic composition can be estimated for comparison with changes in atmospheric concentrations*. 

![Graph showing emissions over time](image)
2. Are CO₂ changes anthropogenic?

Redundant data → Discovery of recorded mistakes

USA carbon emissions from natural gas consumption

Fig 4. Comparison of the results of this paper for natural gas consumption with CDIAC (United Nations) data (Marland et al., 2003).

Fuel amount \( \text{Mg, m}^3 \) • heat coefficient [MJ/amount] • carbon coefficient [g/MJ]

= carbon emissions [g-C]
Another reason for the higher estimates presented here, particularly for 1976 to 1991, is an apparent problem in the United Nations (UN) energy data base for natural gas, on which the emissions estimates of Marland et al. (2003) are based. Post-1976 UN accounting apparently involved some confusion of US conventions on “wet” gas (before natural gas liquids are separated out) and “dry” gas (after the liquid portion has been separated out) and the change in heating value that occurs during this “shrinkage”. After 1991 the problem was largely compensated by an accounting change in the calculation of “shrinkage” (see Fig. 4).
2. CO₂ changes are anthropogenic.

**Transport of Embodied Emissions**

**Carbon emissions (PgC y⁻¹)**

attributed to *producers*  
attributed to *consumers*

25% of the emissions growth in developing countries (2000-2008) is due to the manufacturing of products consumed in developed countries.

2. CO₂ Changes are anthropogenic

Analysis
2. CO₂ changes are anthropogenic.
3. Is the temperature increasing?

Importance of redundant/corroborating data

Documentation of Global Warming

Hubert Horace Lamb (1913-1997)

RSS = Remote Sensing Systems
UAH = University of Alabama, Huntsville

Surface and Satellite Temperatures

Direct Surface Measurements
Satellite Measurements
UAH / RSS

Jan-Dec Global Mean Temperature over Land & Ocean

NCDC/NESDIS/NOAA
3. Is the temperature increasing? Importance of redundant/corroborating data

http://www.usanpn.org/
3. Is the temperature increasing? 

Importance of redundant/corroborating data
3. Is the temperature increasing?

Importance of redundant/corroborating data
3. Is the temperature increasing? Importance of Archiving

' Climategate ': Scientists, Politicians War Over Hacked E-Mails

Do They Prove a Global Warming 'Conspiracy' or Honest Debate? The Heat Builds

Dec. 4, 2009

In e-mails, science of warming is hot debate

By David A. Fahrenthold and Juliet Eilperin
Washington Post Staff Writer

Sunday, December 5, 2009
Dale,

Ages ago there were two US DoE Technical Reports numbered 22 and 27. One was for the NH and one was for the SH. They have years 1985 and 1986. I'm sure you recall them.

Did we send you the station data? I'm sure we did on mag tapes probably! Do you still have it? I can't see the two TRs or the datasets online, so apologies if they are. If they are not online can you see if you still have them somewhere and email them back to us.

We have copies here, but we want to check whether they are the same as the one we sent you ages ago.

When replying can you include the cc in the message.

Cheers

Phil

Prof. Phil Jones

Climatic Research Unit

School of Environmental Sciences

University of East Anglia

Norwich, NR4 7TJ,

UK

Email p.jones@uea.ac.uk

Importance of Archiving

3. Is the temperature increasing?
3. Is the temperature increasing?

Importance of Archiving

At 19:53 04/12/2009, Kaiser, Dale Patrick wrote:
Dear Phil,

I spoke with Tom Boden about these databases and Tom has presented the summary below with regard to your questions about the station data.

Best wishes from all of us at CDIAC,

Dale

In 1991, when CDIAC updated the original gridded temperature anomalies through 1990 (i.e, NDP020/R1) CRU provided the underlying monthly mean temperature records from individual stations. The original release of the database (i.e., NDP020 with gridded anomalies through 1984) following the publication of TR027 in 1986 did not contain the individual station records. According to the documentation for NDP020/R1, the records for NH stations are corrected but the records for the SH are not and lack 5 expected stations (e.g., Lincoln College, New Zealand). These files have been, and remain, freely available since June 1993 from the CDIAC FTP server (see URLs below). Please realize we were still spinning 9-track tapes, 8mm tapes, and the like to satisfy data requests from the time of publication of the updates (October 1991) until June 1993.

ftp://cdiac.ornl.gov/pub/ndp020/jonesnh.dat

• • •
3. Is the temperature increasing?

**Importance of Archiving**

The original data are there, the CRU temperature record can be reconstructed from original data.

<table>
<thead>
<tr>
<th>Year</th>
<th>Temp 1</th>
<th>Temp 2</th>
<th>Temp 3</th>
<th>Temp 4</th>
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</table>
CO₂ EMISSIONS AFFECT CO₂ EMISSIONS

Atmospheric CO₂ Concentrations

Radiation Balance
Vertical Temperature Profile

CO₂ Emissions

Energy Sources

Energy Needs

General Atmospheric Circulation
Global Temperature Pattern
Global Precipitation Pattern
Changes toward Earlier Streamflow Timing across Western North America

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Scripps Institution of Oceanography, La Jolla, California

DANIEL R. CAYAN
Scripps Institution of Oceanography, and U.S. Geological Survey, La Jolla, California

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U.S. Geological Survey, and Scripps Institution of Oceanography, La Jolla, California

ABSTRACT

The highly variable timing of streamflow in snowmelt-dominated basins across western North America is an important consequence, and indicator, of climate fluctuations. Changes in the timing of snowmelt-derived streamflow from 1948 to 2002 were investigated in a network of 302 western North America gauges by examining the center of mass for flow, spring pulse onset dates, and seasonal fractional flows through trend and principal component analyses. Statistical analysis of the streamflow timing measures with Pacific climate indicators identified local and key large-scale processes that govern the regionally coherent parts of the changes and their relative importance.

Widespread and regionally coherent trends toward earlier onsets of springtime snowmelt and streamflow have taken place across most of western North America, affecting an area that is much larger than previously recognized. These timing changes have resulted in increasing fractions of annual flow occurring earlier in the water year by 1–4 weeks. The immediate (or proximal) forcings for the spatially coherent parts of the year-to-year fluctuations and longer-term trends of streamflow timing have been higher winter and spring temperatures. Although these temperature changes are partly controlled by the decadal-scale Pacific climate mode [Pacific decadal oscillation (PDO)], a separate and significant part of the variance is associated with a springtime warming trend that spans the PDO phases.
Analysis

You heard it first on WGMD

Million metric tons of oxidized carbon