

The Inertia Trap - Update

The Intergovernmental Panel on Climate Change released a report in September 2013 'Climate Change 2013 The Physical Science Basis - Summary for Policymakers' which provides updated information on the science of climate change presented in *The Inertia Trap*. Some of the conclusions they have made are:

'Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.' B.

'Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850.' B1.

'Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010. It is virtually certain that the upper ocean (0-700m) warmed from 1971 to 2010 and it is likely warmed between the 1870s and 1971.' B2.

'Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern hemisphere spring snow cover have continued to decrease in extent.' B3.

'There is high confidence that permafrost temperatures have increased in most regions since the early 1980s. Observed warming was up to 3⁰ C in parts of Northern Alaska (early 1980s to mid-2000s) and up to 2⁰ C in parts of the Russian European North (1971 to 2010).' B3. Dot point 7.

'The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia.' B4

'The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification.' B5

'Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system. Limiting climate change will require substantial and sustained reductions of greenhouse gas emissions.' E.



'It is virtually certain that there will be more frequent hot and fewer cold temperature extremes over most land areas on daily and seasonal timescales as global mean temperatures increase. It is very likely that heat waves will occur with a higher frequency and duration. Occasional cold winter extremes will continue to occur.' E.1. Dot point 4.

'The global ocean will continue to warm during the 21st century. Heat will penetrate from the surface to the deep ocean and affect ocean circulation.' E.4.

'It is very unlikely that the AMOC [Atlantic Meridional Overturning Circulation] will undergo an abrupt transition or collapse in the 21st century for the scenarios considered. There is low confidence in assessing the evolution of the AMOC beyond the 21st century because of the limited number of analyses and equivocal results. However, a collapse beyond the 21st century for large sustained warming cannot be excluded.' E.4. Dot point 3.

'It is very likely that the Arctic sea ice cover will continue to shrink and thin and that Northern Hemisphere spring snow cover will decrease during the 21st century as global mean surface temperature rises. Global glacier volume will further decrease.' E 5.

'Global mean sea level will continue to rise during the 21st century. Under all RCP [Representative Concentration Pathways] scenarios, the rate of sea level rise will very likely exceed that observed during the 1971 to 2010 due to increased ocean warming and increased loss of mass from glaciers and ice sheets.' E. 6.

'Sea level rise will not be uniform. By the end of the 21st century, it is very likely that sea level will rise in more than 95% of the ocean area. About 70% of the coastlines worldwide are projected to experience sea level change within 20% of the global mean sea level change.' E. 6. Dot point 6.

The full IPCC 2013 Summary Report can be downloaded at

<http://www.ipcc.ch/report/ar5/wg1/#.Ut9Dst3Ohpg>

PS: The US NASA reports that measurements in May 2013 from the Mauna Loa monitoring station in Hawaii showed that CO₂ concentrations peaked at 399.76 ppm. 'At the beginning of the industrial revolution, carbon dioxide levels in the atmosphere were roughly 278 parts per million.' See <http://earthobservatory.nasa.gov/IOTD/view.php?id=82142>

Kathryn Kelly, 22 January 2014



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