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Energy budget constraints on climate response: Uncertainty or wrong theory? The ocean temperatures are not rising

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ABSTRACT

During the decade 2003-2013, there has been no significant thermal expansion contribution to the accelerating sea level in perfect agreement with the lack of any acceleration experienced in the long term tide gauges. The rate of global warming has been negligible over the first decade where measurements of ocean temperatures have been properly collected within the ARGO project. Possibly a wrong theory and not uncertainty is responsible of the unbalanced energy budget experienced in the last decade, the first one where ocean temperatures have been properly measured.

KEYWORDS

Ocean temperatures;
Sea level acceleration.

ENERGY BUDGET, MEASURED SEA LEVELS AND OCEAN TEMPERATURES

The recent study[1] published in Nature Geoscience looks at the slowdown in the rate of global warming and how it will affect temperatures in coming decades. The authors recognizes a recent "downturn" in the rate of global warming, but without questioning if the global warming theory is correct, they claim uncertainty is the cause of the discrepancy in between models and measurements. The authors say this "downturn" in the rate of global warming will lead to lower temperature rises in the short-term. However, if short-term rises are likely to be less than predicted, long term rises are expected to follow predictions.

The paper[1] looks at how the past decade might impact the long-term temperatures and shorter-term climate response. In 2007 the Intergovernmental Panel on Climate Change (IPCC) reported of short-term temperature rise 1-3 °C. The study[1] predicts between 0.9-2 °C from only including the last decade's temperatures. The models are looking less likely or inconsistent with the data from the last decade alone. According to the study[1], the global average temperatures are predicted to rise 20% slowly than expected over the coming decades, but the authors nevertheless say their work agrees with previous IPCC estimates of climate sensitivity in the range of 2-4.5 °C that have remained unchanged since the 1979 Charney report. The "uncertainty" argument is used in the study[1] to conjugate the lack of present evidence of global warming with the reliability of future projections.

The study[1] derives ΔQ using the change in estimated 0–2000 m ocean heat content (OHC) which accounts for most of the Earth system heat uptake from the start to the end of the relevant decade or 1970–

2009. The study splits the 0-2000 m ocean layer between 0–700 m and 700–2000 m. It retains the NODC/NOAA OHC data[2], Figure 1, which corresponds to[3] for the 700–2000 m layer but uses a different dataset for 0–700 m OHC that is an update from[4].[3]provides updated estimates of the change of ocean heat content and the thermosteric component of sea level change of the 0–700 and 0–2000 m layers of the World Ocean for 1955–2010. The estimates are based on historical data not previously available, additional modern data, and bathythermograph data corrected for instrumental biases. Argo data are also claimed to be at least partially included in the estimations. According to[3] the heat content of the World Ocean for the 0–2000 m layer increased by $24.0 \pm 1.9 \times 10^{22}$ J corresponding to a rate of 0.39 W m^{-2} per unit area of the World Ocean and a volume mean warming of 0.09°C. This warming corresponds to a rate of 0.27 W m^{-2} per unit area of earth's surface. The heat content of the World Ocean for the 0–700 m layer increased by $16.7 \pm 1.6 \times 10^{22}$ J corresponding to a rate of 0.27 W m^{-2} per unit area of the World Ocean and a volume mean warming of 0.18°C. The World Ocean accounts for approximately 93% of the warming of the earth system that has occurred since 1955. The 700–2000 m ocean layer accounted for approximately one-third of the warming of the 0–2000 m layer of the World Ocean. According to[3], the thermosteric component of sea level trend was $0.54 \pm .05$ mm yr^{-1} for the 0–2000 m layer and $0.41 \pm .04$ mm yr^{-1} for the 0–700 m layer of the World Ocean for 1955–2010.

