

Abrupt Climate Change – Faster Than Before

- 1. Abrupt climate change...** Twenty-three times in the last 100,000 years our climate has changed 9 to 15 degrees F globally and 25 to 35 across the Arctic. The changes happened in a few generations to a few decades normally, but at the most extreme in two to three years. In Greenland the temperature changes were 25 to 35 degrees F.
Alley, Wally Was Right - Predictive ability of the North Atlantic Conveyor Belt Hypothesis for Abrupt Climate Change, Annual Review of Earth and Planetary Science, February 2007, Figure 1 shows the 23 abrupt climate changes.
<http://shadow.eas.gatech.edu/~kcobb/abrupt/alley07.pdf>
- 2. Record Temperature Data... Record High Temperatures far Outpace Record Lows Across the U.S.** NCAR/UCAR Atmos News, November 12, 2009.
<https://www2.ucar.edu/atmosnews/news/1036/record-high-temperatures-far-outpace-record-lows-across-us>
- 3. NOAA Data Tools: Daily Weather Records...** Last 365 days from April 1, 2017, record highs and lows globally.
<https://www.ncdc.noaa.gov/cdo-web/datatools/records>
- 4. Western North American Forest Flip from carbon sink to carbon source...**
Charney et al., Observed forest sensitivity to climate implies large changes in 21st century North American forest growth, Ecology Letters, July 19, 2016.
(ResearchGate: Requires free subscription)
https://www.researchgate.net/publication/305452793_Observed_forest_sensitivity_to_climate_implies_large_changes_in_21st_century_North_American_forest_growth
Background on the most recent insect and disease attacks:
Melton, The Beetles: Eighty-Nine Million Acres of Abrupt Climate Change, Truthout, February 16, 2016.
<http://www.truth-out.org/news/item/34853-the-beetles-eighty-nine-million-acres-of-abrupt-climate-change>
- 5. The Amazon Flip...**
Melton, Climate Change 2016, The Year The Future Arrived, Truthout, December 29, 2016, see the section, "The Amazon Continues to Emit More Carbon Than it Absorbs."
<http://www.truth-out.org/news/item/38905-climate-change-2016-the-year-the-future-arrived>
References:
The Amazon Continues to Emit More Carbon than it Absorbs...
Feldpausch, Amazon forest response repeated droughts, Global Biogeochemical Cycles, July 1, 2016.
Press Release: http://www.exeter.ac.uk/news/featurednews/title_527669_en.html
Lewis et al., The 2010 Amazon Drought, Science, February, 2011.
(Free subscription)
https://www.researchgate.net/publication/49809450_The_2010_Amazon_Drought
- 6. Gulf Stream slowed seven percent per year, 2008 to 2012 ...**

Melton, There All Along: "Exceptional" Slowdown of the Gulf Stream From Greenland Melt, Truthout, April 13, 2015.

<http://www.truth-out.org/news/item/30114-it-s-been-there-all-along-exceptional-slowdown-of-the-gulf-stream-from-greenland-melt>

Reference:

Smeed et al., Observed decline of the Atlantic meridional overturning circulation 2004-2012, Ocean Science, February 6, 2014, abstract.

<http://www.rapid.ac.uk/rapidmoc/>

7. **May snow cover across the Northern Hemisphere...**

Snow Cover Extents: NOAA National Center for Environmental Information, Global Snow and Ice.

<https://www.ncdc.noaa.gov/sotc/global-snow/201305>

8. **Collapse of the West Antarctic Ice Sheet...**

Melton, Collapse of West Antarctic Ice Sheet Reveals Inadequacy of Current Climate Strategies, Truthout, December 20, 2016.

<http://www.truth-out.org/news/item/38794-collapse-of-west-antarctic-ice-sheet-reveals-inadequacy-of-current-climate-strategies>

References:

West Antarctic Ice Sheet (WAIS) Collapse Tipping Point Defined... This work out of the German National Science Institute describes marine ice sheet collapse mechanisms, and how there is a very distinct tipping point with the West Antarctic Ice Sheet where collapse becomes irreversible in about 2050. The very important take-away from this work is that to prevent ice sheet collapse the "perturbation" that creates the warming that is responsible for ice sheet collapse, which is mostly ocean warming, must end by at the latest 2050. This means that we must return ocean temperature to its preindustrial stable temperature by 2050. The challenge here is that it is much more difficult to cool the oceans than it is the atmosphere. Figure 3 shows the model runs that define the stable state in blue.

Feldmann and Levermann, Collapse of the West Antarctic Ice Sheet after local destabilization of the Amundsen Basin, PNAS, November 17, 2015.

<http://www.pnas.org/content/112/46/14191.full.pdf>

If upper ocean warming around Antarctica is not returned to zero...

Dynamical Ice Sheet Collapse Modeling Arrives: The abstract from DeConto and Pollard states: "model coupling ice sheet and climate dynamics—including previously underappreciated processes linking atmospheric warming with hydrofracturing of buttressing ice shelves and structural collapse of marine-terminating ice cliffs—that is calibrated against Pliocene and Last Interglacial sea-level estimates and applied to future greenhouse gas emission scenarios.

Antarctica has the potential to contribute more than a metre of sea-level rise by 2100 and more than 13 metres by 2500, if emissions continue unabated."

DeConto and Pollard, Contribution of Antarctica to past and future sea level rise, Nature, March 31, 2016.

Abstract:

http://www.nature.com/nature/journal/v531/n7596/full/nature17145.html?WT.feed_name=subjects_earth-and-environmental-sciences

Full: <http://www.documentcloud.org/documents/2823837-DeConto-Pollard-2016-Contribution-of-Antarctica.html>

9. Benign atmospheric carbon dioxide cleanup technologies...

Melton, A Generation of Delay: Climate Policy Is 20 Years Behind, Truthout, December 4, 2015.

<http://www.truth-out.org/news/item/33906-a-generation-of-delay-climate-policy-is-20-years-behind>

Continuing Research on CDR in 2016... Climate Change Now has been working with the Healthy Climate Alliance to further carbon dioxide capture science and describe successful industrial scale field trials that are perform according to previous research estimates. There has been a significant theoretical controversy over the cost feasibility of these technologies because of "infeasible" suggesting theoretical publication from researchers at the American Physical Society and MIT. This controversy is over as the new field trials in Menlo Park California by Global Thermostat, and Squamish, British Columbia by Carbon Engineering, are removing carbon dioxide from the atmosphere for \$75 and \$250 per ton using \$0.06 to \$0.07 kWh electricity. Of importance to dramatically reduced costs in the near future, ENGIE France has projected that because of the extremely strong performance of solar photovoltaic manufacturing and generation installation globally, by 2025 new solar generation will be at \$0.01 kWh. The latest 300+ Megawatt installation in Abu Dahbi was at \$0.0242 kWh.

ENGIE France...

SOLAR ENERGY AT \$0.01 kWh IN 2025

ENGIE France, Europe's natural gas giant, says that by 2025, oil will be at \$10 per barrel and solar energy at \$0.01 kWh. Aubu Dabi set the last record for new solar at \$0.0242 kWh in the fall of 2016.

Bloomberg, December 20, 2016:

<https://www.bloomberg.com/news/articles/2016-12-20/energy-tsunamis-threaten-to-drag-oil-down-to-10-engie-says>

Abu Dahbi...

Bloomberg, September 19, 2016:

<https://www.bloomberg.com/news/articles/2016-09-19/cheapest-solar-on-record-said-to-be-offered-for-abu-dhabi>