Some Geological Aspects of Long- and Short-Term Climate Change Relevant to Pacific Tropical Islands*

George Devries Klein¹

Search and Discovery Article #70217 (2016)**
Posted June 20, 2016

*Adapted and modified from presentations at the University of Guam’s 2016 Sustainability Conference, April 13-14, 2016, Tumon, Guam, to the Water and Environmental Research Center of the Western Pacific, Mangilao, April 22, 2016, and the University, of Guam Marine Sciences Laboratory, Mangilao, Guam, May 13, 2016; manuscript accepted June 14, 2016.

**Datapages © 2016. Serial rights given by author. For all other rights contact author directly.

¹Geologist, Author, & Professor Emeritus of Geology, University of Illinois @ Urbana-Champaign, Barrigada, Guam (gkgeo@earthlink.net)

Abstract

Geological observations, data and measurements show that throughout the last 600 million years, global temperatures changed independently of changes in CO₂ content. Similar geological analysis of the Antarctic Vostok Ice Core shows that during the past 400,000 years increases in temperature occurred ~800-1000 years prior to measured increases in CO₂. Past temperature cycles show that climate always recovered from extremes. Evidence for “Tipping Points” and runaway “scenarios” appear absent from the geological record, even though CO₂ content was unusually high during certain past geological periods.

Recent geological research demonstrated also that Pacific Ocean coral reef growth keeps pace with rising sea level; thus barrier and fringing reefs likely can protect islands and island nations from flooding during sea level rise. Additional factors contributing to relative sea level change include island thermal subsidence, tectonic uplift, and hydro-isostasy. Mitigation by land-raising is a plausible solution to potentially threatened islands.

Acknowledgements

I would like to thank the following individuals for their helpful reviews of earlier versions of this paper: R.F. Giegengack, Bill Hudson, Thomas Klekamp, Liz Quinn, W.C. Riese, R.C. Shoup, and D.K. Voorhees.
Selected References


Darwin, Charles, 1842, The Structure and Distribution of Coral Reefs, being the first part of the geology of the voyage of the Beagle, under the command of Capt. R.N. Fitzroy during the years 1832 to 1836, London: Smith Elder.


Shoup, R.C., 2013, Climate Change, what are temperatures doing and why are they doing it? Houston Geological Society Video. Website accessed June 14, 2016, https://www.youtube.com/watch?v=6-9yJAPxf6Y.


Websites


SOME GEOLOGICAL ASPECTS OF CLIMATE CHANGE RELEVANT TO PACIFIC TROPICAL ISLANDS

George Devries Klein
Geologist, Author, and Professor Emeritus, Geology, University of Illinois @ Urbana-Champaign

FUNDING DISCLOSURE: This research was supported from personal funds only.

APRIL 13 & 22, 2016 PRESENTATION:
Researchers have determined, using various techniques, that atmospheric levels of CO₂ were multiple times higher than in the modern era. CO₂ levels did fluctuate during pre-history but with no recognizable pattern.

Temperatures during the same periods fluctuated also, but there is a repeating pattern of highs & lows. The variation in temperatures does not appear to be correlated with CO₂ at all. The hypothesis of CO₂ being the cause of increasing temperatures is not supported by this evidence.

The temperature cycles indicate that the climate always recovers from extremes, with no "tipping" points or runaway scenarios taking place, despite the incredibly high CO₂ levels.

**REFERENCES:** CO₂ from Berner & Kothvala, 2001; TEMP from: [http://www.scotese.com/climate.htm](http://www.scotese.com/climate.htm)

CO₂ Lags ~800-1,000 years behind Temperature rise; therefore CO₂ appears NOT to force global temperature increases

(FROM: Shoup, 2012; redrawn from Petit et al, 1999)
Comparison of Modeled Temperatures, Measured Temperature, and Atmospheric CO₂ Content.

- Models don’t seem to predict actual Temperature Changes.
- CO₂ seems to increase independently from change in atmospheric temperature.
- Dependency of Atmospheric Temperature on CO₂ content remains UNPROVEN

FROM: Christy, 2015

Above: Global average mid-tropospheric temperature variations (5-year averages) for 32 models (lines) representing 102 individual simulations. Circles (balloons) and squares (satellites) depict the observations.

http://scrippsco2.ucsd.edu/ - Charles Keeling
UNCERTAINTY OF CO2 RESIDENCE TIME IN ATMOSPHERE

Why is the IPCC so far out of step from dozens of peer reviewed papers? Do they require a long residence time to support their 'carbon' narrative?

See also: http://wattsupwiththat.com/2016/03/16/the-ipcc-has-been-deceiving-the-public-about-the-carbon-cycle-from-the-start/
There is this mismatch between what the climate models are producing and what the observations are showing,” says lead author John Fyfe, a climate modeler at the Canadian Centre for Climate Modelling and Analysis in Victoria, British Columbia. “We can’t ignore it.” (REFERENCE: Fyfe et al., 2016)
CORRELATION DOES NOT PROVE CAUSATION
IS a 1.5° C or a 2° C TEMPERATURE INCREASE ABOVE PRE-INDUSTRIAL TIMES a PROBLEM for GUAM, ISLAND NATIONS or MANKIND?
**ALMANAC**