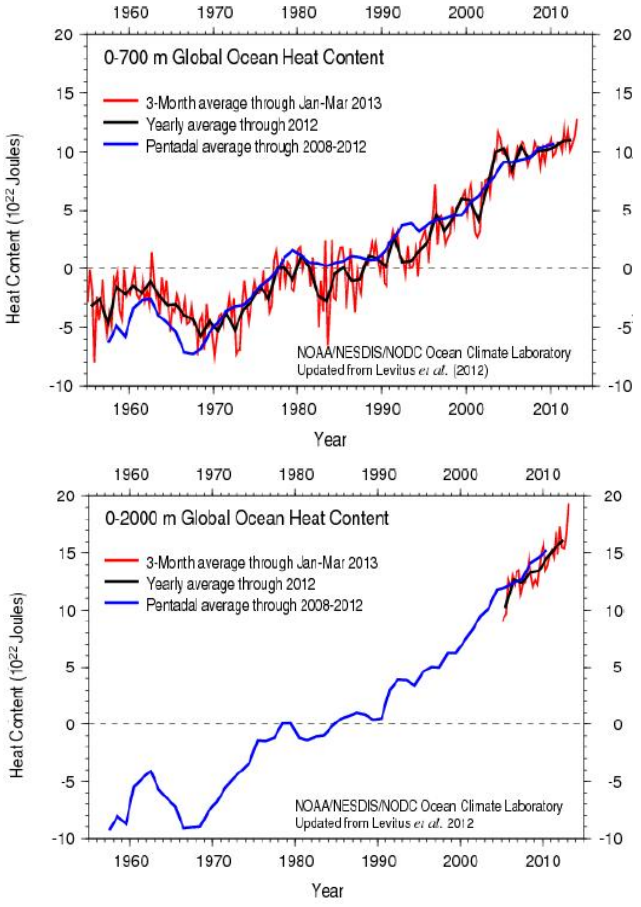

Figure 1 : OHC from[2]

According to[4], changes in the climate system's energy budget are predominantly revealed in ocean temperatures and the associated thermal expansion contribution to sea-level rise[2]. Climate models, however, do not reproduce the large decadal variability in globally averaged ocean heat content inferred from the sparse observational database, even when volcanic and other variable climate forcings are included. The sum of the observed contributions has also not adequately explained the overall multi-decadal rise. The authors report improved estimates of near-global ocean heat content and thermal expansion for the upper 300 m and 700 m of the ocean for 1950–2003, using statistical techniques that allow for sparse data coverage and applying recent corrections to reduce systematic biases in the most common ocean temperature observations. The authors of[4] claim ocean warming and thermal expansion trends for 1961–2003 are about 50 per cent larger than earlier estimates but about 40 per cent smaller for 1993–2003, which is consistent with the recognition that previously estimated rates for the 1990s had a positive bias as a result of instrumental errors. On average, the decadal variability of the climate models with volcanic forcing agrees approximately with the observations, but the modelled multi-decadal trends are smaller than observed. Addition of observational estimate of upper-ocean thermal expansion to other contributions to sea-level rise gives a sum of contributions from 1961 to 2003 is about 1.5 ± 0.4 mm yr^{-1}, in good agreement with our updated estimate of near-global mean sea-level rise using techniques established in earlier studies of 1.6 0.2 mm yr^{-1}.

MEASURED SEA LEVELS AND OCEAN TEMPERATURES

As already written many times[5-8], sea levels around

the world are certainly rising, but absolutely not presently accelerating. Different claims follow the lack of data, the neglected naturally oscillating behaviour of the oceans exhibiting different periodicities, with the quasi-60 years periodicity[5-10] introducing a minimum length of 60-70 years of continuous recording to infer a proper sea level velocity, the naturally oscillating behaviour of everything derived from tide gauge results including the time derivative of this velocity, the estimation of the error in the velocity and acceleration that is not the statistical error of the linear fitting. This lack of acceleration is supported by the lack of any warming in the temperatures of the oceans the first time in human history they have been properly measured in the ARGO project[11]. The ARGO system permits to measure within a reasonable accuracy the temperature up to 2,000m. The measurements are performed by more than 3,000 buoys. The temperatures in the Argo profiles are claimed to be accurate to ± 0.0050 °C and depths are claimed to be accurate to ± 5m. Certainly optimistic is the expectation that the global ocean temperature 0-2000 m is predicted within an accuracy of ± 0.0050 °C considering the number of independent measurements collected in space, deep and time needed to derive the global temperature through averaging.

