

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

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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.

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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.

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SOME GEOLOGICAL ASPECTS OF CLIMATE CHANGE RELEVANT TO PACIFIC TROPICAL ISLANDS

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

APRIL 13 & 22, 2016 PRESENTATION:

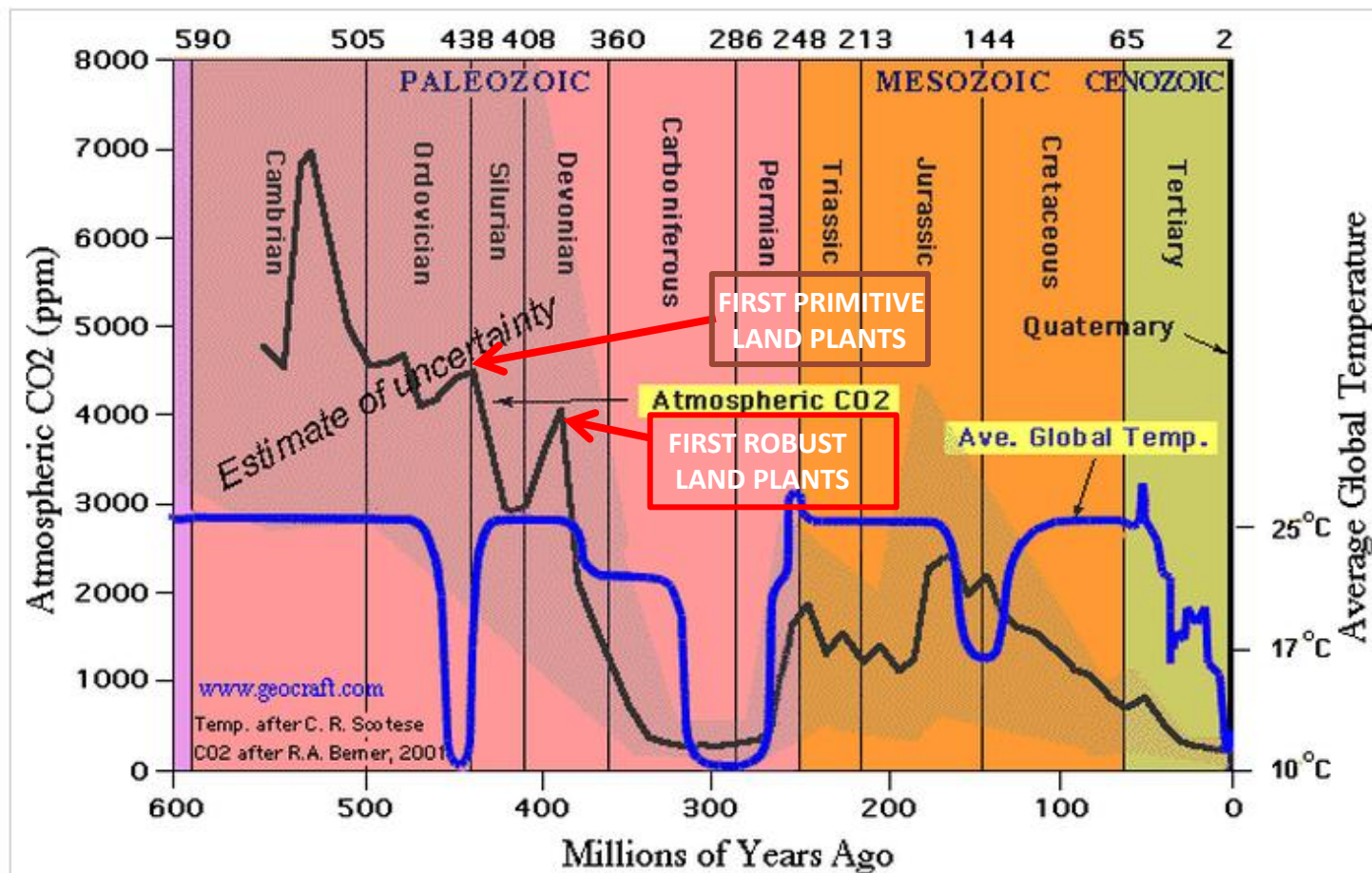


OUTLINE

- **Geological History of Climate Change**
- **Temp & CO₂**
- **Island Sustainability & Solutions**
- **Geological Conclusions**

TEMP/CO₂ EARTH HISTORY SINCE 600 Million Years Ago

600,000,000 Years – C. R. Scotese and R. A. Berner



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.

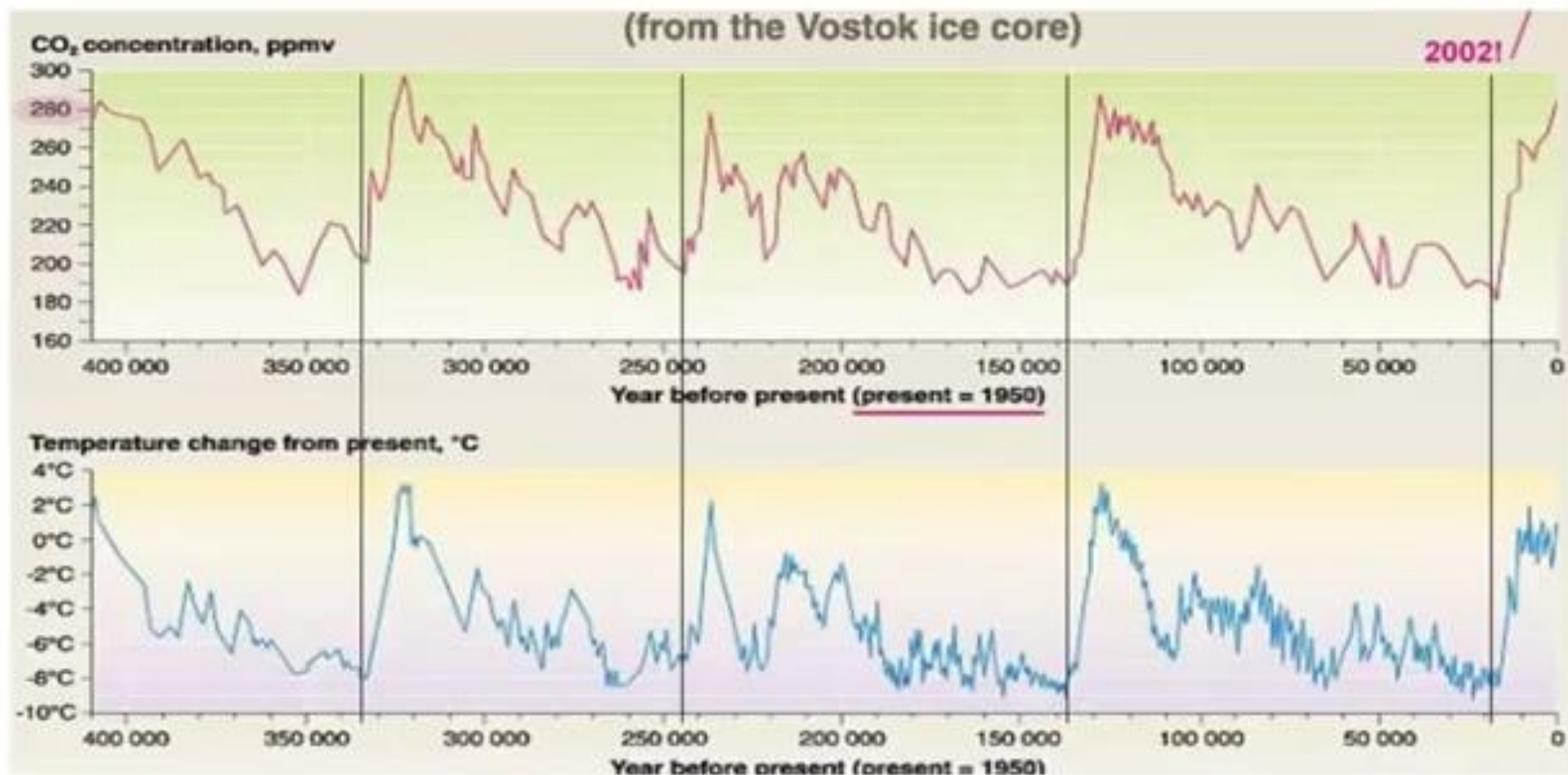
The temperature cycles indicate that the climate always recovers from extremes, with no "tipping" points or runaway scenarios taking place, despite the incredibly high CO₂ levels.

