



The Global Warming Policy Foundation

55 Tufton Street, London SW1P 3QL
0207 340 6038 www.thegwpf.org

Dr Valérie Masson-Delmotte
IPCC Co-Chair, Working Group I

Dr Panmao Zhai
IPCC Co-Chair, Working Group I

c/o Université Paris Saclay
FCS Campus Paris-Saclay
Immeuble Discovery
Route de l'Orme des Merisiers
91190 Saint-Aubin
France

Dr Hans-Otto Pörtner
IPCC Co-Chair, Working Group II

Dr Debra Roberts
IPCC Co-Chair, Working Group II

c/o Alfred Wegener Institute
Markstrasse 3
28195 Bremen
Germany

11 October 2019

Dear IPCC Co-Chairs

We would like to draw your attention to a number of errors and misinterpretations in your recently published *Special Report on the Ocean and Cryosphere in a Changing Climate* (SROCC).

Re: Observed and projected global ocean heat uptake

Your report (SROCC, p. 5-14) concludes that

"critically, the high confidence and high agreement in the ocean temperature data means we can detect discernable rates of increase in ocean heat uptake (Gleckler et al., 2012; Cheng et al., 2019) The rate of heat uptake in the upper ocean (0-700m) is very likely higher in the 1993-2017 (or 2005-2017) period compared with the 1969-1993 period (see Table 5.1)... Updated observationally-based estimates

Director: Dr Benny Peiser

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of ocean heat uptake are consistent with simulations of equivalent time-periods from an ensemble of CMIP5 ESMs (Table 5.1 and the inset panel in Figure 5.1) (high confidence), once the limitations of the historical ocean observing network and the internally generated variability with a single realization of the real world are taken into account."

We would like to point out that this conclusion is based to a significant degree on a paper by Cheng et al. (2019) which itself relies on a flawed estimate by Resplandy et al. (2018). An authors' correction to this paper and its ocean heat uptake (OHU) estimate was under review for nearly a year, but in the end *Nature* requested that the paper be retracted (Retraction Note, 2019).

While the SROCC's conclusion that the rate of ocean heat uptake has increased in recent years may probably be right, the evidence you cite for there being 'high confidence' and 'high agreement' is rather doubtful due to your inclusion of flawed evidence of the retracted paper by Resplandy et al. (2018).

Moreover, the only study other than Cheng et al (2019) cited in support of the statement regarding discernable rates of increase in OHU, Gleckler et al. (2012), is seven years old and does not appear to show that OHU increased during the period that it studied.

Given the important role Cheng et al. (2019) plays in your overall assessment on ocean heat uptake their claim that "All four recent studies show that the rate of ocean warming for the upper 2000 m has accelerated in the decades after 1991 to 0.55 to 0.68 W m⁻²" (Cheng et al. 2019) is incorrect.

There is also doubt about your conclusion that ocean heat uptake (OHU) has been accelerating recently. According to your own report (SROCC, Table 5.1), based on the mean of a compilation of observational estimates [see section SM5.1] 0-2000 m OHU was nearly 10% higher over 1993-2017 than over the second half of that period, 2005-2017, suggesting that OHU may have been declining slightly rather than accelerating over the last 25 years.

Period	Ocean Heat Uptake Rate, ZJ yr ⁻¹				Ocean Heat Uptake as Average Fluxes, W m ⁻²			
	1969-1993	1993-2017	1970-2017	2005-2017	1969-1993	1993-2017	1970-2017	2005-2017
Observationally Based Ocean Heat Uptake Estimates:								
0-700m	3.22±1.61	6.28±0.48	4.35±0.80	5.31±0.48	0.20±0.1	0.39±0.03	0.27±0.05	0.33±0.03
700-2000m	0.97±0.64	3.86±2.09	2.25±0.64	4.02±0.97	0.06±0.04	0.24±0.13	0.14±0.04	0.25±0.06
CMIP5 ESM Ensemble-mean Ocean Heat Uptake with 90% Certainty Range from Ensemble Spread:								
0-700m	3.60±1.92	7.37±2.09	5.64±1.90	7.85±2.71	0.22±0.12	0.46±0.13	0.35±0.12	0.49±0.17
700-2000m	1.32±1.49	2.72±1.41	1.99±1.51	3.33±1.75	0.08±0.09	0.17±0.09	0.12±0.09	0.21±0.11

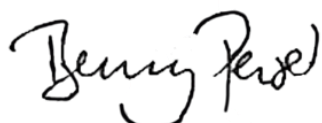
SROCC Table 5.1: The assessed rate of increase in ocean heat content in the two depth layers 0-700 m and 700-2000 m.

This manifest lack of agreement (never mind 'high confidence') is further underpinned by a recent study by Zanna et al. (2019, Fig.1) which shows that estimated 0-2000m ocean heat uptake (OHU), averaged over the four estimates in common, was lower over 2005-15 than either over 1992-2004 or 1970-1991 (or 1920-40 or 1941-54).

The retraction of Resplandy et al. (2018), the OHU estimate by Zana et al. (2019) and your very own report (SROCC, Table 5.1) cast serious doubt on your finding of "high confidence" and "high agreement" when it comes to our knowledge of ocean heat uptake.

In light of these flaws, we call on the IPCC to correct the evident errors in the SROCC's section 5.2.2.2.1 *Observed and projected global ocean heat uptake* and to reduce the IPCC's confidence rating accordingly.

Yours faithfully,



Dr Benny Peiser

P.S. SROCC cites "Resplandy et al., 2018", on page 5-27 (section 5.2.2.3.1) and lists the Resplandy et al (2018) Nature paper in the references list, on page 5-183. However, it appears to do so in error. The citation is: "Once new estimates of the outgassing flux stemming from river derived carbon of 0.8 Pg C yr⁻¹ (Resplandy et al., 2018) are accounted for". But the Resplandy et al (2018) Nature paper contained no estimates of the outgassing carbon flux. It appears that the SROCC should instead have listed this Resplandy et al (2018) paper in the reference list: "Revision of global carbon fluxes based on a reassessment of oceanic and riverine carbon transport, Nature Geoscience 11, pages 504-509.

References

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IPCC: Special Report on the Ocean and Cryosphere in a Changing Climate (2019)

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