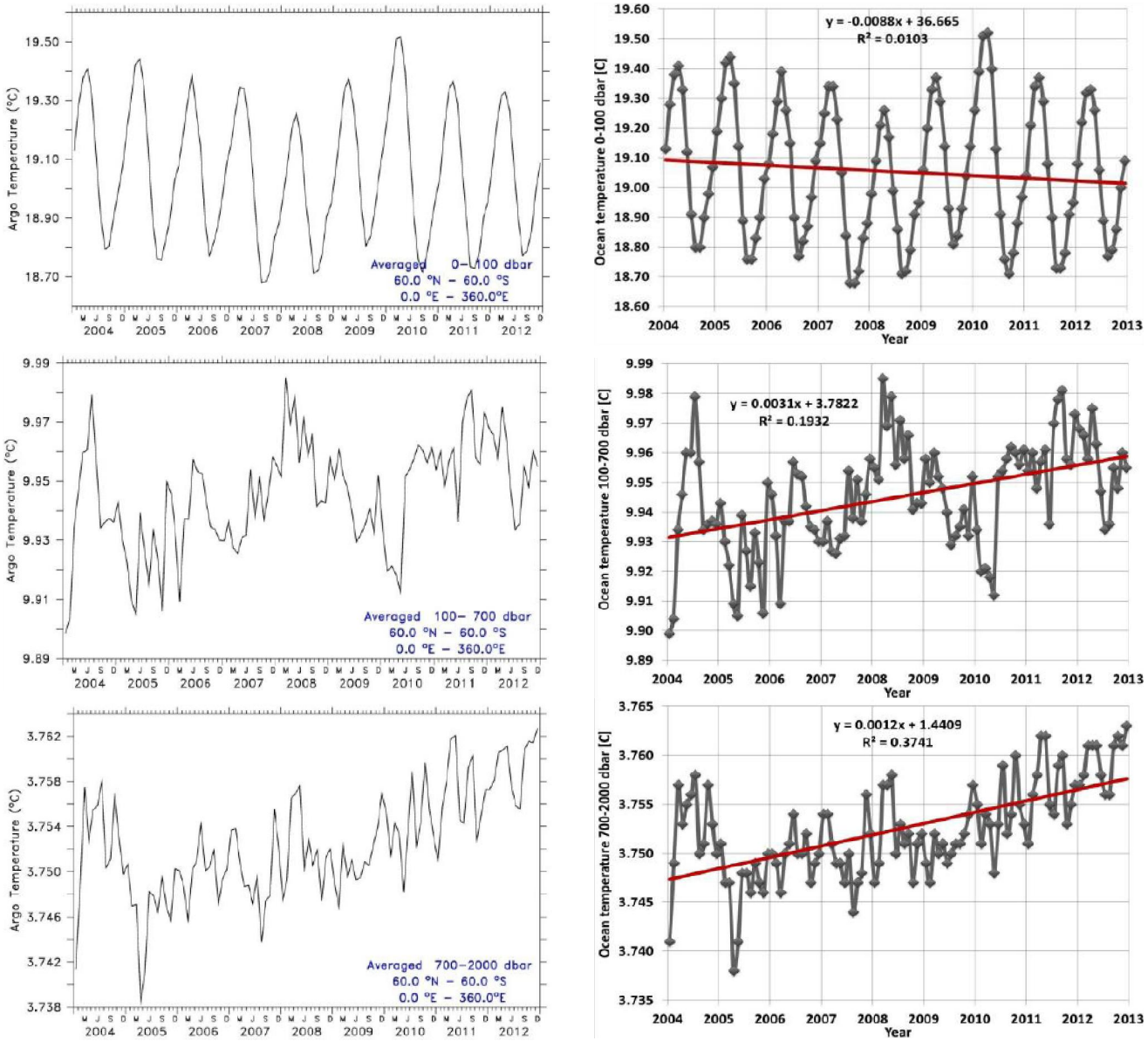

Figure 2 : Truly measured average temperature time history January 2004 to December 2012 over the layers 0-100 deca bar pressure (0m-100m deep), 100-700 deca bar pressure (100m-700m deep) and 700-2000 deca bar pressure (700m-2000m deep)

The ARGO marine atlas[11] is used to create the temperature plots January 2004 to December 2012. Figure 2 presents the ARGO temperatures. The layer 0-100 deca bar does not warm at all over the 9 years. The average temperature actually decreases at a rate of -0.0088 °C/year. The layer 100-700 deca bar is warming marginally over the 9 years. The average temperature increases at a rate of 0.0031 °C/year. The layer 700-2000 deca bar is warming marginally over the 9 years. The average temperature increases at a rate of 0.0012 °C/year. Globally, the layer 0-2000 deca bar pressure (0-2000m deep) experienced an average temperature increase of 0.0012 °C/year. This warming is everything but statistically significant.

CONCLUSIONS

The study[1] should have better been made by considering what is actually measured as ocean temperatures rather than by using reconstructions. In case, the "uncertainty" would have been much larger than the climate sensitivity suggesting the theory is possibly wrong.

During the decade 2003-2013, there has been no significant thermal expansion contribution to the accelerating sea levels. This is in perfect agreement with the lack of any acceleration experienced in the long term tide gauges since the 1900s.

The rate of global warming has been negligible over the first decade where measurements of ocean temperatures have been properly collected within the ARGO project, as confirmed by the lack of acceleration in the tide gauge results of enough quality and length.

Possibly a wrong theory and not uncertainty is responsible of the unbalanced energy budget experienced in the last decade, the first one where ocean temperatures have been properly measured.

The 1979 Charney report claiming a climate sensitivity in the range of 2-4.5 °C has never been questioned so far. May be it is time to discuss what has been truly measured with accuracy.

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