12° C = 54° F 25° C = 77° F

REFERENCES: CO₂ from Berner & Kothvala, 2001; TEMP from: <http://www.scotese.com/climate.htm>

<http://www.c3headlines.com/temperature-charts-historical-proxies.html>

TEMP/CO₂ HISTORY, VOSTOK ICE CORE, ANTARCTICA



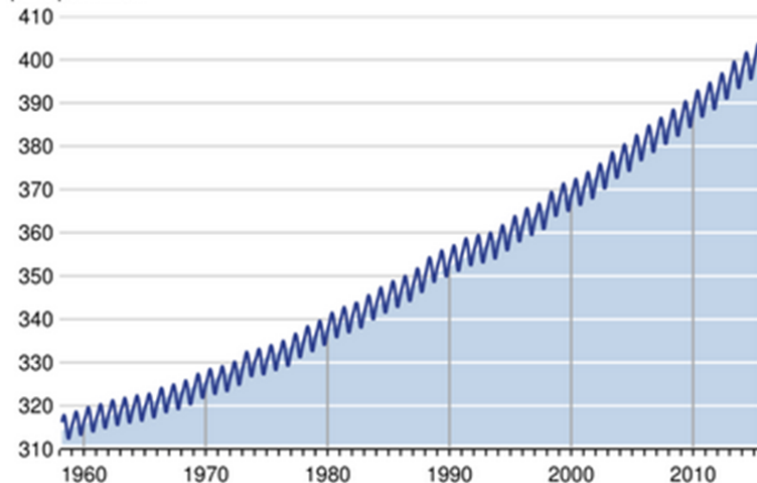
CO₂ Lags ~800-1,000 years behind Temperature rise; therefore
CO₂ appears NOT to force global temperature increases

(FROM: Shoup, 2012; redrawn from Petit et al, 1999)

CO₂ Concentration at Mauna Loa Observatory, Hawaii

Monthly Carbon Dioxide Concentration

parts per million

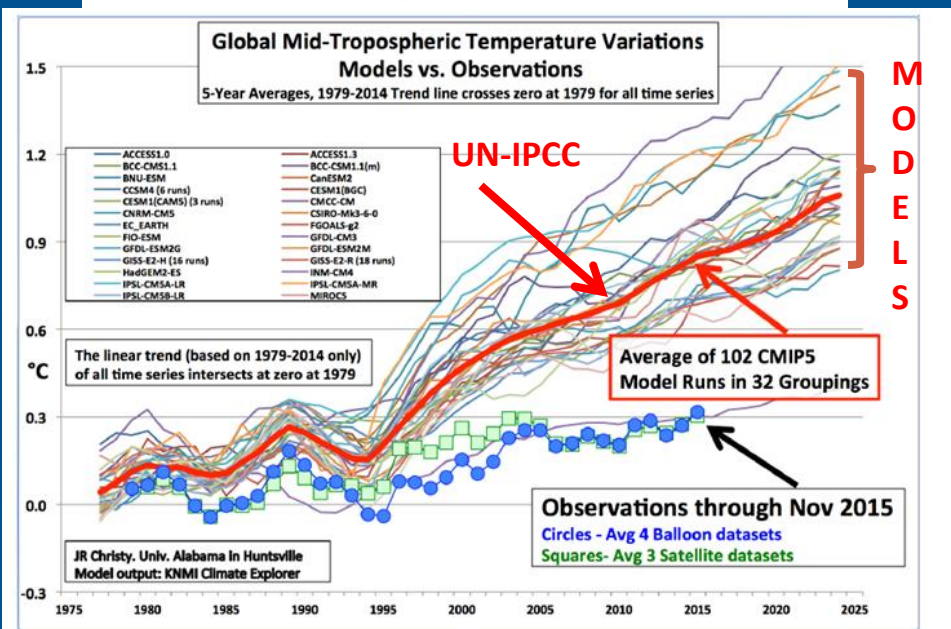


Comparison of Modeled Temperatures, Measured Temperature. and Atmospheric CO₂ Content.

