Senate Standing Committee on Environment and Communications
Legislation Committee
Answers to questions on notice
Environment and Energy portfolio

Question No: 329

Hearing: Additional Estimates

Outcome: Agency

Program: Great Barrier Reef Marine Park Authority

Topic: Ocean temperatures

Hansard Page:

Question Date: 6 March 2017

Question Type: Written

Senator Roberts asked:

Are you aware that ocean temperatures have been cooling since 1978 [Jones et al (2016)] and southern ocean heat content [Rosenthal et al (2013)] is currently the lowest in the last 9,000 years?

If you disagree with either of these two claims, on what basis?

Answer:

1. With regards to the two references:

    - Jones et al., 2016 – Further reference details or a copy of the article will be required. The closest likely reference sourced is Jones, P., 2016: The reliability of global and hemispheric surface temperature records. *Advances in Atmospheric Sciences*, 33 (3): 269-282. However, this article does not support the claim that ocean temperatures have been cooling since 1978.

    - Rosenthal et al., 2013 – It is assumed that this refers to Rosenthal, Y., Linsley, B.K. and Oppo, D.W. 2013, Pacific Ocean heat content during the past 10,000 years, *Science (New York, N.Y.)* 342(6158): 617-621. If incorrect, further reference details, or a copy of the article in question will be required.

2. With regards to the claims mentioned:

Jones, P., 2016 – 'Ocean temperatures have been cooling since 1978'.

- Full comment on this claim requires further reference details in order to source this article, or a copy of this article.

- Contrary to this claim, there is evidence of ongoing warming of sea surface temperatures in tropical oceans. For example:

    - Lough, J.M. (2012), Small change, big difference: Sea surface temperature distributions for tropical coral reef ecosystems, 1950- 2011, *J. Geophys. Res*, 117

- NOAA National Centers for Environmental information, Climate at a Glance: Global Time Series, published March 2017,http://www.ncdc.noaa.gov/cag/
- UK CRU/ Hadley Centre data sets https://crudata.uea.ac.uk/cru/data/temperature/

Rosenthal et al., 2013 – 'Southern ocean heat content is currently the lowest in 9,000 years'.

- Based on proxy records, Rosenthal et al. conclude that the water masses linked to the North Pacific and the Antarctic intermediate waters were approximately 0.65 degrees Celsius warmer during the middle Holocene Thermal Maximum than in more recent decades. Specifically, the Pacific Ocean Heat Content was higher during most of the Holocene than in the period from 2000 – 2010, with the exception of the Little Ice Age period (from approximately 1600 – 1800), when Ocean Heat Content was lower than in during the years 2000 – 2010.
- Marcott et al. (2013) show a similar trend for surface temperatures over the past 10,000 years through their use of a variety of proxy climate records.
  - Marcott, S.A., Shakun, J.D., Clark, P.U. and Mix, A.C. (2013), A reconstruction of regional and global temperature for the past 11,300 years, *Science* 339 (6134), 1198-1201
- Based on this, the point of lowest Ocean Heat Content in the last 9,000 – 10,000 years was during the Little Ice Age period (about 200 years ago), not present day.
- Both papers state that, since the Little Ice Age period, temperatures have been increasing, and at a higher rate of change than previously observed in the last 9,000 – 10,000 years.
  - Marcott et al indicate that, while current temperatures have not yet reached those peak temperatures experienced during the early Holocene, these temperatures are warmer than around 75 per cent of the Holocene distribution. Global temperatures have therefore risen from near the coldest to near the warmest levels of the Holocene within the past 100 years, reversing the long-term cooling trend.
  - Rosenthal et al. indicate that the modern rate of Pacific Ocean Heat Content change is the highest it has been in the past 10,000 years.
- The Intergovernmental Panel on Climate Change model projections for 2100 exceed the full distribution of Holocene temperature under all plausible greenhouse gas emission scenarios.