<table>
<thead>
<tr>
<th>ALMANAC</th>
<th>High (°F)</th>
<th>Low (°F)</th>
<th>High (°C)</th>
<th>Low (°C)</th>
<th>Temp Difference (°C) Day/Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>JULY 22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>87</td>
<td>76</td>
<td>30.6</td>
<td>24.4</td>
<td>6.2</td>
</tr>
<tr>
<td>Record</td>
<td>92 (1994)</td>
<td>71 (1986)</td>
<td>33.3</td>
<td>21.7</td>
<td>12.6</td>
</tr>
</tbody>
</table>

**REPORTED CONDITIONS**

<table>
<thead>
<tr>
<th></th>
<th>High (°F)</th>
<th>Low (°F)</th>
<th>High (°C)</th>
<th>Low (°C)</th>
<th>Temp Difference (°C) Day/Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 21</td>
<td>86</td>
<td>76</td>
<td>30</td>
<td>24.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Last 7 Days</td>
<td>90</td>
<td>75</td>
<td>32.2</td>
<td>23.9</td>
<td>8.3</td>
</tr>
<tr>
<td>June 23-July 22</td>
<td>90</td>
<td>73</td>
<td>32.2</td>
<td>22.8</td>
<td>9.4</td>
</tr>
</tbody>
</table>

**HISTORICAL MONTHLY AVGE**

<table>
<thead>
<tr>
<th></th>
<th>High (°F)</th>
<th>Low (°F)</th>
<th>High (°C)</th>
<th>Low (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>87</td>
<td>77</td>
<td>30.6</td>
<td>25</td>
</tr>
<tr>
<td>August</td>
<td>87</td>
<td>76</td>
<td>30.6</td>
<td>24.6</td>
</tr>
<tr>
<td>September</td>
<td>87</td>
<td>76</td>
<td>30.6</td>
<td>24.6</td>
</tr>
</tbody>
</table>
In Guam, we experience daily temperature changes ~ 3 - 4X greater than 1.5 - 2.0°C!!!
DIURNAL CHANGES ON GUAM’s SCALE ARE LONG-TERM AND OCCUR GLOBALLY, EXCEEDING GUAM’s IN MANY PLACES.

http://wattsupwiththat.com/2015/08/24/lags-and-leads/
IF WE LIVE DAILY WITH A 6° C DIURNAL TEMPERATURE CHANGE, why is the UN’s IPCC projected 1.5-2° C increase in temperature a problem?

**ANSWER:** IT PROBABLY ISN’T!!!!

IN FACT, Sun is from 2X or more as effective as a climate-forcing factor than anthropogenic CO₂. (Sun accounts for 50-90% of temperature increase).

(Source: Vahrenholt, F., and Luning, S., 2015, The Neglected Sun, Arlington Heights, IL, Heartland, 412 p.)
NATURAL VARIABILITY A CRITICAL, KEY, AND MAIN PLAYER.

*Anthropogenic change is there but seems minor.*

**KEY QUESTION:**

HOW MUCH OF CLIMATE CHANGE IS NATURAL AND HOW MUCH IS ANTHROPOGENIC? ? ? ?

**ANSWER:** CLIMATE SCIENCE COMMUNITY DOES NOT KNOW!
A COMMENT ON GEOLOGY, SEA LEVEL, AND TROPICAL ISLAND SUSTAINABILITY
GEOLOGICAL HISTORY OF SEA LEVEL (LEFT); CENOZOIC SEA LEVEL (RIGHT)

(From: Snedden and Liu, 2010)
Change in rate of Rise of Sea Level is relatively constant, has slowed since 2001.

(RIGHT): 20th Century sea level changes. (From IPCC AR-5, 2014)
SIZE OF ISLANDS WITH REEFS INCREASES OR STAYS THE SAME WHILE SEA LEVEL RISES.

(“Keep Up.”)

From: Kench et al., 2015
Kench et al. (2015) Reconfirmed Darwin’s Theory of Atoll Formation by **ADDING** Rising Sea Level to the equation.

**Diagram:**
1. Active Volcano
2. Fringing Reef
3. Barrier Reef
4. Atoll

*Atoll Formation in the Indo-Pacific*

AFTER Darwin (1842)
SEA-LEVEL CHANGE, KWAJALEIN ATOLL, REPUBLIC OF MARSHALL ISLANDS SHOWING POSSIBLE SCHWABE SOLAR CYCLES

http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=1820000

INARAJAN TIDAL POOLS, GU, with Sea Level notch caused by tectonic processes.
CAUSE OF SEA LEVEL CHANGE, GUAM.

1). Tectonic Uplift – Crustal Density contrast; isostasy

2). Hydro-isostasy due to adding water to oceans from melting glaciers.

3). Thermal subsidence (crustal cooling).

4). Glacial melting. (NEW FINDING: Significant Greenland ice melting due to thermal hot spot)

5). 60- Multi-Decadal Cycles (Gervais, 2016) - Gleissberg Cycle (?)
CHINESE SOLUTION? – LAND RAISING

“Dredge, Baby, Dredge”
CONCLUSIONS – Geology & Climate Change:

1). Naturally-driven climate change has ALWAYS occurred during earth’s history.

2). Causation: Increased atmospheric CO₂ driving Temperature increases is unproven during geological past – in fact, it didn’t exist.

3). Climate models APPEAR not to predict temperature change that well.

4). Natural climate change processes dominant over anthropogenic even though anthropogenic, however minor, exists.

4). In Guam, and elsewhere, daily temperature fluctuations exceed 1.5° - 2° C by a factor of ~ 3 - 4 X – thus a 1.5° - 2° C increase is not a problem.

5). Coral Reef Growth keeps up with rising sea level limiting risk of island flooding.

6). Island sustainability where sea level is rising can be achieved by land-raising.