- 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

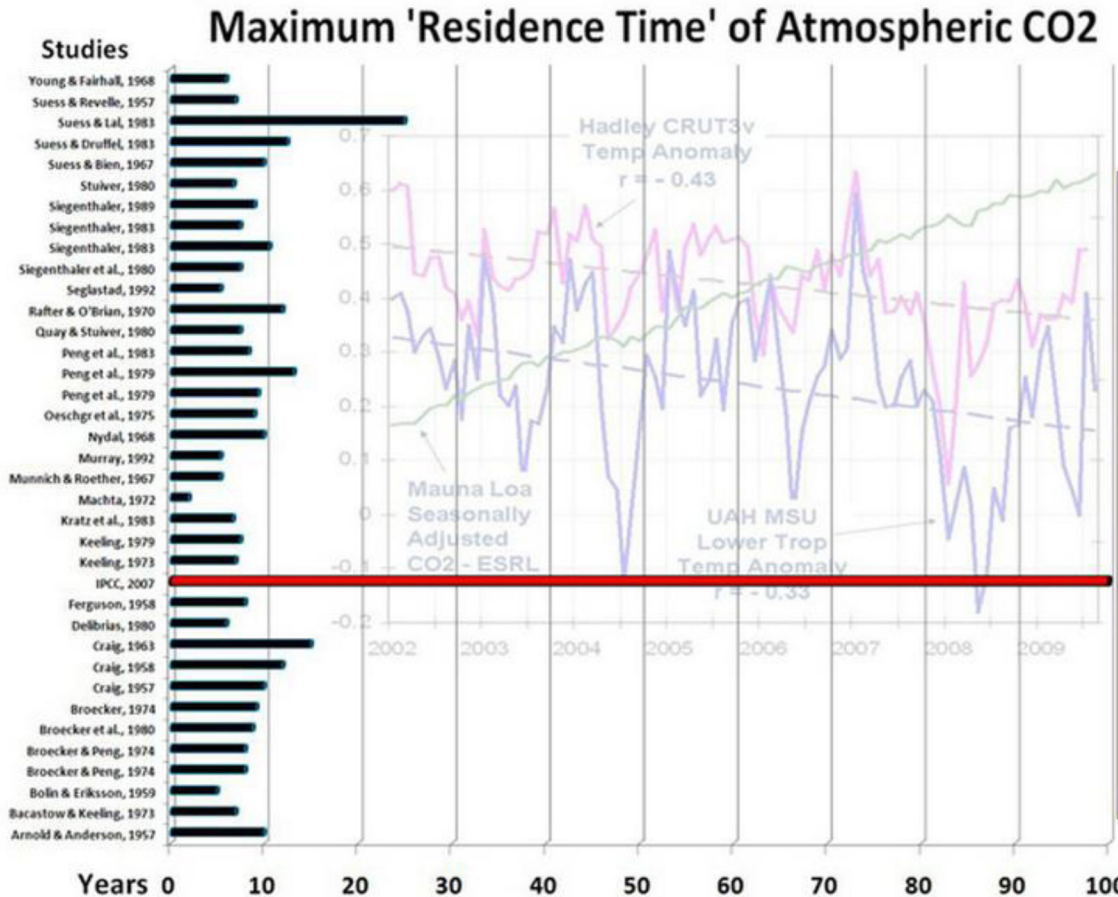


FROM: Christy, 2015

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.

UNCERTAINTY OF CO₂ RESIDENCE TIME IN ATMOSPHERE

CO₂ residence times:



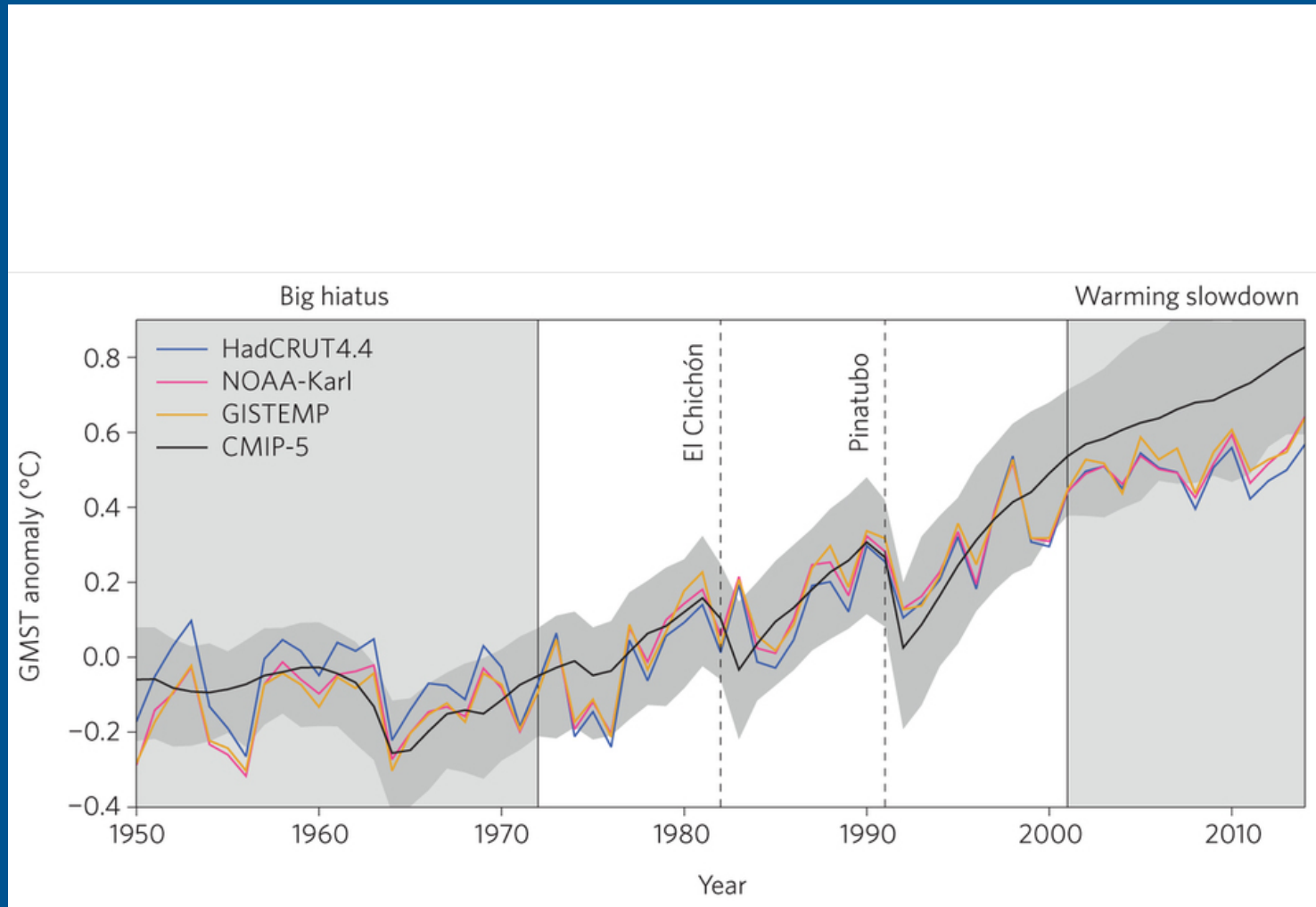
**UN-IPCC
(Nobel
Peace Prize
Winner)**

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?

<http://wattsupwiththat.com/2015/02/22/the-disparity-between-ipcc-science-reports-summary-for-policymakers-and-reality-requires-a-political-science-solution/>

See also: <http://wattsupwiththat.com/2016/03/16/the-ipcc-has-been-deceiving-the-public-about-the-carbon-cycle-from-the-start/>

Hiatus, Pause, Slow-Down???



“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

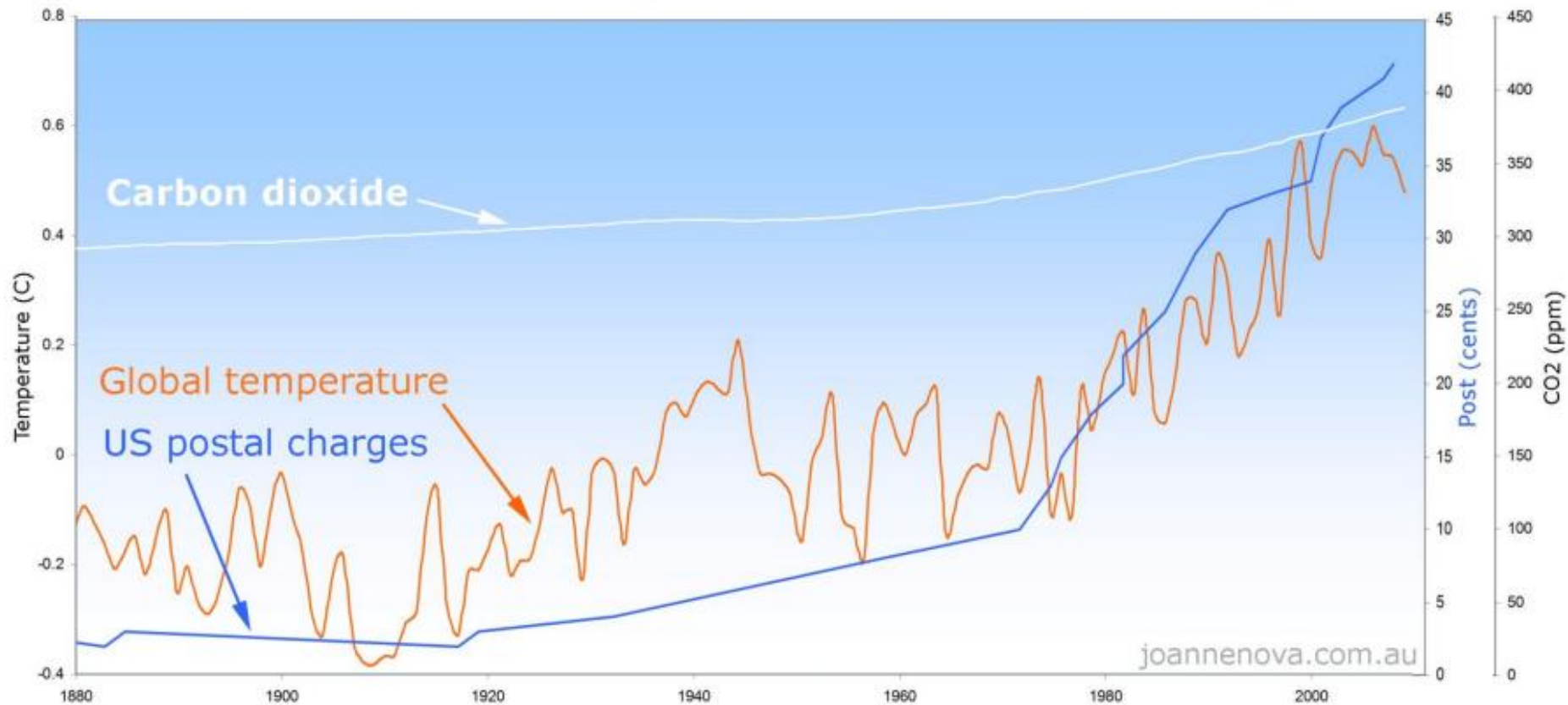
DOES

NOT

PROVE

CAUSATION

US Postal charges drive Global Warming



**IS a 1.5° C or a 2° C TEMPERATURE INCREASE
ABOVE PRE-INDUSTRIAL TIMES a PROBLEM
for GUAM, ISLAND NATIONS or MANKIND?**

WET SEASON - Accessed July 22, 2015 (9:52am).

ALMANAC	High (°F)	Low (°F)	High (°C)	Low (°C)	Temp Difference (°C) Day/Night
JULY 22					
<i>Average</i>	87	76	30.6	24.4	6.2
Record	92 (1994)	71 (1986)	33.3	21.7	12.6
REPORTED CONDITIONS					
July 21	86	76	30	24.4	6.4
Last 7 Days	90	75	32.2	23.9	8.3
June 23-July 22,	90	73	32.2	22.8	9.4
HISTORICAL MONTHLY AVGE					
July	87	77	30.6	25	5.6
August	87	76	30.6	24.6	6.0
September	87	76	30.6	24.6	6.0

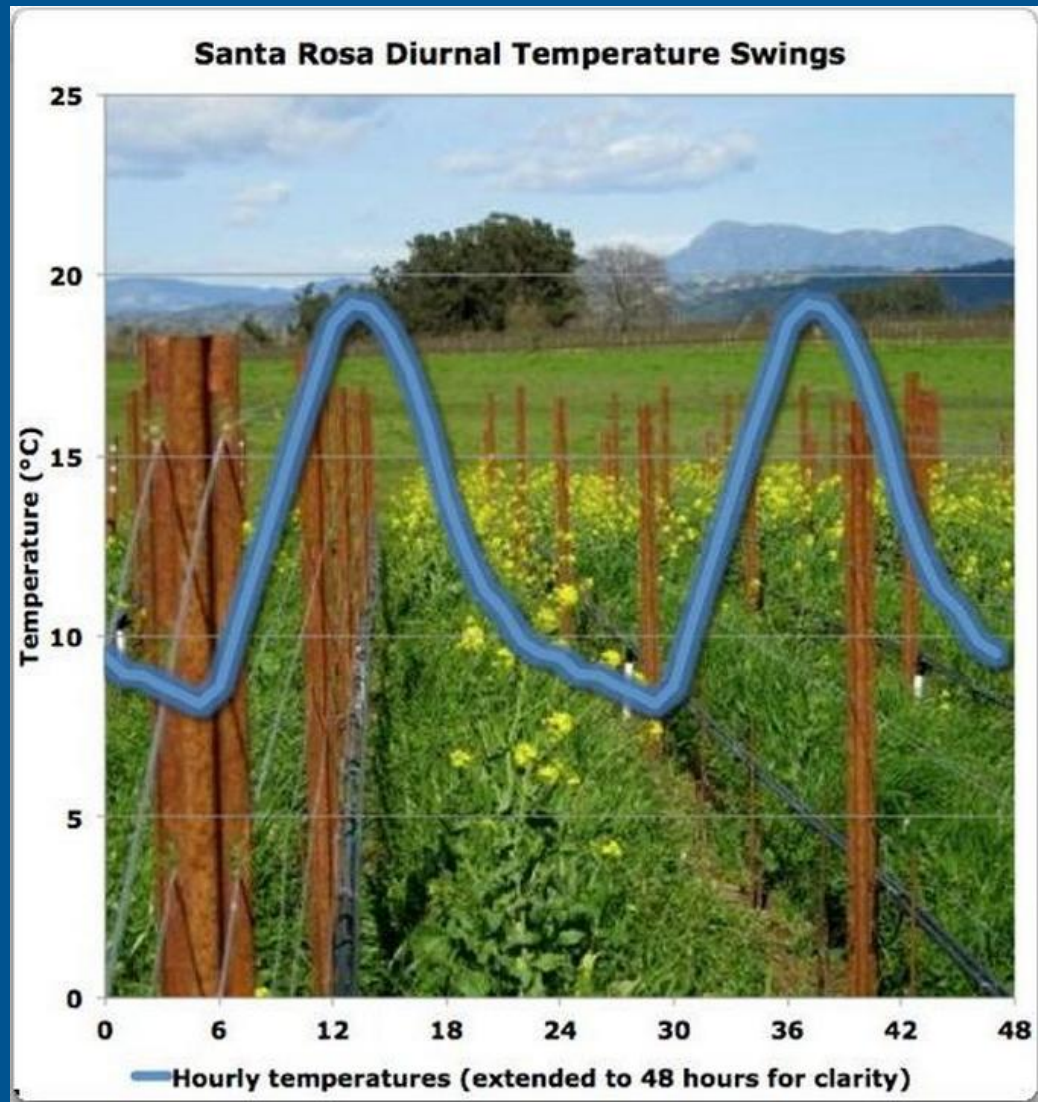
GUAM Weather Data - <http://www.weather.com/weather/today/l/96921:4:US>
Accessed January 23, 2016.

DRY SEASON

Almanac				Temp Difference (°C)
JAN 23	HIGH	LOW	PRECIP	Day/Night
Averages	30°C	24°	—	6
Records	—	—	—	
Reported Conditions				
Yesterday	29°	24°	—	5
Last 7 Days	31°	24°	—	7
Month to Date	31°	23°	—	8
Historical Monthly Avg				
January	30°	24°	114.3mm	6
February	30°	24°	94.0	6
March	30°	24°	76.2	6

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.



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

MESOZOIC-CENOZOIC SEA-LEVEL CHANGE AND COASTAL ONLAPS

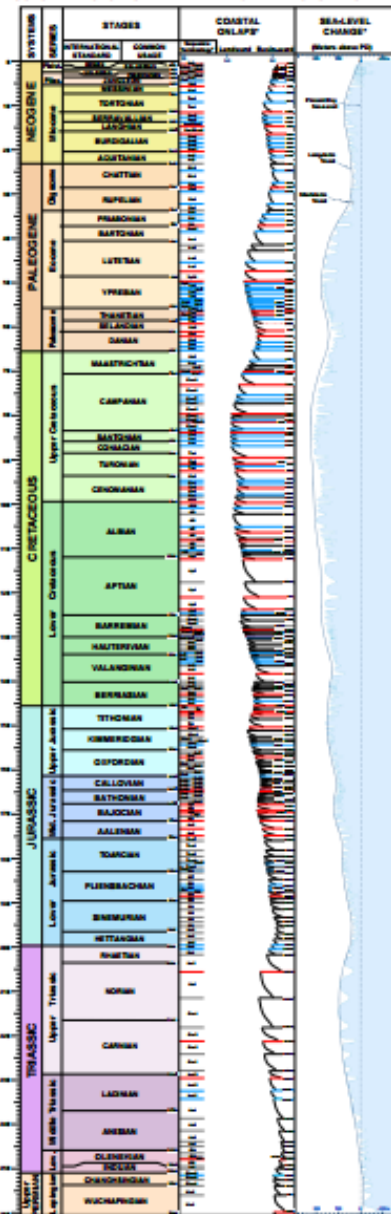


Figure 10.10 and 10.11 show the sea-level change and coastal onlaps from the Neogene to the Paleozoic. The chart is divided into stages and sub-stages, with a color-coded legend for sea-level change (red for high, blue for low, green for intermediate). The chart shows the sea-level change (meters above present) and coastal onlaps (landward and seaward) from the Neogene to the Paleozoic. The Neogene section includes the Miocene, Pliocene, and Pleistocene. The Paleozoic section includes the Permian, Carboniferous, Devonian, Silurian, Ordovician, and Cambrian. The chart is divided into stages and sub-stages, with a color-coded legend for sea-level change (red for high, blue for low, green for intermediate).

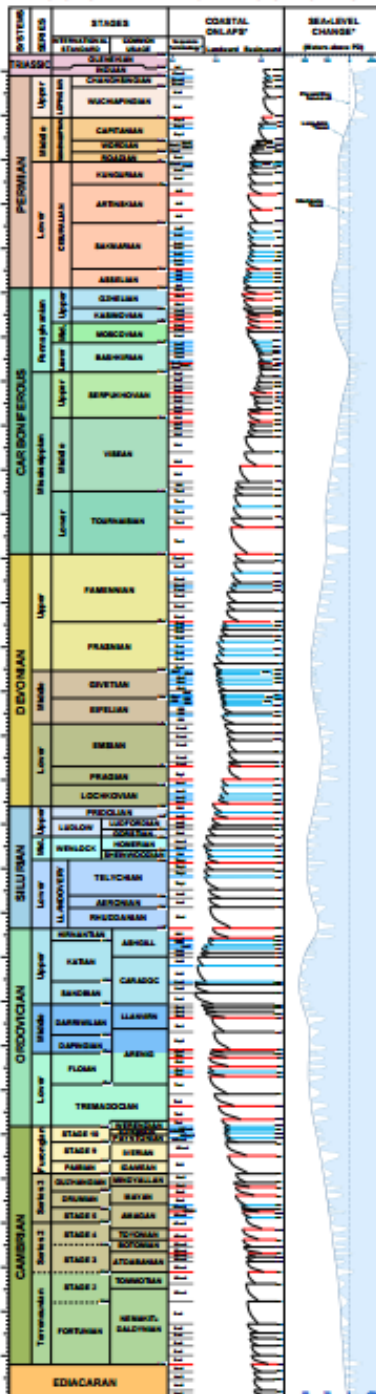
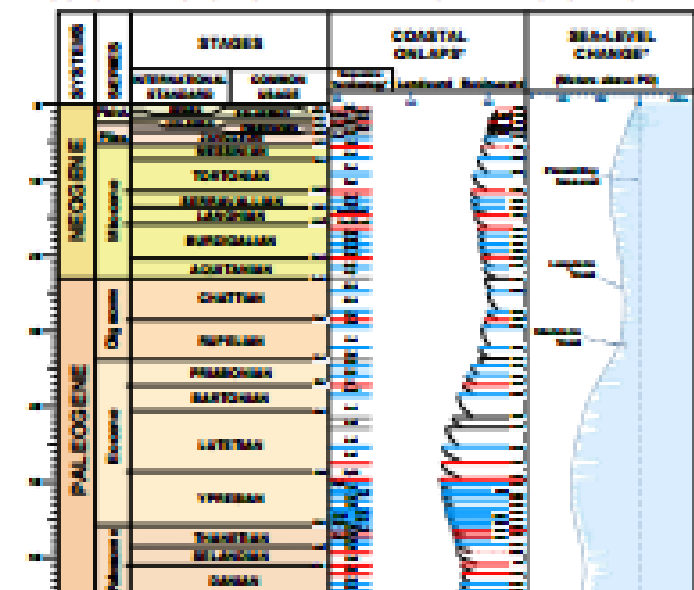


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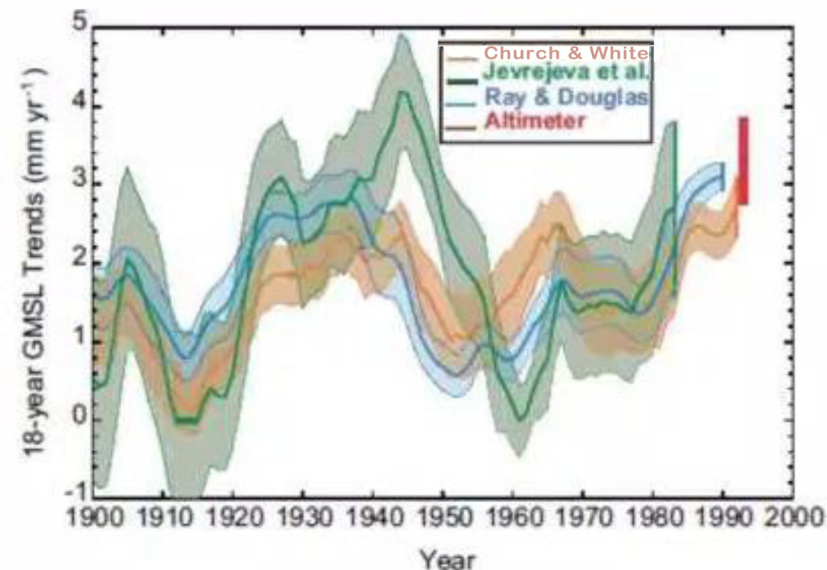
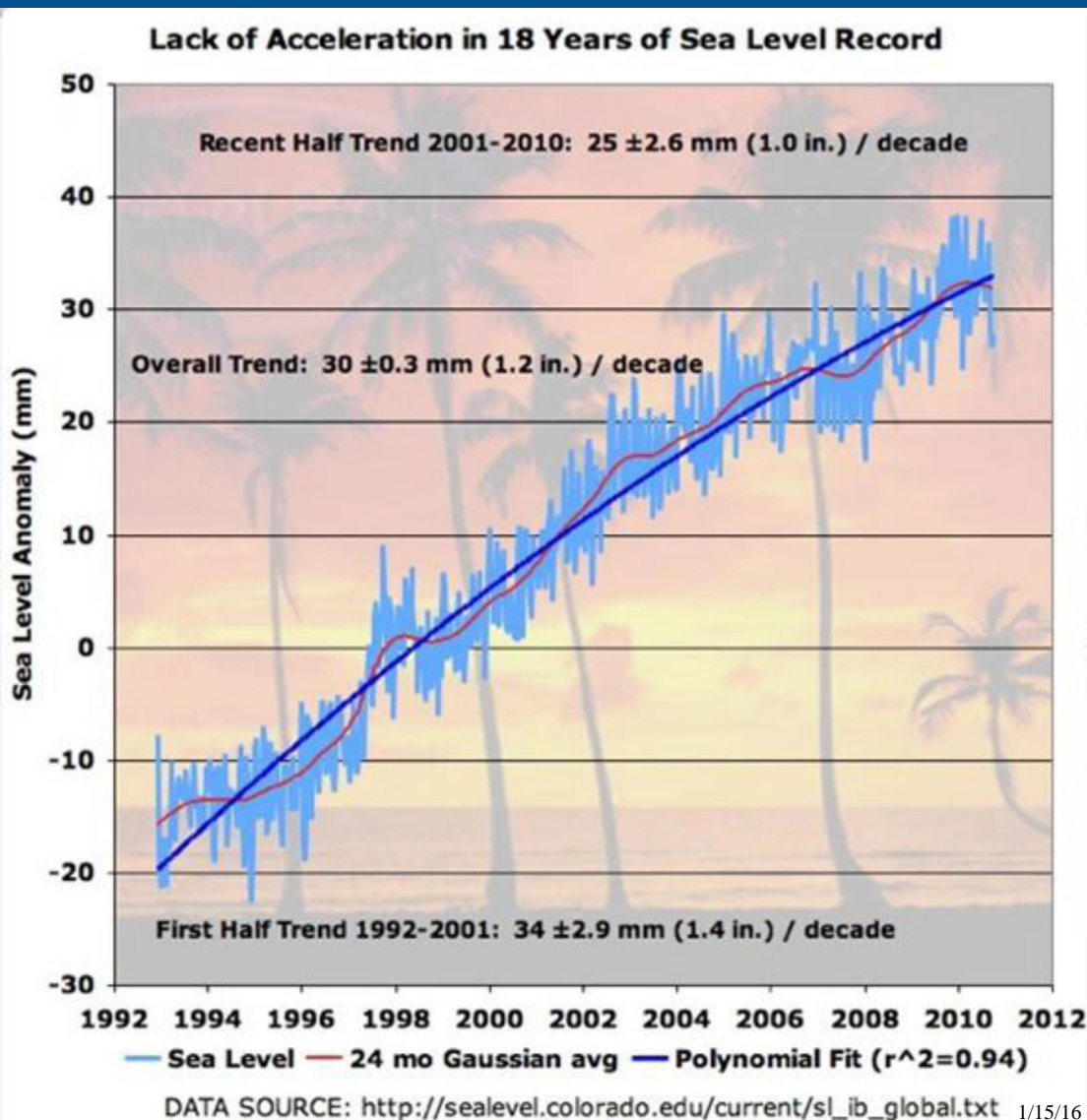
GEOLOGICAL HISTORY OF SEA LEVEL (LEFT); CENOZOIC SEA LEVEL (RIGHT)

MESOZOIC-CENOZOIC SEA-LEVEL CHANGE AND COASTAL ONLAPS

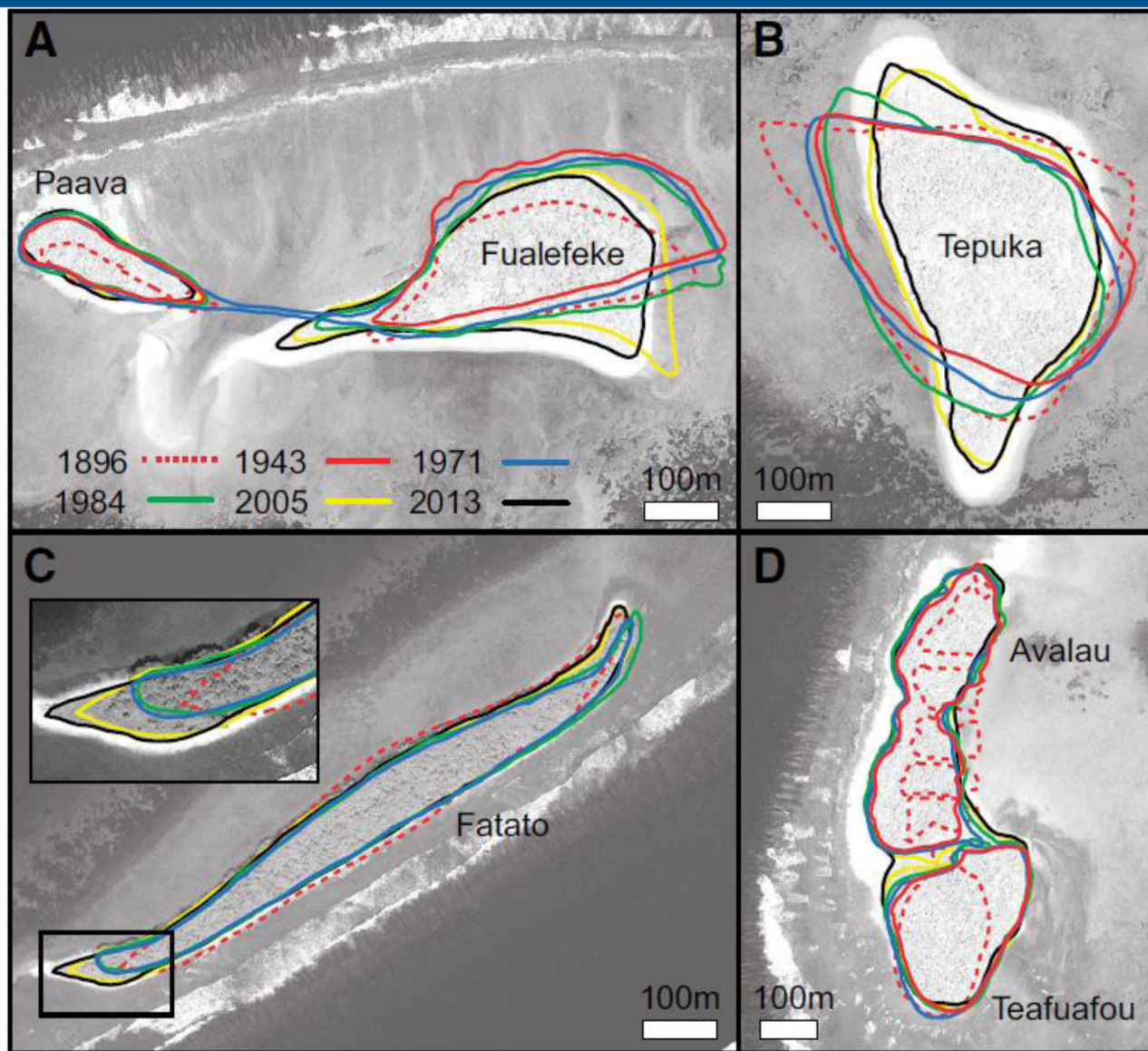


(From: Snedden and Liu, 2010)

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.”)

Changes in planform characteristics of selected reef islands in Funafuti Atoll (Tuvalu), A.D. 1896–2013, showing different styles of island adjustment. A: Expansion of Paava and rotation of Fualefeke. B: Rotation of Tepuka. C: Lateral extension of Fatato. D: Merging of Avalau and Teafuaafou.

From: Kench et al., 2015

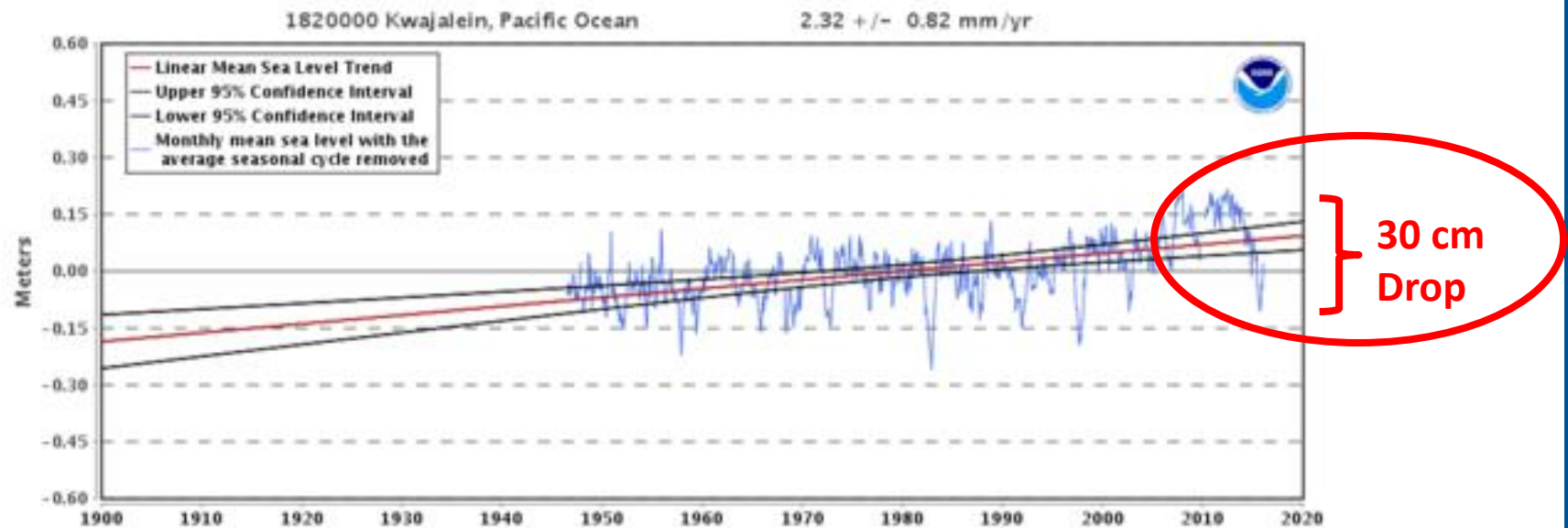
Kench et al. (2015) Reconfirmed Darwin's Theory of Atoll Formation by ADDING Rising Sea Level to the equation



↑
**SEA
LEVEL**

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

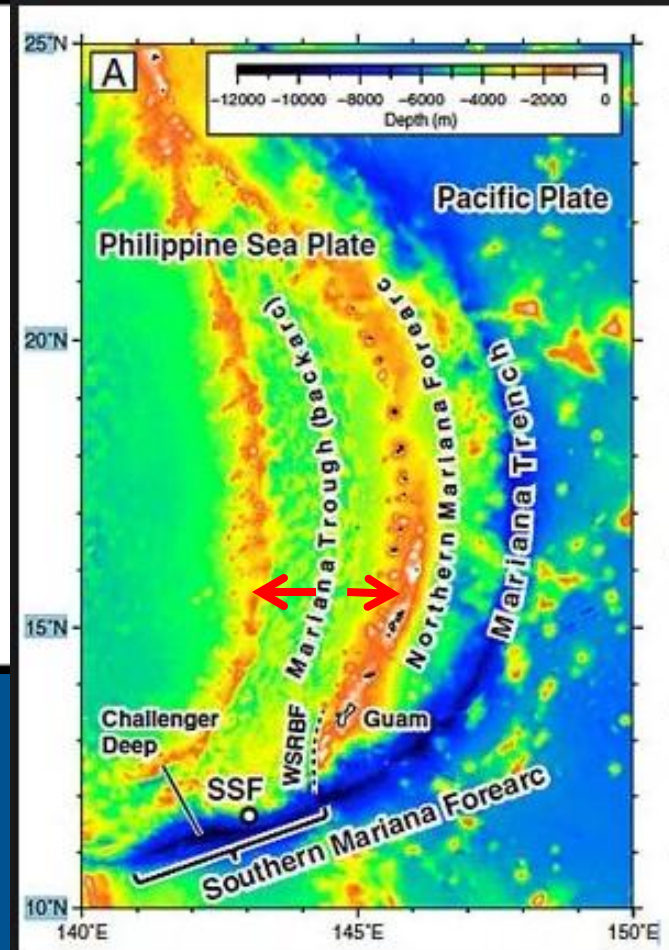
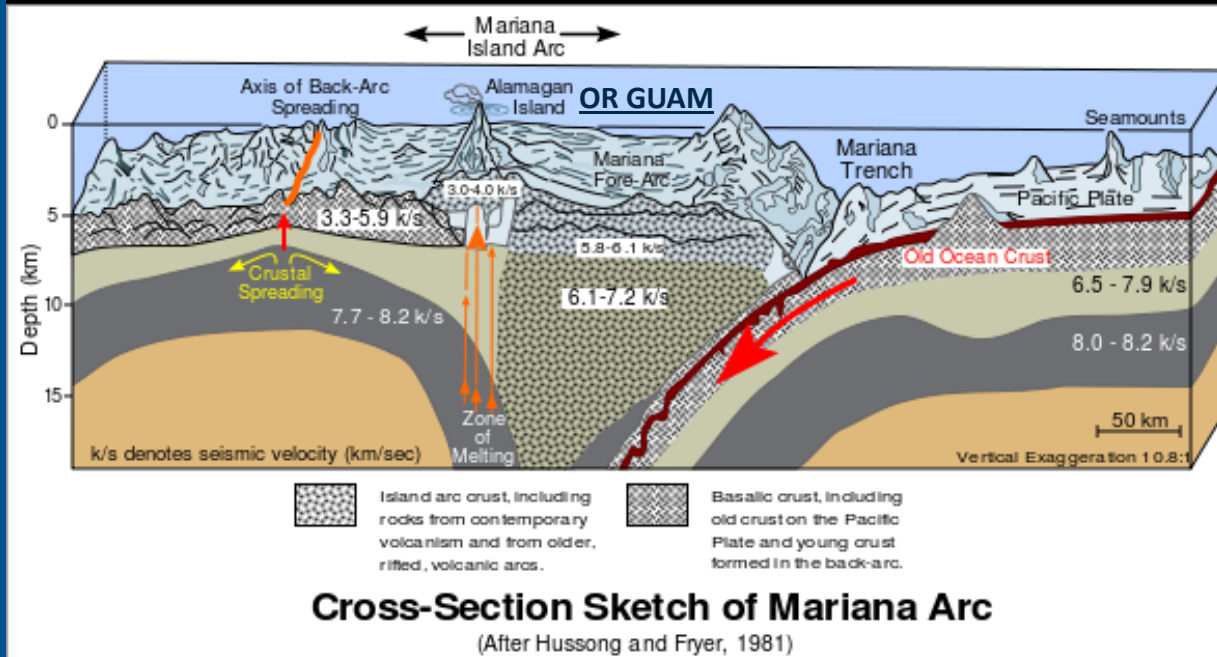
<http://wattsupwiththat.com/2016/03/28/ooops-alarm-over-sinking-islands-premature-as-sea-level-falls-at-kwajalein-atoll/>

INARAJAN TIDAL POOLS, GU, with Sea Level notch caused by tectonic processes.



SEA LEVEL,
1000 yrs. ago

2 m.



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.